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LEATHER RESEARCH INSTITUTE OF NIGERIA
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FOREWORD

The Leather Research Institute of Nigeria (LERIN) was established in the year 1976. Originally the Institute was started as a Project of the United Nations Food and Agriculture Organisation in 1964 under the auspices of Northern Regional Government of Nigeria. During the years between 1972 and 1976, the institute functioned as a Division of the Federal Livestock Department. The Federal Government, as part of its National Science Policy, created the Ministry of Science and Technology in 1980 and the institute, along with other research institutes, came under its supervision as a semi-autonomous body.

The institute, with its headquarters located at Basawa, Zaria, has some of its departments at Samaru, Zaria and extension centres at Jos, Kano, Maiduguri and Sokoto. The institute has on its rolls suitably qualified and highly experienced scientists and technologists assisted by efficient administrative, accounting and other supporting staff. LERIN is equipped with modern scientific instruments and machinery to carry out advanced R & D work in leather and allied fields, in addition to sufficient library facilities. The United Nations Organisations and other sister laboratories of its kind the world-over are well aware of the nature and quality of work being done at the institute.

The research results from LERIN have so far found publication in journals outside the country. In order to have more efficient dissemination of the research findings and to ensure quick and timely contribution to the industry within and outside the country, a need is felt to start a journal by LERIN. The journal is named "Journal of Leather Research" in order to emphasize the institute's main areas of activity in the fields of leather science and technology and is also expected to cater to all other aspects of leather and allied industries. The publication schedule for the "Journal of Leather Research" (JLR) is at quarterly intervals, to start with. It is hoped the readers will find the journal quite useful in their respective areas of specialisation. Suggestions and enquiries from you, dear readers, will be greatly appreciated.

Soliciting your valued co-operation and patronage and with warm greetings.

Zaria, Nigeria
January 1, 1983

Dr. A.S. Mshelbwala,
Director
Leather Research Institute of Nigeria

MESSAGE FROM THE CHAIRMAN, GOVERNING BOARD, LEATHER RESEARCH INSTITUTE OF NIGERIA

In the present context of diversifying the sources of national income, the priorities of each and every Research Institute in Nigeria are better directed towards import substitution and export promotion, through development of newer processes and products. The demands of the local market should not be lost sight of as there is a great scope in serving the indigenes with cheaper yet better quality products. The Federal Government gives unrestricted encouragement to research and development activities in the country and some State Governments too are establishing their own Ministries of Science and Technology.

Alongside with a sizeable livestock population, Nigeria abounds in natural wealth contributed by vegetable, mineral and marine resources. All these must be carefully utilised to maximum advantage. The leather industry must be assured of good quality raw material in sufficient quantities to run our tanneries to full capacity. The Government and people should mutually endeavour to provide maximum supplies of raw hides and skins to the indigenous tanning industry. Efforts must be continued to harness the resources to the maximum extent and absorb latest technologies in the production of leather and leather products towards earning higher foreign exchange.

The Leather Research Institute of Nigeria has great responsibility in realising these ideals. The institute has done quite a good amount of work and the industry is looking forward to still greater contribution from the Institute. Quite often, a need is felt to effectively disseminate the successful results so far achieved by the Institute in order to bring the industry closer to the Institute. The research workers would equally be interested to see their findings reach the proper quarters without loss of time.

It is in this context that the publication of a journal for the Institute is considered quite necessary. The publication of "Journal of Leather Research", I am sure, will bring together the industry and the Institute as well as the research workers engaged in related work throughout the world. The readers would feel happy to share their scientific and technological knowledge through the medium of JLR.

On behalf of the Members of the Governing Board and certainly on my own, I wish the venture every success.

Argungu, Sokoto State, ALHAJI TANIMU KANGIWA.
1/1/1983.

A NOTE ON THE PRESENT STATUS OF THE LEATHER AND LEATHERPRODUCTS INDUSTRIES OF NIGERIA

The livestock population of Nigeria is estimated to be about 12.5m. cattle, 25m. goats and 12m. sheep. Raw hides and skins available to the Nigerian leather industry are of the order of 1.3m. cattle hides, 11m. goat skins and 2.3m. sheep skins. The availability of hides and skins could be greatly augmented through suitable measures such as scientific breeding, curtailing human consumption, controlling the flaying and curing practices etc.

More than 25% of the processing is in the rural and cottage sectors. The auxiliary materials used in these units are those that are locally available. Presently there are ten mechanised tanneries in the country. Tanning activity is confined mostly to northern part of Nigeria. Exports of hides and skins in the raw condition are not generally encouraged at present but channelised through licences. Pickled skins and wet blue and finished leathers are freely exported. Finished leather, although attract excise duty on production advalorem, could be imported on payment of duty. Due to these statutory measures, the processing activit within the country has increased considerably in recent years.

The leatherproducts industry of Nigeria is spread throughout the country with heavy concentration of organised sector near Lagos. Out of a total national production of about 10m. pairs of shoes, the organised sector contributes 8m. The small scale sector numbering around 2,000 units produces about 20 % of total output. About 80% of the leathergoods produced in the country comprise of synthetic components which are mainly imported. The government have recently banned imports of footwear and other leathergoods and this restriction is expected to result in higher production within the country.

With the rapid development of the leather and leather products industries, the magnitude of requirement of the services of Leather Research Institute of Nigeria has been steadily on the increase. Many new departments are already created and more are in the process of establishment in order to more effectively meet the requirements of these industries. Other activities are planned to keep up the spirit of Leather Research Institute's assistance to the entrepreneurs. "Journal of Leather Research" is one of the latest contribution by LERIN at the services of the industry and scientific/technological community.

Leather Research Institute of Nigeria
Zaria, Nigeria

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ADENOPUS BREVIFLORUS PROTEASE, A POTENTIAL DEPILATORY AGENT FOR THE TANNING INDUSTRY

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ABSTRACT

A proteolytic enzyme was isolated from the fruit of *Adenopus breviflorus* using phosphate buffer, pH 7.5, as the extraction medium. Activity was significantly increased by the addition of reducing agents such as cysteine hydrochloride and 2-mercaptoethanol and complexing agents such as polyethyleneglycol and polyclar AT. Most bactericides tested as preservatives were found to be inhibitory to the enzyme's activity. A two-stage unhairing/'liming' process is proposed for the enzyme based on the observation that extracts containing 30% of the ground fruit gave complete hair-loosening action within 6 hours at 40°C and pH 7.5 while a further treatment with 5% 'ash' for 10 hours at 32°C and pH 12.0 was found adequate in opening up the collagen fibres for tannage. The cleaning action of the process was observed to be an improvement on that of the conventional sulphide hair-pulping technique.

INTRODUCTION

There is a growing interest in enzymatic unhairing or dewooling. The principal driving force stems mainly from the belief that enzyme processes offer good prospects of reducing the effluent problems. The mechanism of enzymatic unhairing is often explained in terms of the combined proteolytic and mucolytic activities of the enzymes in the majority of the available preparations (Whiteley, 1960; Money and Scroggie, 1971). However, proteolytic activity is said to be dominant and hence preparations containing mainly proteases are more commonly found (Dhar, 1974).

The fruits of *Adenopus breviflorus* (Cucurbitaceae) (Irvine, 1961), a climbing plant mainly distributed and wildly grown in tropical regions of Africa, are found to contain such proteolytic enzyme through a systematic work on its purification and characterization (Adewoye and Lollar, In Press). The extraction process, like most plant enzymes presented all of the usual difficulties of tissues when homogenized, in addition to problems due to factors which are not generally encountered in the study of other enzymes. One of such factors is that the tissue consists largely of non-protoplasmic materials, notably vacuole contents, cell-wall constituents and starch, while the protoplasm is quantitatively a minor component. Thus, the natural concentration of the enzyme is very low since the enzymatic portion of the available protein is itself a small fraction. Moreover, in the living plant cell, the small amount of protoplasm is protected from large amounts of potentially damaging materials by compartmentalization. When this is, however, destroyed during homogenization, all its contents inevitably get mixed together, with variable adverse effects.

One of such effects is the speed with which the fruit turns brown when sliced into pieces or homogenized. This makes enzyme isolation extremely difficult. High con-

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centration of phenolic compounds is suspected since the presence of such compounds at a certain concentration level is reported to prevent isolation of active enzymes from some plant sources when conventional techniques are employed (Harborne, 1964). Plant phenolic compounds are very diverse, but there are two main biogenetic groups, viz., the phenylpropanoid compounds which include the hydrolyzable tannins and the flavanoids which include the condensed tannins. They react with proteins, principally by hydrogen bonding (Flett, 1952) or get oxidized to quinones which tend to polymerize and condense readily with reactive groups of proteins, notably -SH and $-NH_2$ groups (Loomis and Battaile, 1966; Pierprint, 1969a & 1969b). If a critical -SH group of an enzyme happens to be so reacted with, then complete inactivation could occur while accompanied oxidative reactions, aided by the presence of phenol oxidases, would probably account for the observed browning action (Bonner, 1957). Other factors that may interfere with plant enzyme extraction include pH of maceration, substantial presence of soluble carbohydrates, protein-protein interactions and protease activities.

The fruit under investigation is at present being empirically used in Nigeria by rural tanners for the depilation of hides and skins, a process widely believed to be enzymatic in nature. The objective of the work reported here is to develop an effective method for the application of the enzymatic fruit extract in the pretanning processes of the tanning industry.

MATERIALS AND METHODS

Fresh fruits of *Adenopus breviflorus* were obtained from Oyo in Oyo State of Nigeria. Insoluble form of Polyvinyl pyrrolidone (Polyclar AT powder) was supplied by M/s GAF Corporation, New York, U.S.A. and Polyethylene glycol-6000 came from M/s J.T. Baker Chemical Company, Phillipsburg, U.S.A. All other chemicals were of analytical grade and were obtained from local sources.

'Ash' was constituted by mixing $CaCl_2.2H_2O$, KOH and $Mg(OH)_2$ in the ratio 11:8:1 using average values of elemental analysis (Prasad and Spiers, 1978; Flick et al., 1978) from various plants. A cow hide was fleshed and a square measuring 2'X2' was cut from the butt area. The square was further cut into smaller squares measuring 12''X12'', some of which were again divided into units measuring 6''X6''.

Fruit Preparation for Extraction

Due to lack of substantial detectable activity from the raw fruit juice or its water extract, the fruit was ground and acetone-dehydrated at temperatures between 0—2°C and the dehydrated pulp vacuum-dried in a desiccator. As the enzyme is concentrated in the fruit's mesocarp and endocarp, these parts were used for the work. The dehydration process separated the various phenolic compounds that could inhibit the activity of the enzymes, including that of some phenol oxidases themselves (Swain, 1965; Walker, 1972).

Extraction of Crude Enzyme

Half a gramme portions of the acetone-dehydrated powder were leached at 37°C for 24 hours in 50 ml of phosphate buffer solution (pH 7.5) with occasional stirring. After cooling to room temperature, the supernatant was separated by filtering through filter paper Whatman No.3. The filtrate was successfully used as the crude enzyme extract, contrary to views expressed on the insolubility of enzymes present in acetone-dehydrated powders (Sanderson and Roberts, 1964).

Assay of Enzymatic Activity

The modified Anson's colorimetric method (Greenberg, 1955) was adopted for the work because it gave more reproducible results. Based on this method, optimal conditions for proteolytic activity of the enzyme were determined. The effects of chemical activators, bacterial preservatives, constituted ash and lime on its activity were also assessed.

Proteolytic activity was expressed in terms of units of enzyme activity. One unit is defined as the amount of the enzyme in 0.2 M. Tris-HCl buffer (pH 8.0) which liberated one microgram of tyrosine from 2.5% egg albumin solution in 30 minutes at 45°C.

Unhairing Trials

Hide squares (6''X6'') were washed with three changes of cold water, weighed and put into individual beakers containing a 100% float based on hide weight. Different amounts of the ground fruit were added to give varying concentrations corresponding to 60, 50, 40, 30, 20 and 10% on the hide weight. To the contents of each beaker, enough 'ash' was added to raise the pH to 7.5 and each incubated at 40°C until unhairing occured. The time taken in each case was recorded.

The pieces were then hand-unhaired, washed with cold water, and three of them were further treated with different amounts of 'ash' corresponding to 3,5 and 7% on the hide weight. The float in each case was maintained at 120% and the extent of opening up effect was assessed at regular intervals at room temperature (32°C). Periodic stirring was the only mechanical action employed.

Comparative Study of Unhairing Processes

Modern Hair Pulping Sulphide Treatment: One hide square (12''X12'') was washed clean of dirt and weighed. One percent lime, 1.2% sodium sulphide and 0.6% sodium sulphydrate were added to 100% float based on hide weight. The hide sample was added and the bottle agitated in a mechanical shaker for 3 hours at 27°C. Washing was carried out with water at 26°C till all the pulped hair was completely removed. A reliming liquor was prepared by adding 3% lime and 0.2% sodium bisulphite to a float of 120%, the hide put in and the mixture agitated in the shaker for 8 hours at 26°C.

Traditional Unhairing Process Employed by Nigeria's Local Tanners: Another 12''X12'' hide piece was cleaned and weighed. Eighty percent 'ash' and 55% ground fruit were mixed together in a vessel containing 500% float based on hide weight. The hide was added, the whole content stirred and left to stand at room temperature of about 32°C for 24 hours. The mixture was frequently stirred until unhairing was completed.

Proposed Unhairing Process Using the Fruit Extract: The size of the hide piece for this experiment was 6''X6''. Thirty percent ground fruit was added to a 100% float and 1.0% 'ash' stirred in to raise the pH of the mixture to 7.5. With the temperature raised to 40°C, the hide was added and the contents thoroughly stirred. Periodic stirring at half-hour intervals was continued throughout the 6 hours of processing. The hide was further treated at room temperature of about 32°C with 5% 'ash' in a 120% float, after unhairing. This treatment, accompanied with intermittent stirring, lasted 10 hours.

Modified Unhairing Process: The procedures here were carried out the same way as the "Proposed Process", the only difference being that 'ash' was replaced with lime for both unhairing and reliming.

RESULTS

Acetone dehydration process was observed to give a chlorophyll-free powder and significantly reduced the amount of gum - and resin-like materials of the fruit. Pigments and some phenolic compounds such as tannins were similarly eliminated by the process, thereby terminating the browning action.

Table I shows that the use of water as an extraction medium for the enzyme resulted in low activity while the application of sodium phosphate buffer (pH 7.5) proved effective. Tests carried out to determine the effect of various chemical additives on the activity of the enzyme showed 2-mercaptoethanol as having the most beneficial activating effect, closely followed by polyethyleneglycol. The optimal conditions for activity were found to be : pH:7.5 (phosphate buffer), temperature: 45°C and substrate concentration: 2.5%. All bacterial preservatives used in the tests effected some inhibition (Table II), sodium silico-fluoride recording the least. Hydrogen peroxide, and, to a large extent, mercuric chloride, inactivated the enzyme at all the concentrations tested.

Addition of 'ash' to the enzyme extract (Table III) produced adverse effect on proteolytic activity and such effect got pronounced with the increase in the concentration of 'ash'. The substitution of lime for 'ash' showed the same trend.

TABLE I

EFFECT OF CHEMICAL ADDITIVES ON THE PROTEOLYTIC ACTIVITY OF *ADENOPUS BREVIFLORUS* PROTEASE

Chemical Additives	**Concentration**	**Proteolytic Activity (Enzyme Units)**
Water	—	6.75
Phosphate Buffer (pH 7.5)	—	22.63
Cysteine-HCl	0.005M	23.25
Sodium cyanide	0.005M	22.76
Sodium sulphide	0.033M	20.88
Mercaptobenzothiazole	0.005M	7.94
2-Mercaptoethanol	0.100M	27.13
Complexing Agents:		
Sodium borate	4.0%	18.81
Polyclar AT	6.0%	23.13
Polyethyleneglycol (PEG-6,000)	1.0%	25.50

TABLE II

EFFECT OF BACTERIAL PRESERVATIVES ON THE ACTIVITY OF *ADENOPUS BREVIFLORUS* PROTEASE (IN ENZYME UNITS)

Bactericides	Concentration of Bactericides 0.1%	0.5%	1.0%	2.0%
Control (Sodium phosphate Buffer, pH 7.5)	22.68	22.68	22.68	22.68
Toluene	18.25	16.56	15.38	14.06
Sodium chlorite	17.88	6.88	6.13	5.38
Merthiolate	19.38	8.69	6.81	6.06
Sodium silico-fluoride	21.13	6.81	4.25	3.50
Mercuric chloride	0.13	0.00	0.00	0.00
Sodium pentachlorophenate	13.88	4.88	1.75	0.06
Hydrogen peroxide	0.00	0.00	0.00	0.00

TABLE III

EFFECT OF 'ASH' AND LIME ON THE ACTIVITY OF *ADENOPUS BREVIFLORUS* PROTEASE

Concentration of 'Ash'	Proteolytic Activity (Enzyme Units)
Control (Phosphate Buffer, pH 7.5)	22.81
0.5% (pH 8.9)	17.69
1.0% (pH 9.6)	16.69
2.0% (pH 12.0)	3.00
5.0% (pH 12.1)	1.63
10.0% (pH 12.2)	0.75
Concentration of Lime	
1.0% (pH 10.0)	17.13
2.0% (pH 12.3)	2.44

The assessment of the depilatory action of the enzyme (Table IV) showed complete hair-loosening and outstanding cleaning action when 30% ground fruit was applied for 5½ hours. The remaining results, prove that optimal concentration of the fruit extract is important for speedy and effective unhairing action. When the hide pieces were further treated with different levels of 'ash' for the purposes of reliming action (Table V), the experiment with 5% 'ash' produced the best opening-up of the collagen fibres by 10 hours; the pelt got plumped to the required extent. The desired extent of plumping was not obtained with 3% 'ash', even after 24 hours and the pelt remained quite harsh and stiff to handle.

TABLE IV

DEPILATORY ACTION OF *ADENOPUS BREVIFLORUS* PROTEASE

Percentage of Fruit Pulp (on Hide Weight)	Time taken for Depilation (Hours)	Observation
10	20.00	Pelt unhaired with difficulty and gave poor cleaning action
20	18.00	Less difficulty of unhairing and improved cleaning action
30	5.50	Easy unhairing and excellent cleaning action
40	6.50	Easy unhairing and good cleaning action
50	21.00	Relatively difficult unhairing with fair cleaning action
60	24.00	Difficult unhairing and poor cleaning action

TABLE V

LIMING ACTION OF THE 'ASH' PREPARATION

Percentage of 'Ash' (on Hide Weight)	Period of Treatment (Hours)	Observation
3	24	Harsh and stiff pelt
5	10	Flexible and fully plumped pelt with the fibres well-opened up
7	10	Fully plumped pelt but quite stiff to handle

For the comparative study, sulphide hair-pulping was completed within 3 hours and full reliming took about 8 hours. Twentyfour-hour period, however, was required for the traditional process before hair-loosening became very apparent. The apparent slow hair-loosening action might be due to the slow activity of the enzyme in the highly alkaline liquor. The proposed process and its modified version each completed the hair-loosening action within 6 hours. Full opening up of the hide fibres in each case took about 10 hours. The cleaning of the fibre network was so thorough that bating of the pelt might not be necessary in the subsequent step before tannage is carried out.

DISCUSSION

The results in respect of chemical additives and optimal conditions indicate that the enzyme exhibits some chemical characteristics as papain, despite the fact that its source is the juice of vine-fruit while papain is derived from the latex of tree-fruit.

Such similarities include the exhibition of maximum activity by both the enzymes in the pH range of 7.0 to 8.0, activation by such compounds as cysteine-hydrochloride, 2-mercaptoethanol and sodium cyanide and inactivation by both mercuric chloride and hydrogen peroxide. However, there are also some notable dissimilarities. For instance, buffer alone does not efficiently extract papain whereas it extracts about 90% of the new protease.

It is particularly note-worthy that sodium pentachlorophenate, a biocide easily regarded as a popular preservative for proteinacious materials, such as hides and skins, exhibited one of the most drastic effects on the activity of this enzyme, particularly beyond 0.1% concentration. The bactericide may, therefore, not be recommended for treating hides and skins that are to be enzyme-unhaired. The oxidizing power of some of the other bactericides, such as hydrogen peroxide and sodium chlorite, might contribute to the observed partial inactivation or complete loss of activity.

The adverse effect of 'ash' on the activity of the enzyme (Table III) which increases with concentration of 'ash' suggests that, in practice, just enough of 'ash' should be added to raise the pH of the liquor to obtain the enzyme's optimal activity or else the processing period might be unduly prolonged. It could therefore be adduced that some plant proteases would compete favourably with those from animal or microbial sources with respect to their depilatory activities. This possibility would therefore serve to allay some of the fears expressed regarding the unsuitability of enzymes from vegetable origin for use as unhairing agents (Grimm and Trabitzsch, 1964).

Although a saving of about 5 hours in processing time stands in favour of the lime-sulphide process, the cleaning action was not quite sufficient and additional bating time and chemicals would therefore be necessary. Moreover, such a process gives rise to considerable environmental pollution problems brought about as a result of high amounts of suspended solids arising from lime and sodium sulphide and the toxic hydrogen sulphide gas that could be generated. Furthermore, the resulting hair or wool from the enzymatic process could be fully recovered undamaged and sold or properly disposed of. On the other hand, the hair resulting from the lime-sulphide process becomes drastically pulped up, thereby contributing to the high biological oxygen demand (BOD) of the effluent. It should also be noted that proteolytic enzymes, if present in the effluent collection tank, could degrade some of the proteinaceous materials therein to give lower molecular weight products on which micro-organisms could more easily act upon, thereby reducing the BOD to a more manageable level.

As a result of the unhairing/'liming' trials thus carried out, a two-stage liming process is proposed in place of the one-stage traditional process. Although this proposed method may call for some additional over-head costs, the time saved by processing for only 16 hours instead of 24 hours, coupled with the significant reduction in chemicals (6% 'ash' instead of 80% and 30% of the ground fruit instead of 55%) should adequately compensate for any additional expenses. The effective cleaning action of the enzyme in the proposed procedure would also prove to be an added advantage since it would make a separate bating process unnecessary, thereby saving on chemicals and processing time. The procedure would give tanners better control of their pelt preparation, thus yielding high-quality and standardized end-products. A much better working environment would also evolve.

The results also indicate that there is no added advantage in using lime to replace 'ash' in the proposed procedure. In the absence of lime, therefore, as it is often the case with traditional tanners, ash could be very effectively employed. Thus one of the objectives of this work would seem to have been achieved in respect of such tanners, in that no additional processing chemicals would become necessary in adopting the developed process. This type of modification has a better chance of acceptability to tanners.

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SLAUGHTER OF PREGNANT ANIMALS AND ITS EFFECT ON THE LEATHER INDUSTRY

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ABSTRACT

Data from the records of some major slaughter houses in Nigeria were analysed.

From the records of a 5-year period (1975-1980) it was shown that out of 1.7 million cattle slaughtered, 0.6 million were females (37.43%) out of which 0.02 million were pregnant (3.26%), the foetuses of which were condemned.

Thorough ante-mortem inspection to detect and salvage pregnant animals from slaughter will enable the leather industry to have an adequate and cheap supply of hides and skins for its operations.

INTRODUCTION

The leather industry in Nigeria depends on the availability and supply of hides and skins from animals slaughtered.

Differences in the quality of hides and skins and skills of the butcher in dehiding or skinning of animals influence the quantity of hides and skins available to the leather industry. A sizeable proportion of available hides and skins is also used for human consumption.

Slaughter-house by-products include other than the carcass, everything of economic value, obtained from an animal during slaughter and processing. These products are classified as edible or inedible.

The meat packing industry of the developed countries has long been noted for its efficiency in the processing and utilization of by-products. Although the value of by-products is only a small fraction of the current live animal value, they are of considerable economic importance to the entire livestock and meat industry (American Meat Institute Committee on Textbooks, 1953). Over the past several years, the value of by-products has declined with respect to the value of the live animal. This relative decline in value has been due largely to technological progress in producing competitive products from non-animal sources. Various synthetic materials have been developed and are imported to make many items which were once made of leather (Forrest *et al.* 1975a.)

Yields of by-products vary greatly, depending upon the method of processing and the weight, grade, sex and species of animal. The value of by-products is greater when processed immediately after slaughter than when delayed (Clemen, 1927).

Numerous edible meat by-products are obtained during the slaughter and processing of meat animals. To the leather industry, the inedible by-products (Table I) are of

TABLE I

INEDIBLE BY-PRODUCTS OBTAINED FROM MEAT ANIMALS AND THEIR MAJOR USAGES

Raw By-products	Processed By-products	Principal Uses
Hide (cattle and calves)	(Leather	Numerous leather goods,
	(Glue	Paper boxes, sand paper, plywood
	(Hair	Felts, upholstery
Pork skins	Leather	Leather goods
Pelts (sheep and goat skins)	(Wool	Textiles
	(Skin	Leathergoods
	(Lanolin	Ointments
Fats (cattle, calves, lambs and sheep)	Inedible tallow	Industrial oils, lubricants, soap, glycerin
Bones, Horns, Hooves	(Dry bone	Glue, hardening steel, refining sugar (bone charcoal)
	(Bone meal	Animal Feed, fertilizer
Blood	(Blood albumen	Leather finishing, textile sizing
	(Blood meal	Animal feed
Glands	(Pharmaceuticals	Medicines
	(Enzyme preparations	Industrial uses

paramount importance (Forrest *et al.*, 1975b). The use of some of these processed by-products is varied and almost unlimited in number.

Cattle hides and skins are graded on the basis of hide weight, sex, maturity, the presence and location of brands and the method of curing (Forrest *et al.*, 1975b). Hides and skins are technically divided into hides, kips and skins, based on the weight of the clean hide. Hides come from large and mature animals, kips are skins of immature animals while skins are from small animals such as calves, sheep and goats. The brands burned into the hide and certain cutaneous diseases such as streptothricosis (kirchi) greatly affect the value of hides and skins.

In Nigeria, the main sources of hides and skins for the leather industry are the slaughter slabs and abattoirs located in various parts of the country. The careless and crude practices in these operation areas have gone a long way to starve the leather industry of ready supply of adequate hides and skins.

Nuru (1979) stressed the significance of hides and skins as one of the major national economic livestock products and foreign exchange earner for Nigeria. Exports of hides and skins continue to hold a key position in the Nigerian economy despite the prohibition order of 1978. Figures on the production and exportation of Nigerian hides and skins from the available records are presented in Table-II (Nuru, 1979).

The potential supply of hides and skins in 1973 was estimated at 1.3 million hides, 11 million goat skins and 2.3 million sheep skins (Nuru, 1979).

The aim of this paper is to highlight some slaughter house practices leading to poor turn-over of hides and skins for the Nigerian leather industry and advance some solutions.

MATERIALS AND METHODS

Data were obtained from the record books of the Veterinary Public Health and Epidemiological Unit of the Federal Livestock Department, Kaduna. The record books contained monthly and annual reports on meat inspection received from the slaughter houses and slaughter slabs throughout Nigeria.

The total number of cattle slaughtered during a five-year period (1975-1980) and that of total females as well as the total number of pregnant females and condemned foetuses were analysed and the percentage of the latter expressed (Table III).

RESULTS

It can be observed that a total of 1,709,478 (1.7m) cattle were slaughtered between 1975 and 1980. A total of 20,872 (3.26%) foetuses were recorded recovered, out of a total of 639,826 females slaughtered. It is also believed that over 60% of all slaughtered sheep and goats in Nigerian abattoirs were pregnant (Aganga, 1983a).

DISCUSSION

The significance of livestock and livestock by-products in the Nigerian economy cannot be over-emphasized. It has been reported that the livestock industry in Nigeria wastes up to 79,000 tons of inedible slaughter house by-products valued at about ₦2 million annually (Anon, 1981). Poor slaughter house practices may be responsible for a large proportion of the wastage. From Table-III, it is seen that 20,872 foetuses were recorded. These were condemned and disposed of during the post-mortem inspection of meat at these slaughter houses and slaughter slabs. If these pregnant animals were detected in time during ante-mortem inspection, at least more than 70% of these foetuses may have grown to adulthood yielding the desired meat as well as hides for the leather industry. The leather industry is further deprived of hides because up to 60% of hides now produced are consumed by human beings (Adewoye, 1982).

It is however to be noted that the slaughter figures in Table-III are subject to inaccuracies because of a number of factors as observed by Aganga (1983b) such as:

(i) non-chalant attitude of the meat inspector;

(ii) non-recording of all slaughterings at the slaughter houses;

(iii) inaccurate records in annual reports sent to the Federal Livestock Department by the inspectors.

TABLE II

PRODUCTION AND EXPORTATION OF NIGERIAN HIDES AND SKINS
(1967—1972)

YEAR	HIDES, IN PIECES		GOAT SKINS, IN PIECES		SHEEP SKINS, IN PIECES	
	PRODUCTION IN '000	EXPORTATION IN '000	PRODUCTION IN '000	EXPORTATION IN '000	PRODUCTION IN '000	EXPORTATION IN '000
1967	1,700	900	8,500	5,670	1,700	1,400
1968	1,700	724	8,300	5,000	2,000	1,500
1969	NA	NA	NA	NA	NA	NA
1970	1,300	634	7,400	4,000	2,000	1,000
1971	1,200	280	8,200	4,800	1,700	1,200
1972	1,300	250	7,600	3,300	2,300	1,500

Key: NA = Not Available

TABLE III

RECOVERED FOETUSES FROM THE SLAUGHTERED CATTLE IN FEW SELECTED NIGERIAN SLAUGHTER HOUSES (1975—80)

	1975 — 1976		1976 — 1977		1977 — 1978		1978 — 1979		1979 — 1980	
	Total Slaughtered	Total Foetuses	Total Slaughtered	Total Foetuses	Total Slaughtered	Total Foetuses	Total Slaughtered	Total Foetuses	Total Slaughtered	Total Foetuses
ILORIN	16788	318	16259	1	NA	NA	12445	NA	28924	309
JOS	22361	1668	19683	1430	14412	0.00	4086	0.00	13575	383
BAUCHI	4784	118	6518	224	3275	0.00	392	0.00	14647	40
MAIDUGURI	28059	3390	26560	3427	29644	238	32838	960	30963	326
ENUGU	16869	207	7089	64	16808	917	64731	253	38588	NA
CALABAR	13829	533	13550	678	15678	445	13437	428	19797	706
ZARIA	25195	399	26825	677	31926	125	27755	307	39529	248
KADUNA	15246	560	7427	282	10372	0.00	14100	0.00	16015	665
SOKOTO	15755	157	8973	55	18128	55	20204	51	30700	228
Total =	158,886	7,350	132,884	6,838	140,243	1,780	189,988	1,999	232,738	2,905

GRAND TOTAL FOR THE PERIOD 1975—1980 = 1,709,478 (1.7m) cattle slaughtered

Total No. of females = 639,826
Total No. of pregnant females = 20,872
Condemned foetuses, % = 3.26

NA = Not Available

These inaccuracies may have accounted for the higher figure of slaughtered cattle in Zaria compared to Kaduna and Sokoto which are known to have higher turnovers than Zaria.

Although the primary producers of livestock need a change of attitude towards modern techniques of production, the inefficient marketing, processing, preservation and wastages from non-utilization of livestock products result in a great loss of income and thus a reduction in the contribution of livestock to the national economy. There is an urgent need for better slaughtering, processing and storage functions if the maximum economic potential of the industry is to be achieved. With the ever increasing cost of imported finished leather and leather footwear into Nigeria which rose annually from ₦613 thousand in 1968 to the tune of ₦2 million in 1972, the need to encourage home industries to effectively collect and utilize available hides and skins to promote growth becomes obvious (Nuru, 1979).

It is estimated that approximately ₦1 million was lost to the leather industry during the period under review through the slaughter of pregnant animals. It is therefore suggested that thorough ante-mortem examination be enforced by law to prevent this. All the pregnant animals detected during such examination should be salvaged and kept on government farms until they have delivered.

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ABSTRACTS

HIDES AND SKINS

Russel, A.E. and Galloway, A.C. (1980), "LOW-SALT ANTISEPTIC CURING STUDIES," J.S.L.T.C., **64** (1), 1.

Enhanced antiseptic activity occurs in the case of a number of commercial antiseptics when these are applied to green hide in dilute salt solutions. This effect has been utilised in the present study to reduce the amounts of salt in curing by carrying out processor treatments of green hides in low salt-antiseptic mixtures, giving extended storage up to seven weeks during the cooler months of the year. Summer storage potential appears to be about four weeks. Examination of the salt components arising indicates that the proposed method offers the possibility of achieving significant salt reductions and better utilisation of salt to ease pollution problems. Scaled-up, matched-side field trials are currently being conducted to compare physical properties of the trial leather against conventional leathers. The question of biodegradability of the commercial antiseptics in use is also being studied in laboratory effluent treatment systems. (14 Tabs.; 6 Refs.)

BIO-SCIENCES AND TECHNOLOGY

Craig, N.L. and Roberts, J.W. (1980), "*E.COLI* RECA PROTEIN-DIRECTED CLEAVAGE OF PHAGE λ REPRESSOR REQUIRES POLYNUCLEOTIDE," Nature, **283** (5742), 26.

The recA protein, obtained from *E. coli* cells carrying the recessive A (recA) gene seems to have two distinct roles. It mediates both genetic recombination and several cellular responses to DNA damage, including the induction of temperate bacteriophage. Induction of phage λ results from proteolytic cleavage of λ repressor directed by recA protein. It was demonstrated that this cleavage reaction required both polynucleotide and ATP. This observation led to the suggestion that in the presence of ATP, a stoichiometric complex of recA protein and single stranded DNA is activated to attack and destroy repressors by proteolytic cleavage and to initiate pairing of this DNA to its homologous sequence in a DNA duplex. (6 Figs.; 27 Refs.)

(GE)

Mehra, U., Patil, B.G. and Ranjekar, P.K. (1980), "ANALYSIS OF BOVIDEAE GENOMES: PART II—GENOME CHARACTERIZATION OF GOAT & SHEEP," Indian J. Biochem. Biophys., **17** (1), 8.

Characterisation of deoxyribonucleic acids (DNAs) of goat and sheep were carried out by studying their melting properties and reassociation kinetics. Both DNAs were subjected to thermal denaturation as a single component with a Tm (melting temperature) of 83°C in goat and of 84°C in sheep. Multiple DNA components were, however, observed after differentiation of their melting curves. Observation of the DNA reassociation plots of these two species revealed the presence of a fast reassociating DNA fraction comprising 26 — 28% of the total genome. Slow and an intermediately reassociating DNA fractions were also observed. The observation that the Cot ½ value of the slow reassociating DNA fraction was $3.3 - 4.6 \times 10^5$ times more than that of fast reassociating DNA fraction led to the assumption that the latter was made up of mainly repeated DNA sequences. From the comparative Cot ½ values of *E. coli* whose nucleotide pairs are known and those of the slow reassociating DNA fractions of goat and sheep, the genome size of the latter were estimated to be 3.1×10^9 and 5.5×10^9 nucleotide pairs respectively. (3 Figs.; 2 Tabs.; 10 Refs.)

(GE)

Bano, B., Saleemuddin, M. and Siddiqi, M. (1980), "STUDIES ON CHEMICALLY AGGREGATED TRYPSIN USING GLUTARALDEHYDE," Indian J. Biochem. Biophys., **17** (1), 12.

Glutaraldehyde, used as cross-linking agent for commercially obtained trypsin from "Difco" and "Sigma" preparations produced water — insoluble derivatives. These derivatives were dispersable in fine suspension after homogenisation and displayed caseinolytic and estrolytic enzyme activities. Although the insoluble preparations showed lower enzyme activities than the corresponding soluble enzyme, the former were found to be more stable than the latter against urea, guanidine-HCI, heat and pH denaturation. Insolubilized trypsin obtained form "Difco" preparation was more stable than the insoluble "Sigma" preparation most probably due to the formation of more extensive cross — linkages in the former due to the presence of non-trypsin polypeptides. It is considered that insolubilization of enzymes by chemical cross-linking agents has advantages over the practice of binding enzymes to insoluble carrier in that the carrier adds to the reactor volume which can be appreciably reduced by chemical aggregation. Apart from enhanced resistance to denaturation, chemical aggregation of enzymes aids in the easy removal of the enzyme from the reaction mixture. (8 Figs.; 2 Tabs.; 15 Refs.)

(GE)

(1980), "RESEARCH IN PROCESS IN THE AREA OF BIOTECHNOLOGY IN TURKEY," Biosources Digest, **2** (1), 2.

Research in biotechnology which had hitherto been limited in scope is fast gaining prominence in several institutions of higher learning in Turkey. Research is being actively carried out in applied and theoretical areas of biochemical engineering, enzyme technology and bio-energy. Current research interests include production of single cell protein (SCP) from olive, cheese waste water, hydrocarbons etc., and that of bio-gas besides determination of optimum systems for alcohol production from molasses for alcohol — gasoline mixtures. Several small scale industries have been established based on the research findings in the above areas of biotechnology such as fermentation technology to produce antibiotics, citric acid and baker's yeast. It is envisaged that more areas of biotechnology will continue to gain greater interest and momentum in several institutions in Turkey in the near future.

(GE)

Gaden, E.L., Jr., (1980), "PROSPECTS FOR BIOTECHNOLOGY IN A RESOURCE— LIMITED WORLD," Pure and Appl. Chem., **52** (1), 1.

There is an argument with regard to the causes of and responsibilities for the industrialized world's current resource dilemma. Many of the minerals are in short supply in the industrialised countries making them almost totally dependent upon external sources. Prominent areas of suffering for many of them include some aspects of social and political instability. Biotechnology is said to influence all aspects of the exploitation and control of living cells or their products (eg., enzymes) to achieve desirable ends. It is suited to the generation of appropriate technology which is the process of establishing social and environmental goals, evaluating the potential positive and negative social environmental effects of a proposed technology before it is developed, and then attempting to incorporate beneficial elements into the various phases of development and utilization; appropriate technology also suggests the matching of local resources to local needs and the employment of local talents and techniques to convert the first to meet the second. Case studies on petroleum, natural gas and wood as energy resources are made. Conversion technologies, the processes themselves, are suggested to integrate closely with prospective markets and raw materials resources.

(EOAF)

TANNING AGENTS AND MECHANISM OF TANNING AGENTS

Galwey, A.K., Reed, R., and Guarini, G.G.T., (1980), "OBSERVATIONS ON INTERNAL STRUCTURES OF CHROME ALUM DEHYDRATION NUCLEI," Nature, **283** (5742), 52.

Decomposition reactions of many solids proceed by nucleation and growth processes so that the kinetic expressions used and the interpretation of rate data are based on quantitative consideration of the progressive changes in geometry of advancing reactant/product interfaces. Conclusions from such kinetic analyses are often confirmed by optical microscopic observations. A method whereby information may be obtained, in favourable systems, about the three-dimensional shapes of nuclei and the disposition of product particles in the wake of interface advance is described. From the dehydration reaction of $KCr(SO_4)2.\ 12H_20$, it is concluded that product shrinkage results in crack development through which water is evolved and crystallographic factors exert little control on the directions of interface advance during growth of the approximately hemispherical nuclei. (1 Fig.; 10 Refs.)

Whitehurst, D.D. (1980), "CATALYSIS BY HETEROGENIZED TRANSITION — METAL COMPLEXES," Chemtech, **Jan.,** 44.

An attempt has been made to summarize the state of the art for catalysis by heterogenized transition-metal complexes. During the course of these discussions several areas were identified which are believed to be fruitful areas for future research. These are summarized as follows: extension of heterogenized transition-metal complexes to high thermal stability polymers; increased steric control on intermediates (e.g., optically active ligands or polymers); multistep catalytic reactions; selective reagent concentration by matrices; cooperative catalysis by several sites; site isolation and control of pore size for heterogenized transition-metal complexes. (3 Figs.; 1 Tab. 67 Refs.)

Gupta, S.D. (1980), "SOME THOUGHTS ON STANDARDISATION OF SYNTHETIC TANNING MATERIALS," JSLTC, **64** (1), 16.

Syntans were fully reviewed. It was stated that the variation in leather properties is due to the use of the large number of syntans. The major differences in syntans are due to their chemical constituents and tehcniques of production leading to differences in ultimate tanning capacity and quality parameters. While reviewing the development of syntans, their classification based on tanning ability ie., as auxiliary, combination and exchange syntans was brought about. Other classifications by Kuntzel, Mauthe and Chen were discussed. Parameters for evaluating syntans were suggested and specifications for the various groups of syntans proposed. (5 Tabs.; 74 Refs.)

(BBD)

ANALYTICAL CHEMISTRY

Jackson, L.L., Janet, O., John, O'Dea and Osteryoung, R.A. (1980), "CONSECUTIVE AMPEROMETRIC TITRATIONS FOR CALCIUM AND MAGNESIUM," Anal. Chem., **52** (1), 71.

This is an extension of Monier and Roueche method for the determination of Ca and Mg concentrations in the same water sample aliquot by successive titration with EGTA and EDTA (or DCTA) respectively, using pulse polarographic amperometric technique for the detection of the end point. For Ca and Mg concentration ranges of 1:0.1 to 0.1:0.5 mF, errors recorded for Ca were within ± 1% and standard deviations within 1% while errors for Mg were + 1 - 3% and standard deviations within 1%. The method is suitable for the analysis of natural waters and water samples containing other metals. (3 Figs.; 5 Tabs.; 17 Refs.)

(AAN)

Routh, M.W. (1980), ANALYTICAL PARAMETERS FOR DETERMINATION OF CHROMIUM IN URINE BY ELECTROTHERMAL ATOMIC ABSORPTION SPECTROMETRY," Anal. Chem., **52** (1), 182.

Electrothermal atomic absorption spectrometry (EAAS) has been shown to be suitable for the determination of chromium in urine incorporating the standard addition method. Reduction of non-specific absorption to an acceptable level was achieved using a hydrogen diffusion flame as a supplement to the inert gas sheathing the graphite absorption cell. Residual non-specific absorbance can be compensated by the use of a deuterium arc lamp. The limit of detection of 0.2 μg/L obtained with this technique from 20-μL sample injections was in accordance with other recent studies; the values however differed from those obtained using graphite furnace atomization method. (6 Figs.; 2 Tabs.; 16 Refs.)

(AAN)

Shaw, F. (1980), "DEVELOPMENT AND CONSTRUCTION OF AN ANALYSER FOR THE DETERMINATION OF THE HYDROGEN PEROXIDE CONTENT OF NATURAL WATER USING A CHEMILUMINESCENT REACTION," The Analyst, **105** (1246), 11.

The development and construction of a portable analyser for the determination of hydrogen peroxide, at concentrations as low as 0.02 mgl^{-1} in natural water are described. The system employed the chemiluminescent reaction of luminol (3-aminophthalhydrazide) and hydrogen peroxide with potassium hexacyanoferrate (III) as the catalyst. The method is reported to be simple, sensitive and rapid. Interfering organic compounds are removed easily by dialysis. The apparatus can be powered by a 12-volts car battery. (4 Figs.; 6 Tabs.; 10 Refs.)

(JBG)

Holm, K.A. (1980), "AUTOMATED COLORIMETRIC DETERMINATION OF ACID PROTEINASE ACTIVITY IN FERMENTATION SAMPLES USING A TRINITROBENZENESULPHONIC ACID REAGENT," The Analyst, **105** (1246), 18.

An automated method for the determination of acid proteinase activity has been developed. The enzyme is incubated with a haemoglobin substrate after which the reaction solution is dialysed. The concentration of the liberated amino acids and peptides is determined by reaction with a trinitrobenzenesulphonic acid reagent. The technical parameters of the process and the general analytical conditions have been optimised. The method offers great advantages in its flexibility of selecting substrate and buffer independently of the conditions for the colour reaction. The final result is an automated method with high sensitivity, precision and speed. The sensitivity of the colour reaction is 1 mg 1^{-1} of nitrogen from leucine. (5 Figs.; 13 Refs.)

Eusebius, L.C.T., Ghose, A.K., Askok Mahan and Dey, A.K. (1980), "THIOSULPHATE AS A COMPLEXING AGENT IN THE SEPARATION OF CATIONS BY ANION-EXCHANGE CHROMATOGRAPHY," The Analyst, **105** (1246), 52.

The anion-exchange behaviour of a number of metal ions on Dowex 1-X8 (Cl^- form), in both neutral and alkaline sodium thiosulphate solution (0.02 — 0.4M), has been investigated. Cu(II), Zn(II), Cd(II), Ag(I) and Pb(II) form anionic complexes and are selectively adsorbed by the resin, whereas other metal ions remain unadsorbed. The separation factors relative to Cu(II), Zn(II), Cd(II), Ag(I) and Pb(II) have been calculated as a function of sodium thiosulphate concentration following determination of the distribution coefficients. As predicted from the separation factor, column chromatographic separations of a number of synthetic binary mixtures could be achieved. Cu(II), Zn(II), Cd(II), Ag(I) or Pb(II) can be separated from Mn(II), Co(II), Ni(II), Mg(II), Ca(II), Sr(II), Ba(II), La(III) or Ce(III). Of the sorbable ions, Ag(I) and Pb(II) are firmly held by the resin at high sodium thiosulphate concentrations. Separation of either of these ions from the other sorbable ions, Cu(II), Zn(II) or Cd(II), was achieved and experimental conditions for the separations are described. Also, ternary separations of Ag(I) or Pb(II) from Cu(II), Zn(II) or Cd(II) and from Mn(II), Co(II), Ni(II), Mg(II), Ca(II), Sr(II), Ba(II), La(III) or Ce(III) have been carried out. The distribution coefficients, column elution behaviour, elution curves and statistical evaluation of the experimental results are presented. (6 Figs.; 4 Tabs.; 10 Refs.)

Azad, J., Kirkbright, G.F. and Snook, R.D. (1980), "DETERMINATION OF ARSENIC IN SOIL DIGESTS BY NON-DISPERSIVE ATOMIC-FLUORESCENCE SPECTROMETRY USING AN ARGON-HYDROGEN FLAME AND THE HYDRIDE GENERATION TECHNIQUE," The Analyst, **105** (1246), 79.

The determination of arsenic in soil digests has been successfully demonstrated using the technique of non-dispersive atomic-fluorescence spectrometry together with the application of the hydride generation technique for sample introduction into an argon — hydrogen entrained-air flame. Interference has been noted when nickel is present in the sample solutions at concentrations greater than 5 μg cm^{-3}, possibly owing to the formation of stable nickel arsenide in the sample solution. The results obtained for nine soil digests, which were analysed for arsenic concentration, show good agreement with those obtained by inductively coupled plasma emission spectrometry. Previously published results for the determination of selenium in soil digests have demonstrated the use of non-dispersive atomic-fluorescence spectrometry for the sensitive and precise determination of selenium in soil digests. The use of non-dispersive atomic-fluorescence spectrometry allows the sequential determination of both arsenic and selenium by simple substitution of the spectral source and no other changes of instrumental parameters. (2 Figs.; 4 Tabs.; 10 Refs.)

Cottenie, A., Camerlynck, R., Verloo, M. and Dhaese, A. (1980), "FRACTIONATION AND DETERMINATION OF TRACE ELEMENTS IN PLANTS, SOILS AND SEDIMENTS," Pure and Appl. Chem., **52** (1), 45.

With the aid of more sensitive instrumental methods it is possible to determine trace elements after separation of different fractions from soil and plant samples. Fractions of soils and sediments are obtained by extraction with different reagents, chosen in function of biological, ecological or chemical considerations. In plant samples it is possible to separate free ions and organo-mineral complexes combining techniques of extraction, sephadex gel filtration and ion exchange, thin layer chromatography, electrophoresis and molecular filtration. (3 Figs.; 4 Tabs.; 25 Refs.)

Urano, K., Kawabata, M., Yamada, N. and Masaki Y. (1980), "SELECTIVITY OF ION TRANSPORT IN DESALINATION BY ELECTRODIALYSIS," Ind. Eng. Chem. Process Des. Dev., **19** (1), 59.

Changes of selectivity of ion transport (T/) with operating conditions such as electric current density (I/S), total concentration of desalting solution (C_T) and linear flow velocity (v) were studied in the electrodialysis desalination process. When I/S is very large, or when C_T or v is very small, T/ is equal to the ratio of the equivalent conductivities of j to i ions in infinite dilute solution. When I/S is very small, or when C_T or v is very large, T/ seems to be equal to the ratio of the diffusion coefficients of j to i ions through the membrane. In the transitional state, which is the most important state in practical use, T/can be given by the equation at T/ $= A(I/S)^{\alpha} C_T^{\beta} V^{\alpha'}$. The values of A and β vary according to systems of membranes and ion species, and the values of α seem to vary only with ion species. But the absolute values of γ vary little according to the systems of membranes and ion species.

Sawaguchi, T., Inami, T., Kuroki, T. and Ikemura, T. (1980), "STUDIES ON THERMAL DEGRADATION OF SYNTHETIC POLYMERS. 12. KINETIC APPROACH TO INTENSITY FUNCTION CONCERNING PYROLYSIS CONDITION FOR POLYETHYLENE LOW POLYMER," Ind. Eng. Chem. Process Des. Dev., **19** (1), 174.

A kinetic equation for the pyrolysis gasification reaction of polyethylene low polymers has been established. On the basis of this equation, the intensity function $I_F = T\theta^a$ (K.g ^{a}) concerning the severity of decomposition conditions, conventionally considered as an important parameter regarding product yield, is clarified theoretically from a kinetic point of view. I_F is supported by this point of view and the value of the exponent $\bar{a}$ of I_F can be calculated quantitatively from the kinetic parameters by the following equation: $\bar{a} = -\text{In}(1\text{-}RT/E \text{ In } \theta) / \text{In } \theta$. It is found that the value of $\bar{a}$ decreases with increasing activation energy. From the kinetic parameters in this experiment, the value of $\bar{a}$ is approximated as 0.032. The calculation method of the product yield from the Arrhenius equation, $k = 9.9 \times 10^{12} \exp(-53.7 \times 10^3/RI_F)$, for the I_F standard is better in terms of convenience and practicality. Since the exponent $\bar{a}$ is clarified theoretically, the concept of I_F has universal acceptance.

Francis, C.G., Huber, H. and Ozin, G.A. (1980), "THE METAL VAPOR-FLUID MATRIX TECHNIQUE FOR THE FORMATION OF POLYMER-SUPPORTED MOLYBDENUM AND MOLYBDENUM/TITANIUM CLUSTER SPECIES," Inorg. Chem., **19** (1), 219.

Problems in the fields of chemisorption and heterogeneous catalysis have acted as an incentive for experimental research in the field of small, well-defined metal clusters. A method for the generation and spectroscopic investigation of such clusters close to room temperature is devised, the final goal being the stabilization of these species on a support. This report demonstrates that very low-nuclearity unimetallic and bimetallic clusters can be efficiently anchored to a liquid poly (methylphenylsiloxane) (DC510) by designed manipulation of metal atom diffusion/aggregation/immobilization processes within a thin viscous film of the polymer, held on a cooled spectroscopic window. The experimental parameters which appear to control cluster size, optimize reaction efficiency, and help maintain homogeneous conditions are investigated. By use of these experimental data, a macrosynthetic metal vapor reaction was undertaken to obtain the unimetallic clusters in quantities suitable for further catalytic investigation. Ultraviolet-visible spectroscopic methods for quantitatively monitoring these metal vapor-liquid polymer reactions and for characterizing reaction intermediates and products are also described. (11 Figs.; 29 Refs.).

(1980), "SHOE COMPLAINTS RESEARCH — MARKET INTELLIGENCE." Leather, **182** (4455), 38.

The Multiple Shoe Retailers' Association (MSRA), U.K. is contributing 20% towards a £50,000 Research Study by SATRA on how to reduce footwear complaints which rank high among the consumers' complaints. In a survey of 2,000 complaints, 87% of shoes examined had broken down in wear and only 4% of the complaints were due to the fitting problems. The major faults were due to adhesion failure and lack of quality control rather than on designs. Where leather and synthetics were involved, the complaints were 56% ad 44% respectively. In effect, the information is meaningless unless it relates to the proportion of footwear sold in various types and styles. The study is now said to be extended to cover 10,000 complaints over the year and in the long run the impact is expected to be felt by the shoe industry in U.K.(1 Tab.)

(ETO)

(1980), "ADVICE ON THE USE OF SHEET SOLING MATERIAL," Shoe and Leather News, **Jan.3**, 18.

The use of sheet soling material is reviewed in the last Fashion Technology Presentation organised by SATRA in Kettering. A gradual increase in its use by the U.K. footwear manufacturers is observed. Investment on expensive moulds is discouraged but improvements upon the existing ones suggested. Correct selection of soling material is very important to meet the customers' requirements and sole adhesion problem is the major complaint. The best grade resin rubber suited to the designs is to be selected and a thickness of 4.3 mm is recommended. The importance of laboratory tests and production trials before attempting full production is stressed. Development of adequate bonding system and surface preparation is very important and wear trials should not be rushed through.

(ETO)

CHARACTERISTICS OF HIDES/SKINS/LEATHERS/LEATHER PRODUCTS

Russell, A.E., Galloway, A.C., Naude, R.T., Argo, A.D. and Venter, H.J. (1980), "HIDE AND LEATHER CHARACTERISTICS OF YOUNG AFRIKANER-TYPE STEERS SLAUGHTERED AT FOUR DIFFERENT LIVE MASSES," JSLTC, **64** (1), 9.

In a long term study of cross-breeds of young Afrikaner steers, it was observed that the conditions in which animals were reared, have significant influences on the properties of the final leather. They were grouped into animals killed after weaning — B1, animals placed on restricted rations — B2 and animals kept on accelerated feedings — B3 and B4. Groups 3 and 4 recorded decreases in leather yield as against the groups 1 and 2. The tensile strength values fell below the recommended minimum for all groups particularly for the last two. The slit tear strength was observed to be satisfactory for all groups. Normal growth was thus found to favour strength and extensibility in the final leather, but nutrition deficiency tended to increase these parameters indicating extensive cross-linking of collagen matrix; exposing animals to higher nutrition reversed this trend as was observed in 3 and 4. The importance of biological aspect on leather performance with particular reference to the influence of rearing practices on the final product quality is established. (7 Figs.; 13 Tabs., 6 Refs.)

(ETO)

CONTROL AND TREATMENT OF EFFLUENTS/ENVIRON. SC. AND TECH.

Wilkinson, P.D., Bolas, P.M. and Adkins, M.F. (1980), "THE FIRST DISSOLVED AIR FLOTATION PLANT FOR WATER CLARIFICATION IN THE UK," Water Services, **84** (1007), 19.

This plant, which is part of the water treatment works, is designed to effect clarification of flocculated water by way of dissolved air flotation. The essential features of the complete treatment works, which would handle 11.35 Mliters of water per day in Stage 1 and 22.7 Mliters/day in the final stage are described fully. In particular, there are three dissolved air flotation cells, each 5.0m wide, 4.3m long and 3.0m water depth. In these cells, when dissolved air previously injected into flocculated water is released, bubbles are formed on the floc causing it to become buoyant and rise to the surface of the tank where it forms a light floting sludge. The sludge with clarified water underneath, is carefully scraped off continually. (7 Figs.)

(JBG)

Josephson, J. (1980), "SAFEGUARDS FOR GROUNDWATER — SPECIAL REPORT," Environmental Sci. & Tech., **14** (1), 38.

This report surveys the protection of groundwater which accounts for 50% of the water supply for the domestic, agricultural and industrial requirements of 110 million population in U.S. As groundwater is very difficult to clean up after contamination, the most expedient approach to its protection is to prevent contaminants from reaching it in the first place. The US Safe Drinking Water Act (SDWA) of 1974 and the Resources Conservation and Recovery Act (RCRA) of 1976 are aimed at providing the necessary preventive regulations. The RCRA regulations would provide for hazardous wastes being land-disposed, to be contained in the land-fill in such a manner that may in no way contaminate surface or groundwater. It will also be required that land-fills be given impermeable linings such as special clays, proprietary materials or plastics. Monitoring underground water contamination may also be covered by the regulations. How and where sampling and monitoring should be done are described. (5 Figs.)

(JBG)

Cox, R.A., Derwent, R.G. and Williams, M.R. (1980), "ATMOSPHERIC PHOTO-OXIDATION REACTIONS. RATES, REACTIVITY AND MECHANISM FOR REACTION OF ORGANIC COMPOUNDS WITH HYDROXYL RADICALS," Environmental Sci. & Tech., **14** (1), 57.

The photooxidation of a number of organic species, representing several classes of atmospheric pollutants, has been studied in the presence of HONO, NO, and NO_2 at parts per million concentrations. The experiments give information on the rate and mechanism of the reaction with organic molecules of HO radicals produced by photolysis of HONO under these conditions. The data allow evaluation of relative rate constants for the reaction of HO with these organic species and the stoichiometry for NO to NO_2 conversion during the subsequent oxidation steps. The implications of the results for the assessment of the atmospheric reactivity of organic pollutants with respect to photooxidant formation are briefly discussed (2 Figs.; 3 Tabs.; 22 Refs.)

Miller, D.L., Woods, J.S., Grubaugh, K.W. and Jordon, L.M. (1980), "ANALYSIS OF STACK GASES USING A PORTABLE GAS CHROMATOGRAPHIC SAMPLING AND ANALYZING SYSTEM," Environmental Sci. & Tech., **14** (1), 97.

EPA method No.5 for the determination of particulate emission requires the dry molecular weight of the gas. A gas chromatographic (GC) technique has been developed as a substitute for the chemical ORSAT technique. The GC technique has several advantages: one, the stack gas can be analyzed rapidly for CO_2, 0_2, CO, and N_2 directly; two, the sample for the GC analysis is obtained via an on-stream sampling system, thus reducing potential contamination as opposed to the necessary "grab" samples and containers for the ORSAT analyzer; three, the analog signal from the GC is interfaced simultaneously to a recorder and integrator, thus giving a graphical and digital readout. The GC sampling and analysis system is described, and a procedure for preparing gas mixtures is presented. Data showing the correlation among the theoretical composition, GC analysis, and ORSAT analyses of gas mixtures and stack gases are presented. (3 Figs.; 3 Tabs.; 6 Refs.)

Heathcote, S. (1980), "EPA ATTACKS INDUSTRY'S LACK OF TESTING — TOXIC SUBSTANCES CONTROL," Chem. and Ind., **19 Jan.** (2), 53.

It is pointed out that not one notice out of the 35 premanufacture notifications received by EPA under Toxic substances control Act (Tosca), contained chronic testing data. The only testing that has been performed for the premanufacture notification seemed to be that involved the least trouble and expense. EPA would soon publish guidelines on the sort of testing it expects on new chemicals. These guidelines would take into consideration the need to minimize the adverse effects of the testing requirements on innovations in the chemical industry. (1 Fig.)

(JBG)

Whittield, M. (1980), "ENVIRONMENTAL PROTECTION SURVEY," Process Engineering, May, 49.

New incinerators which can burn a wide variety of wastes including rubber, plastics and solvents are being introduced into the UK. They are smoke-free and highly efficient. Equipment for the collection of fumes, dust and smoke are also available, most of which fitted with pulse jet fabric filters. New equipment and products are being made available in the UK for noise attenuation. One approach is to develop designs that reduce the noise. Another is to change the tonal quality of the noise produced by the machinery. A simple biological system for effluent disposal employing 'Actizyme', an enzyme based material developed in Australia is also available. A sum of £210,000 is being expended to expand the Allied Colloids trade effluents treatment system. The biological treatment plant consists of a $136m^3$ flow and a load balancing tank. The biological unit has provision for fine pH adjustment, nutrient addition, a $1140m^3$ I C I Flocor E high rate biofilter, a $100m^3$ settlement tank and flow sampling of the final effluent. (3 Figs.)

(JBG)

Les Hunt (1980), "NEW ROUTE TO CHEAP TROUBLE-FREE EFFLUENT TREATMENT," Process Engineering, **May**, 71.

An economically attractive liquid effluent treatment process that can simultaneously handle both organic and inorganic wastes is developed. The equipment consists of six tubular vessels which contain the active electrochemical elements responsible for the treatment. Tests made on the pilot plant yielded water that was 99% clear of trace elements such as zinc, lead and cadmium. Other contaminants that can be removed by the process are mercury, iron, copper, chrome, phenols, oil and grease. (1 Fig.)

(JBG)

Les Hunt (1980), "RELIABLE ON—LINE MONITORING FOR BETTER EFFLUENT CONTROL," Process Enginnering, **May**, 73.

Various problems associated with on-line methods of effluent monitoring are summarised. A case is that of the effect of suspended solids and colloids on analytical methods involving light or atomic absorption spectroscopy. Recent analytical methods for the on-line determination of Total Organic Carbon (TOC) and Biochemical Oxygen Demand (BOD) are given. TOC and BOD are very important in the monitoring of oil pollution and biological degradability. (3 Figs.)

(JBG)

Whitfield, M. (1980), "A REVOLUTIONARY DESIGN IN ELECTROSTATIC PRECIPITATION," Process Engineering, **May**, 85.

A new electrostatic precipitator which is claimed to be power — efficient, compact and easy to maintain has been developed by a Swedish design company. The design enables air to be cleaned in an 'electrodynamical' manner. The rotation of the electrodes adds a cyclone effect to the unit. The unit can withstand high temperatures up to 400°C. (2 Figs.)

(JBG)

Searle, D. (1980), "RECYCLING BOOSTS PROFITS AND SAVES RESOURCES," Process Engineering, **May**, 93.

Increasing cost and scarcity of raw materials, coupled with anti-dumping regulations has made the recycling of wastes to be economically viable. Recovery units for a wide range of organic solvents are made available by a British concern. The company also deals with the recovery of ammonia. A refinery recovers industrial oils and chlorinated solvents. Biogas production plants are being employed by companies that generate biodegradable solid wastes. These ventures aim at contributing significantly to profit margins, raw materials savings, and higher capacity to cope with legal restrictions on waste disposal. (2 Figs.)

(JBG)

Grayson, J. (1980), "INCINERATION BURNS AWAY WASTE DISPOSAL PROBLEMS," Process Engineering, **May**, 99.

Incineration is described as becoming more significant in the conversion of solid wastes into innocuous state. Incinerators that can handle a wide range of waste materials, though not easy to design, are more applicable. Such an incinerator, which could handle chlorinated organic wastes as well as conventional wastes, has been designed and installed by a firm in UK. Details of the plant which can also treat pumpable liquid wastes are presented. (2 Figs.; 1 Ref.)

(JBG)

ECONOMICS AND MARKETING

(1980), "DANISH-NIGERIAN RELATIONS — TRADE," West African Technical Review, **Jan.**, 45.

The structure of the Danish economy has changed considerably. After the World War II for example, 58% of the country's exports were agricultural products while 31% industrial goods. Today, while industrial products account for 70% of total exports, agricultural products account for less than 20%. Danish agriculture is highly mechanised and rationalised and today it is able to meet with external demands for its agricultural products such as meat, cheese, butter, poultry and livestock besides frozen and processed fish. In the field of industry, its exports include machinery, electronics, pharmaceuticals, chemicals, fertilizer, textiles and beverages. It has also made a mark in the shipbuilding industry which ranges from pleasure boats to super-tankers. About one-third of all diesel powered vessels in the world are fitted with Danish-máde engines. Denmark is also renouned in the construction industry. Trade relations between Denmark and Nigeria date back to the early 1950's and are characterised by increasing number of joint ventures being established between the two countries. Danish interests in the Nigerian economy abound in the fields of shipping, trade, highway maintenance, design and construction, establishment of breweries, dairies and cold stores. Between 1976 and 1978, the balance of trade between the two countries was in favour of Nigeria. (3 Figs.)

(AAI)

Leone, R.P. and Schultz, R.L. (1980), "STUDY OF MARKETING GENERALIZATIONS," J. Marketing, **44** (1), 10.

Marketing generalizations precede marketing theories and are in fact marketing knowledge. It is not possible presently to provide an inventory of scientific generalizations in marketing. The greatest problem associated with this is the lack of conformity of methodology and the definition of evidence for generalization. The other problem relates to the apparent confusion surrounding the idea of marketing vis-a-vis the development of marketing theory. A statement after being transformed into an operational proposition can be tested using any of the following methods: (a) Experimental Replication — same method — same situation; (b) Non — Experimental Replication — same method — different situation and (c) Corroboration — different method — same situation as well as different method — different situation. Research findings that represent scientific generalizations in the area of advertising effects with a focus on aggregate sales or market share response to advertising expenditures, distributions and shelf space are presented. (2 Tabs.; 77 Refs.)

(AAI)

Lawton, L. and Parsuraman, A. (1980), "THE IMPACT OF THE MARKETING CONCEPT ON NEW PRODUCT PLANNING," J. Marketing, **44** (1), 19.

The objective of the paper is to examine the impact of the adoption of the marketing concept on new product planning. A survey of marketing literature reveals that little, if any, empirical research has been carried out in this area and this paper seeks to fill the void. The adoption of marketing concept may result in increased reliance on customer-oriented sources for new product ideas which may however, lead to a proliferation of imitative products at the expense of breakthrough innovations. This study was designed to test the following hypotheses: The greater the extent of adoption of the marketing concept by a firm, (a) the more likely it is that it will use customer-oriented sources for new product ideas; (b) the greater its utilization of marketing research between the idea generation and commercialization and (c) the less innovative its new products will be. Chi-square analyses were performed to test the validity of each of the above three propositions and the summary results failed to support any of them. The findings thus suggest that the extent of adoption of the marketing concept has little impact on new product planning. (5 Tabs.; 27 Refs.)

(AAI)

Zif, J. (1980), "A MANAGERIAL APPROACH TO MACROMARKETING," J. Marketing, 44 (1), 36.

This paper proposes a dual concept for macromanagement based on a strategic balance between managerial control and cultivation of public support. The managerial approach, most commonly used in studies of micromarketing sees marketing as the performance of business activities which direct the flow of goods from producer to consumer or user in order to satisfy customers and accomplish the company's objectives. The major variables of the managerial approach include: (a) managerial responsibilities; (b) managerial objectives; (c)managerial orientations and strategies and (d) decision making variables. When managers assume comprehensive responsibility on a macro level, aggregate outcomes and societal consequences are major concerns and the importance of managing multiple objectives increases substantially. In the case of managerial orientations, it is observed that when a comprehensive macromarketing responsibility is created, part of the exchange system is transferred from the market place to the political area. In respect of decision making in macromarketing, most situations show a significant decrease in direct competition and an increase in cooperation in the regulation of consumption and in product line. Managerial responsibilities could be classified into (a) comprehensive macromanagement; (b) joint micro/macro management; (c) central coordination and/or regulation and (d) specialised macromanagement. (2 Figs.; 1 Tab.; 30 Refs.)

(AAI)

Mahajan, V., Bretschneider, S.I. and Bradford, J.W. (1980), "FEEDBACK APPROACHES TO MODELING STRUCTURAL SHIFTS IN MARKET RESPONSES," J. Marketing, 44 (1), 71.

The use of feedback approaches to develop self-adaptive market response models is discussed. It is emphasised that the marketing decisions system is not static and therefore provisions must be made for continuous revision and re-evaluation in the light of new data and insights about the decision making environment. The key element in the marketing planning and control process is the notion of feedback from the decision making environment. At every time period t, the predicted market response in period (t — 1) is compared with the actual response and the error is fed back in order to adjust the coefficients or parameters of the postulated market response model. The revised model is then used to predict the market response for the period (t — 1). The feedback approaches to modeling structural shifts in market response are particularly useful when the timing of structural changes is not known. (4 Figs.; 3 Tabs.; 36 Refs.)

(AAI)

Greyser, S. (1980), "MARKETING ISSUES," J. Marketing, 44 (1), 89.

The principal areas of future concern in marketing as seen by marketing executives include marketing productivity, regulatory impacts of marketing, corporal communications, integrating marketing and strategic planning within a companywide marketing orientation. The concerns expressed by marketing executives include the productivity of marketing expenditures within the firm, the marketing decision process and marketing as a contributor to economic growth. On regulatory impacts on marketing, while the growth of regulation in marketing is widely recognised, executives think that not enough is known about the process by which public needs, desires and perceptions at the grassroots level evolve into legislation or regulatory action and about the extent to which the end result of this process reflects the concerns of the public at large. Another major challenge of a changing environment affects corporate communications and goes beyond the traditional functions of advertising. Executives recognise new roles for advertising and new channels of communications for reaching both traditional audiences and special groups in the public at large. Marketing executives often desire to develop and encourage a companywide marketing orientation. Directly related to a "marketing orientation" influencing corporate practices, organisational structure, allocation of resources and decision making is the process of strategic planning.

(AAI)

DISSEMINATION

Williams, G.R. (1980), "THE FUNCTION AND METHODS OF LIBRARIES IN THE DIFFUSION OF KNOWLEDGE," The Library Quarterly, **50** (1), 58.

The article reveals how ancient an institution the library is as a basis for pointing out that such institution's survival for 4,000 years indicates a fulfilment of a useful and necessary purpose. The Pre-Renaissance Period saw its libraries owned by rulers and wealthy collectors, religious temples and collegiates. The Renaissance period is said to have witnessed some pattern changes such as invention of printing, in the form of libraries — this time to proprietary or subscription libraries. Some major steps in library development were detailed to have featured in the nineteenth century. The growth of university library collection is said to have caused some social problems. These were enumerated and reasons why the university libraries could not possibly keep up with demands were discussed. It is suggested that more recognition should be given to the fundamental purpose of libraries, that is to provide an assured, fast and widespread access to recorded information rather than concentrating on a means towards the accomplishment of the purpose. It is confirmed that new technologies will increase the need for this action and not decrease it. (1 Tab.; 9 Refs.)

(EOAF)

Swanson, D.R. (1980), "EVOLUTION, LIBRARIES AND NATIONAL INFORMATION POLICY," The Library Quarterly, **50** (1), 76.

The growth of knowledge and the improvement of large complex systems are bot seen in the light of evolutionary mechanisms which are defined in terms of variatio and selection, or trial and error elimination. It is suggested that improvements in large system should be confined to small components in order to be able to confi the occurence of inevitable failures to a small scale. Furthermore one should foc on promoting evolutionary mechanisms that eliminate error and could encoura innovation by autonomous units within such system. The preceding arguments a said to explain why innovative developments such as on-line information servic in libraries and related services are discovered to originate in private sector whe the mechanisms of trial and error elimination is provided. These arguments are a said to underscore the advantages of charging user fees for some specified library services. It is finally suggested that the preservation and encouragement of trial-and — error evolutionary mechanisms should be reflected in the National Information Policy. (17 Refs.)

(EOAF)

Swanson, D.R. (1980), "LIBRARIES AND THE GROWTH OF KNOWLEDGE," The Library Quarterly, **50** (1), 112.

The problems that libraries are meant to solve are identified. The central problem identified for Research Libraries is the provision of access to recorded information which could promote the growth of knowledge. It is suggested that librarianship should make methods of problem-oriented access to information its central concern. Research on trial-and-error processes is said to be focussed on the behaviour of library users. The importance of improved collection, development and management is stressed. It is noted that future libraries would spring up from present libraries through corrections and improvements introduced into the existing pattern and set up. Since evolution entails variation and selection, the planning of future library systems should be guided by selection mechanisms and correctability. (27 Refs.)

(EOAF)

Hahn, G.J. (1980), "RANDOM SAMPLINGS — PLANNING EXPERIMENTS: AN ANNOTATED BIBLIOGRAPHY," Chemtech, **Jan.**, 36.

A critical bibliography of some books on basic experimental designs is given. Most of the books presume a prior knowledge of some statistics and deal with basic concepts and simple statistical design of experiments (eg., Box, Hunter and Hunter). Some include most popular designs (eg., Mendenhall) while others have more extensive treatment with emphasis on chemical and industrial applications (eg., Davies et al.; Anderson and McLean), agricultural and biological applications (eg., Cochran and Cox) and practical applications (eg., Daniel). The characteristics of each of the nineteen books are critically examined and tabulated. (1 Fig.; 1 Tab.)

(EOAF)

GENERAL

(1980), "S.W. AFRICA — MAJOR SOURCE OF FASHIONABLE KARAKUL — SPECIAL REPORT," Leather, **182** (4455), 85.

South West Africa is said to have about 2.0 million karakul and the combined exports with South Africa stand at 5.5 million annually. The USSR, with a population of 17 million, exports only 3.5 million skins due to their internal demand of Astrakhan for the armed forces. Karakul, being a grazing animal, is economical to keep and the export of its pelts is expected to reach R 75 million in 1979. South West Africa is considered as the traditional region for karakul farming and is said to produce 70% of the Southern Africa's production. Over-grazing is being checked by "Camp" system where the sheep are moved from one feed area to another in a three-year cycle.

The two farmers co-operatives who are said to be responsible for collecting the prepared pelts are the Boeremakelaars (Koop) Beperk (BKB) and the South African Karakul Ko-operativ (SAKK). The pelts are auctioned in London and there is always 100% sale. The International Karakul Secretariat in Windhock looks after the promotion and research on the karakul. (9 Figs.)

(ETO)

Rahman, A., Sharma, K.D., Qureshi, M.A. and Kharbanda, V.P. (1980), "CHINESE SCIENCE POLICY: PART 1 — THE PENDULUM SWING," J. Scient. Ind. Res., **39** (1), 1.

The fulfilment of high hopes of Chinese leadership in the field of science and technology depends largely on stable political leadership at the centre. As long as there is a swing in political leadership, there is bound to be a swing in science and technology policy. The tremendous rate of development in science and technology policies in China is termed the pendulum swing. The swing is between "technical" and "ideological" concepts. The period of development is classified into six phases. The phases when political ideologists were in power laid emphasis on production needs in agriculture and industry. The area of basic research was neglected during those phases. Things then changed with the western influence when emphasis shifted to basic research. Efforts were made to modernize the country to attain the high levels that prevailed in civilized countries and their success well acknowledged in the area of scientific and technological development.

(EOAF)

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The scope for the papers intended for publication in the JLR could project the research and development work conducted on science and technology of leather and leather-products such as footwear and all types of leathergoods, chemistry, biochemistry, physics, biophysics, biology, microbiology, environmental engineering, by-product utilisation, quality control and standardisation, machinery and equipment, industrial chemicals, management, technical education and training, economics, marketing and dissemination as applicable to leather and leather-products industries.

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CONTENTS

MANUFACTURE OF LEATHERS FROM WET BLUES AND CRUSTS AND THE PROBLEMS INVOLVED

W.J. Bley,

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Leverkusen,

West Germany.

ABSTRACT

A detailed account on the manufacture and further processing of wet blues is given. Important points to be kept in view in the production of chrome crusts and during their further processing are discussed. Future prospects for the development of leather and leather-products industries in the third world countries are projected.

INTRODUCTION

For many years, the leather industry throughout the world purchased its raw material largely in the form of raw hides and skins, the exceptions being E.I. goatskins, bastards and crust leathers as well as pickled skins.

This began to change only around 1960 with the increasing industralization of countries which had been traditional suppliers of raw hides and skins. They began to export wet blues. The pacemakers were India and Pakistan with skins and Argentina, Uruguay and Brazil with hides. They were followed by young nations in Africa and Asia which had gained their independence. Here too, considerations as to how to increase the net production led these countries to build up their own industry and create jobs. An additional factor was the difficulties facing the leather industry in the industrialized countries because of the high wages there (Traubel, 1978).

The development then went one stage further. With the increasing efficiency of the leather industry in the countries producing raw material, the improved skills and greater experience of the technical staff in the tanneries, the need to create jobs and consequently restrictions on the export of raw material and finally the demands of the customers, these countries began to manufacture crust leather, especially from cattle hides to start with.

MANUFACTURE OF WET BLUES

For the manufacturers of wet blues, the demands of the customers form the basis for successful business and for determining the technological aspects. The following requirements are important:

(a) adjustment of the beamhouse work to the required quality of the finished leather;
(b) uniform chrome oxide content of the individual packs and good distribution of the chrome;
(c) uniform final pH;
(d) good preservation, to prevent mould formation even in the case of shipping or during storage up to 6—12 months;
(e) clean, pigment-free grain pattern; and
(f) flat, tight grain.

In order to fulfil these requirements, good preservation of the raw material is essential. Appropriate measures can prevent substantial losses to the national economy at little expense. In hot climates in particular, a bactericidal and fungicidal preserving agent (eg., Preventol L, a mixture of chlorophenols with a wide spectrum of bactericidal and fungicidal action) should be added to the salt to be used. Skins and hides which are to be dried should not be laid out on the ground in the sun, but should be dried suspended or slightly toggled in a shady place. Although nowadays the machinery used nearly always comes up to modern standards, it is perhaps nevertheless worthwhile pointing out some aspects of modern technology.

In order to work efficiently, a 24—hour cycle between the charging of the drums with the fleshed pelts and the unloading of the drums after the chrome tannage is essential. The trend towards working with a short float or indeed with no float at all is constantly gaining ground. This starts as early as the deliming and bating, where, only a few minutes after the addition of the deliming agents, the water taken up by the pelts during liming provides for an adequate float. The running times for the pelts, which are very sensitive at this stage of the manufacturing process, can then be reduced, as the chemicals react in higher concentrations. In many places, short floats in the pickle and chrome tannage are already the state of the art. In this way, rapid penetration of the pickling acid and of the chrome tanning material and good distribution of the chrome in the finished leather are guaranteed. Other advantages are that water is saved and the volume of effluent is reduced. It goes without saying that the drums, drive and motors used have to be stronger than usual.

Self-basifying chrome tanning materials (eg., Baychrom A,F) facilitate the work in the tanneries, as basification of the tannage, which can lead to chrome stains or a drawn grain if the addition of the basifying agents is not controlled, becomes superfluous (Backer, 1977). An organically masked, self-basifying chrome tanning material (eg., Baychrome F) is particularly suitable where the supply of electricity fluctuates since stain-free chrome leather is obtained even if the drum comes to a temporary standstill during the chrome tannage. Mould-resistant chrome leather is obtained by adding a suitable preservative (eg., Preventol L) right at the start of the chrome tannage.

It is important to keep a check on the manufacturing process. In addition to constant measurement of the pH values in the individual stages and in particular at the end of the chrome tannage using pH paper or an electric pH meter, it is essential to carry out random chemical analyses of the residual chrome liquors and the leathers for chrome oxide content. The leather must be resistant to the boil test; some customers require that the leather withstands six minutes' boiling without shrinking.

The wet blues must be packaged so as to prevent partial drying. The polyethylene film which prevents air from entering must be protected from damage by a robust outer covering (jute/wooden container). The leathers must be free of creases, as creases can only be removed during the further processing by using costly chemicals.

FURTHER PROCESSING OF WET BLUES

The basic requirements for successful further processing of wet blues are a uniform chrome oxide content and a uniform pH. Many customers have virtually no more problems here, as, after dealing with the same suppliers of wet blues for a long time, they have achieved a consistent and satisfactory standard of quality. That is to say, taking as a basis the type of finished leather they produce, they have worked out together with their suppliers the appropriate technology and the necessary control measures. In many cases, however, wet blues of different origins, with variations in the quality of the raw material, the chrome oxide content and the pH, are processed together. The procedures to be used must take these facts into account and must be worked out so that the finished leather obtained is uniform from hide to hide and from skin to skin. Influencing factors in this production phase are:

1. The use of chrome in the retannage to increase or level out the chrome oxide content. Experience has shown that the softness and dyeing properties of the leather are improved as well.

2. The use of modern, neutralizing, synethetic retanning materials (eg., Tanigan PC), which, owing to the buffering components they contain, level out the pH right into the interior of the leather (Luck, 1977). At the same time they fix the chrome and thus reduce the chrome content of the effluent. Their synthetic retanning material portion gives the grain a mild initial tannage ie., setting of the grain.

3. An important consideration is to be given in the selection of the type and amounts of synthetic and vegetable retanning materials. The right selection consists of syntans which have low astringency (eg., Tanigan OS, P2, PR, QF) ie., syntans that retan without affecting the grain; natural tanning materials which are more astringent and when used in high amounts give a coarser grain. While the amount of retanning materials used determines the fullness of the finished leather, the colour of the natural (undyed) leather depends on the type of products used. In general it can be said that syntans brighten chrome leather, ie., give it a light colour, while vegetable tanning materials give leather a darker, more olive-brownish colour. Leathers which are to be given a pure white or pastel-shade finish are retanned exclusively with synthetic tanning materials, whereby preference is given to products with particularly good lightfastness (eg., Tanigan LD, LH, 3LN).

4. For those raw materials that have widely varying structures, ie., some parts of the fibre structure being dense, while other parts are more open, resin retanning materials with filling action (eg., Retingan R6, R7) have proved effective in addition to the synthetic and vegetable retanning materials. The most important property of these resin retanning materials is their selective filling action, ie., they are deposited primarily in the looser parts of the leather to be retanned. They also give the leather better cutting properties in the shoe or leather clothing factory.

5. For the drum-dyeing of leather, the chemical industry offers a wide range of dyestuffs, with which it should be possible to satisfy all the current demands. Naturally, a different procedure is needed for each type of leather and then the additional use of specific dyeing auxiliaries is also essential. The most important of these are as follows:
   (a) Levelling agents (eg., Baykanol HLX, SL; Tanigan PR) which give level dyeings.
   (b) Colour-intensifying agents (eg., Levogen LF, HW) which give a full dyeing of the surface.
   (c) Gloss-promoting, handle-improving and impregnating agents (eg., Persiderm SIN, Persoftal SWA, Xeroderm brands) which, in the case of suede, give the desired silk lustre and supple, smooth handle and reduce the water absorption and, in the case of sports shoes and military footwear, improve the resistance of water.

6. Another important group of products which help to determine the character of the finished leather is formed by the fatliquoring agents. It would be beyond the scope of this paper to go into all the different types, their properties, effects and application, but the following are some general points to be noted:
   (a) The product and the amount used depend on the type of finished leather required.
   (b) The leather technician responsible for handling them must know that, while properties such as the softness, grain tightness, fullness, elasticity, lightfastness and absorbency in the finishing depend on the selection and correct application of the fatliquoring agents, they are only part of the whole technology and are closely correlated to the tannage, neutralization and retannage.
   (c) It should be pointed out that, due to the heavy restrictions on whaling and the consequent reduction in the amount of sperm oil available, and also because of the increasing cost of other animal fats, synthetic fatliquoring agents are becoming increasingly important.

MANUFACTURE AND FURTHER PROCESSING OF CRUST LEATHERS

When we talk of crust leather, we do not mean a specific type of leather, but a commerical product which is ready for finishing and which is becoming more and more popular in the place of raw hides and skins, pickled pelts or wet blues. It is a commerical product which can vary a great deal in its handle, fullness, the tightness and fineness of the grain, softness and colour and which determine the character of the finished leather to a large extent. All these mean that there must be close cooperation between the crust leather supplier and buyer, possibly through a dealer.

As was mentioned in the introduction, the first crust leathers on the market were made from cattle hides. The technology and products used are similar to those for wet blues, described earlier. Vegetable-tanned crust leathers--goat and sheep skins and kips of Asian and African origin -- have been available as commerical products for many years and it can be assumed that the method of processing these is known.

Recently, however, the manufacture of curst leathers based on chrome-tanned goat and sheep skins has been becoming more important. There is a certain difference between These and crust leathers made from sides. They do not as yet represent any distinct type of leather, but are wet back by the customer and subsequently processed into the type of leather desired. This type of crust leather can also be described as dry blues. As a commerical product they offer the following advantages:

1. Lower shipping and packaging costs.
2. Possibility of quicker dispatch from tanneries situated in the interior of the country or continent, eg., by air freight.
3. Less risk of damage resulting from transport or prolonged storage.

These crust leathers are simple to manufacture, requiring only neutralization and pre-fatliquoring to ensure complete and rapid wetting back by the customer. A deep-acting, buffering product (eg., Tanigan PC) with or without the addition of bicarbonate should preferably be used for the neutralization. The fatliquoring agent selected should be a stable, deeply penetrating product (e.g. Baykanol liquor TN) with a good emulsifying effect on any untreated oil which may be included in small amounts.

The crust leathers may be dried by the energy-saving suspension-drying method. The other processes are conditioning until the leather is damp enough for staking, staking-proper, brief pressing-off in the vacuum dryer or toggling and packaging. The tanneries set up in the countries which used to supply raw hides and skins do not only make semi-finished leathers, but are also producing finished leathers for domestic requirements or even for export. While in the industrially advanced countries a nascent chemical industry is already manufacturing numerous products for the leather industry, other countries still have to rely wholly on the import of the necessary chemicals. As this point, mention should be made of the importance of efficient storage. The technical manager of a tannery should therefore select for his factory products which

1. can be used several times in the individual stages of the manufacturing process,
2. through their properties, make it possible to manufacture different types of leather,
3. permit efficient storage, which prevents difficulties arising as a result of delays in the granting of import licences, long transport routes and customs clearance.

The technical manager, who is responsible for the technology used in his plant, will strive towards the desired end product by gearing each individual stage of the manufacturing process to the following stage in such a way that leather of optimum quality is obtained.

Thus, for the large amounts of leather which are finished, not only the selection of the finishing products is important, but also in particular the absorbency of the leather, the elasticity of the grain and the good setting out of the leather before it is dried, which often results in substantial area gains. The area gain depends on the drying method used and increases in the order of suspension drying, vacuum drying, paste drying and drying in wet-toggled state. The handle of the leather is also affected by the drying method. It can be taken as a general rule that more the leather is stretched during drying, the firmer it becomes. Here the responsible technician has to find a compromise between good quality and optimum commercial gain, as these leathers are sold by area.

The finishing of these leathers is worth discussing separately. The general properties of newly developed products for finishing are however outlined in the following lines. Good-quality sides and small skins, with little or no grain damage, are, in keeping with the fashion, nearly always finished full grain, smooth or embossea. Pre-dyeing in the drum is no longer absolutely necessary, as newly developed, liquid, cationic (eg., Bayderm Dyestuffs KF liquid) or anionic (eg., Bayderm Dyestuffs A liquid) dyestuffs which can be used in the finishing give full dyeings of the grain surface and the depth of penetration can be controlled by the inclusion of penetrators (eg., Euderm Driver PF). At the same time, specially developed binders(eg., Bayderm Prebottom PK, Bayderm Bottom SM), in the form of polyurethane dispersions ensure good anchoring of this dyeing and of the following finish coats in the gain (Schroer, 1974).

Finished splits must be provided with an artificial grain layer in the finishing which must have good flexibility and scuff resistance. Polymer resins(eg., Euderm Resin 50B) and crosslinking reactive pastes (eg., Euderm Paste RA, Eukanol Paste FA) are available to the leather industry for this purpose. They give a finish film which has excellent embossing properties and which withstands more than the required 100,000 flexes in the case of dry flexing and 20,000 flexes in the case of wet flexing.

Another interesting development (Tork and Traubel, 1976) concerns colourless nitro-cellulose lacquers which are emulsifiable in water (eg., Isoderm Base SE, HF, GL) and which are prepared in the tanneries themselves immediately before use by diluting them with water or solvents or both. Their advantages include:

1. Lower shipping costs, because, unlike conventional lacquer emulsions, these products do not contain any water and have a high solids content.
2. No risk of damage during transport on storage as a result of instability, as substances such as dyestuffs, pigments or water, which are necessary for their application, but which frequently cause instability, are not added until immediately before use.
3. As part of a system, they may be colourless, stained or pigmented. With these products, leathers of every gloss level, from dull corrected grain side leather to glazed kid, can be obtained.

PROSPECTS FOR FUTURE DEVELOPMENTS

To those buying shoes and leather clothing it is no longer a novelty to find in the shoes or leather jacket the trademark of a company from a country which does not belong to the industrialized nations. This trend for Third World countries to manufacture finished leather articles will continue in the coming years for well-known reasons. That is to say, even more tanneries, shoe factories and factories producing other leathergoods will be built in these countries in the future.

The leather industry throughout the world will come under increasing pressure to adopt environmentally acceptable manufacturing processes. Most important will be the demand for clean effluent. The treatment plants necessary for this are very expensive and so not all companies can afford to construct them. The chemical industry is endeavoured to help the leather industry surmount this problem. It is already offering processes involving products (eg., Baychrom 9000 products) which leave the effluent virtually free of sulphide and chrome oxide (Backer et al., 1977).

Tanning machinery manufacturers will continue their efforts to supply the leather industry with improved through-feed machines and production lines with the aim of further rationalization; this applies, however, to industrialized countries with a high wage level. Countries with a low wage level are more concerned with creating jobs and this should be taken into consideration when planning tanneries. For tanneries in countries in which industrialization is only just beginning, uncomplicated machines which require little maintenance are more important than machines which, admittedly, have a higher output, but which need to be maintained by highly qualified technicians, of whom there are not nearly enough available yet. The practical and theoretical training of a young leather technician takes at least five years. When planning a tannery, it is also important to ensure right from the drawing-board stage that there will be a sufficient number of well-trained leather technicians available when production is started.

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STUDIES ON THE TREATMENT AND DISPOSAL OF EFFLUENTS FROM CERTAIN TANNERIES OF NIGERIA

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ABSTRACT

Analytical studies on waste water effulents from six tanneries of Nigeria were carried out to characterise the composition of their effluents. Certain suggestions are provided to curtail the effects of pollution due to these effluents.

INTRODUCTION

The conversion of animal hides and skins into leather (Thorstensen, 1976) results in considerable quantities of several varieties of waste products and the tanning industry has the unenviable reputation for being one of the evil-smelling industries. With the modernisation and expansion of the industry to highly mechanised factories in urban areas, the problem is becoming more acute. Thus efforts are being made to limit or eliminate as much as possible the discharge of polluting materials into the atmosphere (Thorstensen, 1979; Rudolfs, 1983).

Tanning of hides and skins involve considerable use of water, either to cleanse them or in the form of process liquors during the various unit processes. Generally, a tannery can contribute to problems of health hazard by (i) causing depletion of oxygen in water where it is discharged, thereby removing the dissovled oxygen required by fish and other aquatic organisms for respiration, (ii) leading to high concentration of salts and possible formation of metal sulphides which are very harmful to both human beings and animals and (iii) causing bacteriological pollution by pathogenic organisms (Effluent and Water Treatment Manual, 1964).

The common methods of disposal presently being followed are discharging into rivers, streams and large areas of land. These methods of disposal have their attendant problems and much pollution is caused by such uncontrolled discharges. Although a small volume of organic trade wastes discharged into rivers is eventually broken down by micro-organisms (Southgate, 1948) especially if nitrogenous organic substances are present, many trade wastes are resistant to bacterial action and the breakdrown may be very slow; too much confidence should not therefore be placed in self-purifying capacity of a stream. In the case of land disposal, it is expected that when the wastes slowly percolate through the soil and gradually undergo oxidation by soil bacteria it would result in the formation of harmless end products; the disadvantages however are the requirement of large areas of land, bad smell and contamination of underground water, ultimately leading to poor agricultural productivity of the land. Also the polluted groundwater eventually flows into a drinking water well or river resulting in the spreading of waterborne diseases in the long run.

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In order to effectively control the pollution hazards arising from the tannery effluents, it is necessary to detrmine the amounts of various constituents present. Although a certain amount of data is already available (Gabriel, 1980), an exhaustive characterisation of the effluents has not yet been attempted. In the present studies, samples of effluents are collected from six different tanneries of Kano and Sokoto States of Nigeria and subjected to a series of analyses for various characteristics. A summary of "Process particulars" as followed in these tanneries is given in Table — 1.

MATERIALS AND METHODS

Collection of samples

Samples (51.) representing the existing conditions in each of the selected tanneries were collected from effluent pits of the respective tannery, every month, over a period of five months in suitable polythene containers with screw cap and stored in a refrigerator where immediate analysis was not possible.

Samples (250ml.) meant for the estimations of biochemical oxygen demand (BOD) and sulphide were collected separately in two glass bottles with glass stoppers. The dissolved oxygen and sulphide were fixed on the spot by the addition of Winkler reagent ($MnSO_4$ followed by alkaline — iodide — azide) and zinc acetate respectively. Since the components of the liquors undergo significant and unavoidable changes on storage, composite samples could not be used.

Evaluation of quality of waste water effluents

Due to the complex nature of the wastewaters and keeping in view the specific requirements relating to environment, the present work is based on the examination of different parameters as indicated in the following lines.

Measurements of temperature, pH and conductivity

Wherever possible the temperature and pH of the samples were determined on the spot; the measurements of pH were conducted using the pH Meter (Philips PW 9418). The electrical conductivity was measured with the Griffin conductivity bridge.

Determination of Total solids, Suspended solids, Dissolved solids and Total ash

The methods for the determination of solids are that of Hanson (Hanson, 1973). The term 'Total ash' is a measure of the total mineral content and was determined by the method prescribed by the Society of Leather Technologists and Chemists (Soc. Leath. Tech. Chem., 1965).

Other characteristics were estimated on the aliquots of the samples (100ml.) obtained after removing the suspended solids by filtration. Estimations or chloride and total nitrogen were carried out using the argentimetric and 'Kjeldahl' methods respectively. The amount of BOD was determined using the dilution method. Estimation of metals was carried out by using Perkin — Elmer Model 306 Atomic Absorption Spectrophotometry and EEL Model A Flame Photometer.

RESULTS AND DISCUSSION

The mean of the results obtained in respect of various characteristics on samples of effluents from six tanneries (A,B,C,D,E and F) is calculated and presented in Table - II.

Tannery A

Although this tannery is engaged only in mineral tannage and certain amount of finishing and effects certain marginal treatment such as segregation and evaporation to its effluents before letting into stream, the amounts of chromium, arsenic, sulphide and BOD in the treated effluent is abnormally high as compared to the limits prescribed by the Standards. The total solids and chloride and sulphate contents too are found to record figures higher than the respective limits. The treatment for bringing down the amounts of arsenic and chromium within the specifications for discharge into streams should receive special attention due to the toxicity of these metal ions. Recycling of chromium and recovery of chromium from spent tan liquors are suggested. Steps employing suitable aerobic/anaerobic treatments such as oxidation pond, aerated lagoons and anaerobic lagoons etc., may be adopted. Use of arsenic may be discouraged and alternate preservation methods may be suggested. Much attention is also required to arrest the excessive salts from entering the stream through evaporation and segregation of solid materials.

Tannery B

This tannery engaged in both the mineral and vegetable tannages as well as certain degree of finishing, does not seem to treat its effluent at all, but disposes of through tankers to locations outside the city limits. Whatever may be the receiving end for these effluents, such practices must be generally discouraged and necessary guidance for the treatment of wasterwaters be provided. The extents of suspended solids, dissolved solids, BOD, salts, chromium, arsenic etc., present in the effluents are very high indeed for disposal straightaway.

Tannery C

Both the mineral and vegetable tannages as well as finishing are being practised in this tannery. Sedimentation is the only treatment given to its effluents and the treated effluents are discharged into sewers. Although the chloride, nitrogen, iron and copper contents of the discharges are within the levels prescribed by the Standards for such discharges, the alkalinity and hence the pH, suspended solids, sulphides, sulphates, BOD and chromium are found to exceed the same. Greater duration of sedimentation, recycling of chrome liquors and recovery of chrome from the used chrome liquors besides treatment for curtailing the BOD by adopting aerobic/anaerobic treatment are suggested.

Tannnery D

The effluents of this tannery producing finished leathers, both mineral and vegetable tanned, undergo sedimentation and open air evaporation. As expected, the salt-contents in the form of chlorides, sulphates and sulphide record high figures. BOD and other characteristics are generally high. The salts may be removed to a great extent by evaporation and segregation of solid matter and BOD could be controlled by either aerobic or anaerobic system.

Tannery E

Wet blue leathers are produced in this tannery and the effluents, after sedimentation, are disposed of on to land. While the extent of damages such as loss in productivity, increase in infertility etc., caused to the soil are well-known, the obnoxious odour emanating from the excessive amounts of sulphides and nitrogenous matter as can be seen from analytical figures, need not be over-emphasised. Total solids, salts and other mineral matters too contribute to the rapid deterioration of the land and underground water. The tannery may be persuaded to adopt suitable methods of treatment for its effluents and the discharges effected scientifically on the lines suggested for Tannery D.

Tannery F

Also producing wet blue leathers, this tannery simply lets off the effluents on to land, without even a primary sedimentation. Consequently, the suspended solids, dissolved solids, total solids, ash, alkalinity, salt as chlorides and sulphates, nitrogen, BOD, minerals etc., are found to be excessive in the effluents. The necessity of treating the effluents may be effectively suggested and proper treatment and disposal involving recycling of chrome liquors, reuse of spent chrome liquors, sedimentation and segregation of solid wastes, aerobic/anaerobic treatment may be evolved in the immediate future.

On comparison with the Standards, the results of analytical studies of wastewater effluents of some of the Nigerian tanneries show that a fair degree of environmental pollution is caused through their discharges into stream and sewers and on to land. This should give the State Governments a serious concern and make them realise the importance of fixing acceptable Nigerian Standards for effluents prior to disposal. Even though the Standards for water quality can never be considered fixed particularly in areas where population and industrial growth is occuring and is expected to continue, the Standards can still be arrived at taking these factors into account. In addition to various suggestions given above while discussing the effluents from the tanneries, the waste waters may be treated with required quantities of flocculating agents like alum, ferrous sulphate and ferric chloride to remove heavy organic and inorganic pollutants.

ACKNOWLEDGEMENT

The authors are thankful to the Director, Leather Research Institute, Zaria for his encouragement throughout the duration of the work. They wish to express their gratitude to the Head, Department of Chemistry, Ahmadu Bello University, Zaria for the facilities provided and the managements of the tanneries for having provided samples of effluents and other information.

TABLE I

PROCESS PARTICULARS

Tannery	Hides/Skins soaked per day Nos.	Type of Tannage	Extent of Processing	Method of Disposal
A	3,380 hides and skins	Mineral	Hides — finishing; Skins — wet blue stage	Marginal treatment-Disposal into stream
B	64,000 hides and skins	Mineral and Vegetable	Hides — finishing; Skins — semi-finish	Through tankers on to land
C	4,500 hides and skins	Mineral and Vegetable	Finishing	Sedimentation — Disposal of liquid to public sewage
D	100 hides	Mineral/Vegetable and 'syntan	Finishing	Sedimentation and open air evaporation
E	2,000 skins	Mineral	Wet-blue stage	Sedimentation — Disposal on to land
F	2,000 skins	Mineral	Wet-blue stage	Disposal on to land

TABLE II

CHARACTERISTICS OF TANNERY EFFLUENTS OF CERTAIN NIGERIAN TANNERIES

Characteristics	Tannery A	Tannery B	Tannery C	Tannery D	Tannery E	Tannery F	Standards for: Drinking water (W.H.O.), (1958)	Discharges to Stream (Effl. & Water Trtt. Manual), (1964)	Discharges to Sewer (Effl. & Water Trtt. Manual), (1964)
Temperature, °C	28.0	29.8	30.0	29.8	30.5	27.8	—	32.5	44
pH	8.6	8.5	11.5	8.4	8.3	8.2	6.5—9.2	5 — 9	6 — 10
Electrical conductivity, (Ω^{-1}),x10^{-3}	2.4	5.3	6.3	3.0	2.8	6.1	—	—	—
Suspended solids, ppm.	55	553	2,024	266	16	585	—	40	1,000
Dissolved solids, ppm.	3,956	9,604	8,470	55,154	4,693	18,911	—	7,500	—
Total solids, ppm.	4,011	10,494	10,896	15,420	4,709	19,496	500	—	—
Total ash, ppm.	3,077	6,676	8,013	4,737	3,044	10,731	—	—	—
Total alkalinity, as $CaCO_3$, ppm.	1,090	2,400	3,400	1,660	3,000	5,400	—	—	2,500
Sulphide, as S, ppm.	130	100	20	20	240	150	None	1	10
Chloride, as Cl, ppm.	3,300	8,750	250	590	450	1,150	600	1 (Free Cl_2)	400
Sulphate, as SO_4, ppm.	726	554	1,036	1,313	2.5	1,479	400	—	1,000
Total Nitrogen, as N, ppm.	315	420	280	—	297.5	1,225	None	—	500
BOD, mg/dm^3	695	7,089	1,251	139	139	3,753	—	20	8
Magnesium, ppm.	6.3	32.3	3.6	17.5	15.2	17.7	150	—	—
Calcium, ppm.	50.7	408.0	572.0	56.0	28.0	110.2	200	—	—
Zinc, ppm.	4.5	0.8	1.5	4.1	0.4	3.4	15	1	—
Iron, ppm.	1.6	1.9	1.3	1.3	2.2	0.5	1	1	1.5
Chromiun, ppm.	36.6	37.0	80.0	13.5	1.3	0.1	None	1	50
Arsenic, ppm.	1.3	0.4	0.5	0.4	0.3	0.2	None	1	—
Copper, ppm.	0.20	0.18	0.20	0.25	0.20	0.13	1.5	1	50
Sodium, ppm.	1,125	1,960	1,900	1,890	1,290	2,820	—	1	—
Potassium, ppm.	16.3	131.3	21.9	12.0	36.3	488.0	—	1	—

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HIDES AND SKINS

Maire, M.S. and Lipsett, V.A. (1980), "OFFAL ENHANCEMENT," Jour. Amer. Leath. Chem. Assn., 75 (1), 16.

Two ways to minimize waste offal quantities to reduce disposal cost and to maximize the offal byproducts to enhance competitiveness and profitability are described. The term "offal" refers specifically to those wastes and byproducts of the tanning process that contain hide substance, hair and fleshings. The pollution problem in the leather industry is critically discussed and tannery process chemicals are viewed as carcinogenic in nature calling for stringent restrictions for their control. A marked variation is assumed from tannery to tannery, from time to time and from place to place, with respect to offals from conventional hides and prefleshed ones. The blue belly splits which were considered waste by most tanners a few years back are now marketable. The offal utilization is fully discussed and falls into three categories - namely 'high', 'low' and 'typical'. The 'low' and 'typical' are said to contain more waste offals than the 'high' and this poses additional disposal problem as they contain large amounts of chrome bearing waste. The 'low' and 'typical' utilization patterns are therefore unacceptable; the long term solution would be to avoid generating chrome bearing waste in the first place. Lime splitting is also discussed and is believed to be one way of accomplishing this but only to a limited extent. In spite of its economic advantage tanners do not convert to lime splitting, perhaps because of operating problems associated with it. Another approach is lime hide segmentation, also known as USDA Trim, in which some of the offals are said to be removed in the lime stage. The claim is that this reduces both chrome and total waste offal generation at all three levels of offal utilization. Conventional blue splitting, lime splitting and lime hide segmentation are fully evaluated. Lime hide segmentation appears to offer maximum flexibility for enhancing offal utilization under differing market situations thereby providing greater opportunities for technological improvement in processing. Although the concept of lime hide segmentation was developed in 1965, it is still an untried and unproven concept, in spite of its potential for solving the offal problem which is one of the keys to the survival and success of the leather industry. (4 Figs.; 7 Tabs.; 12 Refs.)

(ETO)

BIO—SCIENCES AND TECHNOLOGY

Newmark, P. (1980), "THE ORIGINS OF BIOTECHNOLOGY," Nature, 283 (5743), 124.

An appraisal of current and future trends in research into biotechnology from the humble beginnings of the most ancient biotechnological art of fermentation has been given. The current approach to biotechnology is based on two main techniques, namely: genetic manipulation and enzyme or (cell and cell organelle) immobilisation. The main aim of genetic manipulation is to enhance the natural genetic performance of a micro-organism. This is usually achieved by donating to the micro-organism a gene for a hormone or enzyme with the aid of vectors in such a manner that the product of the gene is thenceforth synthesized by the micro-organism. Crucial to the success of genetic manipulation is the present knowledge of nucleic acid biochemistry such as DNA and

RNA sequencing, synthesis and degradation and the identification of the enzymes involved in these processes. The development of vectors for transfering foreign genes into micro-organisms is also an important factor. The development of immobilised enzymes, cells or organelles has revolutionized the conventional use of these materials in their pure forms. An immobilized enzyme is bound chemically to a matrix or entrapped in a small pore gel. This facilitates easy separation of the enzyme from its products and makes recycling of the former feasible. Potential advantages derived from immobilised cells or organelles include stabilization of otherwise unstable enzymes. Efforts are now being made to extend the scope of biotechnology to both animal and plant cells. Commercial production of interferon from stimulated lymphoblastiod cells and high - grade antibodies for research, diagnostic and clinical use from hybridoma cell (fusion of antibody - producing cell with a tumor cell) are some of the achievements of application of biotechnology to animal cells. Future applications of biotechnology inlcude transfering the nitrogen - fixing genes to plants and production of new high yielding or resistant varieties of plants through genetic manipulation of their cells.

(GE)

Ehring, R., Beyreuther, K., Wright, J.K. and Overath, P. (1980) "*In Vitro and In Vivo* PRODUCTS OF *E. Coli* LACTOSE PERMEASE GENE ARE IDENTICAL," Nature, *283* (5747), 537.

Evidence has been presented to show that lactose permease, a lactose carrier and product of the *Y* gene of the *lac* operon of *Escherichia coli* synthesized *in vitro* is identical to the *in vivo* product isolated from the cytoplasmic membranes of the micro-organisms on the basis of their apparent moleculer weight and N-terminal amino acid sequence. Furthermore, there is good agreement between the amino acid composition of the *in vivo* product and that postulated from the DNA sequence. The translational start of the protein synthesis both *in vitro* and *in vivo* has been unambiguously attributed to the methionine codon and data has been provided to show that lactose permease is processed only by deformylation but not by proteolytic cleavage at the N-terminal methionine and there is no evidence to suggest any processing at the C-terminus. Since the cell - free extract used in *in vitro* studies was not freed to membranes, it is not clear whether the protein becomes associated with membranes during or after synthesis. Knowledge obtained from the above studies is of some significance, because, as a model for the biosynthesis of a hydrophobic protein, lactose permease seems attractive; this protein must attain a highly organised tertiary in the membrane in order to function as a lactose/proton symporter. (5 Figs.; 1 Tab., 29 Refs.)

(GE)

Sharma, O.P. and Krishnamurti, C.R. (1980), "LIPID PEROXIDATION IN ANIMAL TISSUES," J. Scient. Ind. Res. 39 (2), 110.

The significance of lipid peroxidation of biomembranes in animal tissues is discussed. Study of its involvement in normal healthy tissues and a number of pathological conditions, toxicity, drug metabolism, inflammatory processes, chemiluminescence and ageing process have gained some prominence in recent years. Under various pathological states such as atherosclerosis, relative deficiency of antioxidants and increase in lipid peroxidation appear to play an important role. Vitamin E deficiency in animals also promote lipid peroxidation is rat tissue homogenates. Characterisation of the native pro-oxidant factors in the normal rat brain cells has thrown more light on the role of vitamin C in cell metabolism. A number of biomolecules such as vitamin E, K, ubiquinones among others have been identified to have protective or regulatory action on lipid peroxidation of biomembranes in a number of enzymatic and non-enzymatic systems which confirms the hypothesis of involvement of membrane peroxidation in biochemical processes of healthy cells. It is generally agreed by various workers that lipid peroxidation of biomembranes under the regulatory action of the native anti-oxidants might play an important role in free radical reactions, membrane transport, repair and remodelling, oxidation of unsaturated fatty acids, bioluminescence and ageing phenomena. Further clarifications on these can only be provided through further research work. (3 Figs.; 5 Tabs.; 145 Refs.)

(GE)

TANNING AGENTS & MECHANISM OF TANNAGES

Ziolkowski, J.J. and Rybak, W.K. (1980), "THE NATURE AND IMPORTANCE OF HYDROCARBON-OXYGEN-METAL COMPLEX INTERACTION FOR C-H AND C-C BOND ACTIVATION," Pure & Appl. Chem., 52 (2), 325.

The understanding of the oxidation reaction mechanism of hydrocarbons is essential both in problems of selective transformation to the required products and in problems of the resistance of organic materials (polymers) containing the C-H and C-C bonds accessible to the action of molecular oxygen or oxidizers as well as of other factors, such as temperature, pressure, trace amounts of metal ions and solvents of various polar and donor - acceptor properties. The effect of the metal complex electron structure on the initiation reaction rate is discussed with reference to the effect of partial oxygen pressure and the effect of solvent in the initiation mechanism. In a hydroperoxide-free hydrocarbon, it is shown that the oxidation reaction is initiated as a result of metal complex - oxygen - hydrocarbon interaction. It is also shown that the reactivity of intermediate complex strongly depends on solvent properties. (3 Figs.; 6 Tabs.; 49 Refs.)

(BBD)

Scott, G. (1980), "THE ANTIOXIDANT ROLE OF UV STABILISERS," Pure & Appl. Chem., 52 (2), 365.

The mechanisms of action of the more important classes of uv stabilisers for polyolefins are considered in the light of present views on the mechanisms of antioxidant behaviour. The metal thiolate catalytic peroxide decomposers (PD-C) are seen to be effective uv stabilisers in their own right and as synergists with 'uv absorbers'. Chain-breaking antioxidants (CB-A), of which the hindered nitroxyl radicals are the most important, are very effective as single-component uv stabilisers but their precursors, the hindered amines, are thermal pro-oxidants. Donor chain-breaking antioxidants (CB-D), as typified by the hindered phenols, are weak photostabilisers with only a small concentration gradient. Their radical scavenging effect, is augmented when they are used in conjunction with the 'uv absorbers' but they antagonise with the peroxide decomposers. The 'uv absorbers' appear to function at least in part by a CB-D mechanism and their effectiveness is due mainly to their uv stability. They are destroyed by both hydroperoxides and by excited carbonyl chromophores and their synergism with the peroxide decomposers (PD-C) is to a large extent due to their protection by this class of uv stabiliser. (19 Figs.; 7 Tabs.; 56 Refs.)

(Author's Summary)

ANALYTICAL CHEMISTRY

Barcelona, M.J., Liljestrand, H.M. and Morgan, J.J.(1980), "DETERMINATION OF LOW MOLECULAR WEIGHT VOLATILE FATTY ACIDS IN AQUEOUS SAMPLES," Anal. Chem., 52 (2), 321.

This study applied a powerful ion—exchange/derivatization procedure to the determination of volatile $C_1 - C_5$ fatty acids in very dilute aqueous samples such as sewage, rainwater and marine sediment pore water. p—bromophenacyl ester derivatives of the fatty acids formed by utilizing the catalytic properties of dicyclohexyl-18-crown-6 were analysed with either HPLC or GLC techniques depending on desired selectivity and sensitivity. The method is rapid and economical. (2 Figs.; 3 Tabs.; 23 Refs.)

(AAN)

Chao, S.S. and Pickett, E.E. (1980), "TRACE CHROMIUM DETERMINATION BY FURNACE ATOMIC ABSORPTION SPECTROMETRY FOLLOWING ENRICHMENT BY EXTRACTION," Anal. Chem., 52 (2), 335.

A modified method of analysis for traces of chromium in biological materials has been described. This includes wet-ashing of the sample with mixed acids ($HN0_3—H_2S0_4—HC10_4$) followed by a further treatment with potassium permanganate and sulphuric acid. The resulting enriched chromium VI is then complexed with methyltricaprylylammonium chloride (MTCA) and determined by grafite furnace atomic absorption (GFAA) spectrometry. The above procedure when applied to brewers' yeast grown in medium containing ^{51}Cr and two NBS standard reference materials showed comparable satisfactory chromium recovery. (7 Tabs.; 31 Refs.)

(AAN)

Heineman, W.R., Wieck, H.J. and Yacynych, A.M. (1980), "POLYMER FILM CHEMICALLY MODIFIED ELECTRODE AS A POTENTIOMETRIC SENSOR," Anal. Chem., 52 (2), 345.

Electrochemically initiated polymer film formation on an electrode surface which was hitherto considered as electrode "poisoning" can now be used to make a potentiometric sensing electrode. Such electrodes chemically modified with poly-(1,2-diaminobenzene) have been checked for stability by cyclic voltammetry and found to be stable between pH range 4 - 10 and unstable at pH 1 and pH 13. (2 Figs.; 27 Refs.)

(AAN)

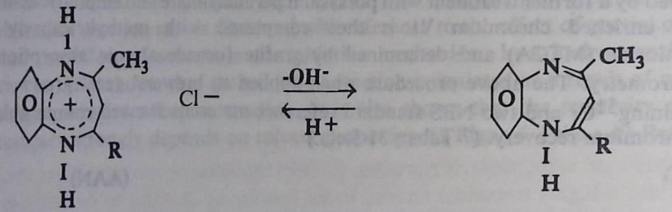
(1980), "DETERMINATION OF RONIDAZOLE IN ANIMAL FEEDS BY GAS - LIQUID CHROMATOGRAPHY: A COLLABORATIVE STUDY BY THE FEC COMMITTEE OR EXPERTS,"The Analyst, 105 (1247), 161.

A gas-liquid chromatographic procedure with flame ionisation detection is described for the determination of ronidazole in animal feeding stuffs. The method has been investigated by inter-laboratory studies and with minor modifications recommended as a method for use by the EEC. The ronidazole is extracted from the feeding stuff with ethyl acetate and the solution is cleaned up by transferring the ronidazole, as its hydrochloride, into an aqueous solution, liberating the ronidazole by making the solution alkaline and re-extracting with ethyl acetate. The solvent is then evaporated, the ronidazole converted into a volatile silyl derivative by reaction with NO-bis (trimethylsilyl) acetamide in hot quinoline solution and the reaction mixture, with the addition of diethyl phthalate as internal standard is examined by gas-liquid chromatography. The pH of the solution in the clean up stage before re-extracting with ethyl acetate was adjusted to between 11 and 12 and the silylation reaction mixture was heated at 150 — 155°C for 10 minutes. (1 Tab.; 2 Refs.)

(FAL)

El-Rabbat, N.A., Youssef, A.F. and Omar, N.M. (1980), "STUDY OF CERTAIN 1,5-BENZODIAZEPINE DERIVATIVES AS ACID - BASE INDICATORS," The Analyst, 105 (1247), 165.

Current interest in the synthesis and investigation of the physical properties of certain azacarbonium heterocyclic compounds can be extended to the study of the fundamental chromogenic properties of 2,4 — disubstituted 1,5 — benzodiazepinium salts such as compounds I — VII indicated herein below. These compounds, prepared as intermediates for the synthesis of 6,7-benzo-1,2,4,5 — tetrahydro — 1,5 — diazepines have been shown to have acid — base characteristics so as to be of use as pH indicators. The deep voilet colour of these conjugated cations was discharged by alkalis and restored by acids thus:-



(Violet/Pink) (Colourless/Yellow)

R	Compound
CH_3	I
C_6H_5	II
$p-C_6H_4Cl$	III
$p-C_6H_4Br$	IV
$p-C_6H_4CH_3$	V
$p-C_6H_4OCH_3$	VI
$m-C_6H_4NO_2$	VII

The use of compounds I — VII as pH indicators has been investigated in terms of their pKa values and the effect of the medium on these values. (3 Figs.; 3 Tabs.; 10 Refs.)

(FAL)

Upadhyaya, K.N. (1980), "GRAVIMETRIC DETERMINATION OF ZINC BY PRECIPITATION WITH BENZIMIDAZOLE DIRECTLY AND FROM HOMOGENEOUS SOLUTION BY REPLACEMENT OF ZINC IN A COMPLEX WITH EDTA," Analyst, **105** (1247), 176.

Benzimidazole has been described as a quantitative precipitant for the gravimetric determination of copper(II) and cobalt(II). Salt formation of zinc with benzimidazole has been reported but no attempt appears to have been made to apply this reagent to the determination of zinc. In the present work, zinc has been determined with benzimidazole by direct precipitation and by precipitation from homogeneous solution. The latter technique was attempted mainly in order to avoid interferences. Results of the investigation of pH conditions indicate that quantitative precipitation of zinc with benzimidazole can be effected in the pH range 7 — 9 and that determinations of zinc in solutions containing different amounts of zinc can be carried out satisfactorily in this pH range. The direct method suffers from interference of metal ions such as Pb^{2+}, Bi^{3+}, Cu^{2+}, Cd^{2+} and Hg^{2+}. In the homogeneous precipitation method, zinc can be determined in the **presence of those metal ions which interfere in the direct precipitation method. (3 Tabs.; 3 Refs.)**

(FAL)

Silva, M. and Valcarcel, M. (1980), "SPECTROPHOTOMETRIC DETERMINATION OF MICROGRAM AMOUNTS OF CALCIUM IN WATERS AND FOODS USING DIPHENYLGLYOXAL BIS(2—HYDROXYBENZOYL HYDRAZONE)," The analyst, **105** (1248), 193.

The synthesis, characteristics and analytical applications of diphenylglyoxal bis (2—hydroxybenzoyl hydrazone) are described. This compound reacts with calcium(II) at pH 12 to produce a yellow complex (λ max. = 432 nm, ε = 1.76 x 10^4 1 mol^{-1} cm^{-1}); another complex (1:1) can be detected at pH 7.80. Dipyridylglyoxal bis **(2—hydroxybenzoyl hydrazone) also reacts with calcium and both reagents are compared. A sensitive and selective spectrophotometric method is proposed for the determination of calcium using dipheylglyoxal bis (2—hydroxybenzoyl hydrazone). Interferences have been investigated and when masking agents are added common cations do not interfere. The yellow calcium(II) complex has been used for the determination of calcium in waters and foods. The results are compared with those obtained using glyoxal bis(2—hydroxyanil).** (4 Figs.; 6 Tabs.; 39 Refs.)

(Authors' Summary)

Burns, D.T. and Abdel Aziz, M.E.M. (1980), "PRECISION SPECTROPHOTO— METRIC DETERMINATION OF CHROMIUM IN CHROMITE ORES AND FERRO-CHROME," The Analyst, **105** (1248), 209.

Classical gravimetric and titrimetric assay procedures have been accepted for major constituents of ores. Direct spectrophotometric methods of analysis using conventional equipment are rapid and simple but give precisions below those of classical procedures. A

direct precision spectrophotometric determination of chromium in chrome ores and in ferro-chrome is described. Samples are sintered with sodium peroxide in zirconium crucibles for 3h. at 510 ± 10°C, then leached, filtered, acidified with perchloric acid and reduced with hydrazine hydrate. Chromium is determined from the absorbance of the chromium(III) aquo ion at 410 and 578nm. The procedure has been evaluated using standard chrome ores, ferro-chrome alloys and a series of Sudanese and industrial ferro-chrome samples. The results are in good agreement with, and of comparable precision to published data and those obtained by titrimetric assay. (2 Figs.; 10 Tabs.; 41 Refs.)

(FAL)

Jorgensen, S.S. and Regitano, M.A.B. (1980), "RAPID DETERMINATION OF CHROMIUM(VI) BY FLOW INJECTION ANALYSIS," The Analyst, **105** (1248), 292.

The photometric determination of chromium(VI) in natural waters and soil extracts as the 1,5—diphenylcarbazide complex is well established as a standard method. The complex is formed rapidly, has a high absorptivity at 540 nm and the method highly selective when the pH is kept at 1—2. For rapid analysis of small sample volumes this method appears to be ideally suited for adaptation to the continuous flow injection technique of Ruzicka and co-workers. The present investigation was undertaken to determine chromium(VI) in soil extracts, in order to study the behaviour of chromium in soils. When compared with results obtained by a standard flame atomic absorption spectrophotometric procedure, the results of the proposed procedure agree satisfactorily. (2 Figs.; 1 Tab.; 7 Refs.)

(FAL)

POLYMERS

Smets, G. (1980), "NEW DEVELOPMENTS AND FUTURE OF SYNTHETIC POLYMER CHEMISTRY," Pure & Appl. Chem., 52 (2), 253.

Reaction mechanism as it relates to polymerisation processes is discussed. Photochemical initiation processes, the polymerisation and copolymerisation of heterocyclic monomers, copolymerisation with complexating agents, block-graft copolymerisation and chemical transformation reactions of polymers are reviewed. Co-ordination type initiators for stereotype polymers with properties better than the conventionally produced stereotype polymers are also discussed. It is stated that failure of physical blends gave the drive for more work on copolymers. It is observed that graft or block copolymers yield good results. The use of polymers as organic reagents, as substrates and models for biopolymers and enzymes and as biological carriers is reviewed. It is asserted that the knowledge of reaction mechanisms and processes makes it possible to develop new products and improve the quality of the existing ones. Use of specific polymers with well-defined structure as model substances will help in elucidating the fundamentals of enzymes and nucleic acids. (91 Refs.)

(BBD)

Weissermel, K. (1980), "RAW MATERIAL — POLYMER INTERRELATIONS — TODAY'S CHOICE — TOMORROW'S OPTIONS," Pure & Appl. Chem., 52(2), 265.

There is the danger of exhaustion of petroleum and natural gas as energy resources before the exhaustion of coal. It takes between 25 — 30 years from the development of a material to its availability in the market as a new raw material and hence long term strategies to safeguard energy and raw material supplies are necessary. Present situation of energy and raw material system is analysed. Present pattern of energy consumption is compared with available reserves of fossil raw materials. Future development of primary energy consumption in the world is discussed. An increase in primary energy consumption from 2 CTE (coal-tonne equivalent) to 3 — 5 CTE per person per year in the next 50 years which means an average of 24 — 40 billion CTE/year compared with 6.9 billion in 1978 is anticipated. This necessitates an urgent development of new energy sources. Alternative energy sources are explored and nuclear energy seems to be the main choice. The development of an energy industry based on hydrogen and electricity is found to be a desirable long term objective. The need to safeguard raw materials through structural changes is discussed; while safeguarding supplies of primary chemicals could be done by optimization of crude oil upgrading through restructuring conventional refineries into petrochemical refineries, raising the exploration level from 30 to 50% through tertiary methods and the upgrading of coal are stressed. The resubstitution of plastics is discussed and it is observed that the substitution of polymer materials for metals will be on the increase. (13 Figs.; 16 Refs.)

(BBD)

Griffin, G.J.L. (1980), "SYNTHETIC POLYMERS AND THE LIVING ENVIRONMENT," Pure & Appl. Chem., 52 (2), 399.

The interaction between synthetic polymers and the physical environment, especially in terms of the effects of oxygen and radiant energy, has been extensively studied and reported and directly useful results have been obtained by the use of experimental techniques of a kind very familiar to physical chemists. The introduction of living organisms to the system, however, adds to the acknowledged difficulty of polymer characterisation other problems more familiar to the biologist. Attempts to reduce the complexity of the system and create study models such as a single homodisperse polymer in contact with a single organism are very misleading because of the mutual dependancy of living things and the delicate balance between organisms, polymer and auxiliary nutrition. This field is reviewed here, and extended with observations on the interdependence of macro and micro biological phenomena in the destruction of plastics together with the significance of oxidation as an intermediate stage in the sequence of events. (5 Figs.; 62 Refs.)

(Author's Summary)

(1980), "MICROPROCESSORS: IMPRESSIVE POSSIBILITIES," Shoe and Leather News, Jan. 10, 66.

The application of microprocessors in the footwear industry has increased the productivity in the industry many-folds. No industry and particularly the footwear, can ignore its impact and hope to survive, but the appraisal for its wider use, is however said to be based on cost and lack of flexibility in fashion trends. Related also to the cost aspect is that the smaller firms may be forced out of business since the pay-back of this high technology is said to be about three years. It is technically feasible for all production stages to be updated for a new line in the shoe construction eg., patterns, cutting, lasts, upper components, insoles, etc. and it will soon come to be regarded as a valued friend in the industry.

(ETO)

SLAUGHTERHOUSE AND TANNERY BYPRODUCTS

(1980), "NRDC CASHES IN ON OLD BONES," Chem. & Ind. 2 Feb. (3), 96.

NRDC in a joint venture with Lensfield Products, to produce a commercial scale plant for producing edible proteins from animal bones is contributing £550,000 towards the cost of the £1.3m plant. The proteins — edible bone collagen, the structural protein of all skin, bone and connective tissue and soluble bone proteins which are not available from any other source have applications as sources of animal protein for addition to a wide range of comminuted meat products and as additives in soups and baby foods. The process involves defatting of all the meat bones and the resultant mixture of protein and mineral matter is subjected to either acid extraction to obtain edible bone collagen or steam and water extractions to get soluble bone protein. The plant will also produce edible bone phosphate, dicalcium phosphate and edible fats. Already 40% of the output from the plant is exported. NRDC will take a levy on the sales of the products to recoup its investment. The Ministry of Agriculture, Fisheries and Food has approved all the products for incorporation into foods.

(FAL)

CONTROL AND TREATMENT OF EFFLUENTS/ENVIRON. SC. AND TECH.

Dickson, D. (1980), "ENVIRONMENTALISTS WARN OF CONTINUED THREATS TO WATER SUPPLIES," Nature, 283 (5750), 802.

The Council for Environmental Quality (CEQ), the watchdog committee set up by the United States in 1970, has stated in its February 1980 report that ground-water contamination from various activities, such as use of pesticides in agriculture, was becoming a major problem for drinking water supplies. It informed that in the next few years, the US would face three basic, difficult problems of water supply to "water-starved areas", updating ageing distribution systems (which could cost $50 billion to $100 billion nationwide) and tackling carcinogens in drinking water. The report pointed out that there has been considerable success in controlling emissions from factories since the Clean Water Act of 1973. However, in the four years, 1975 — 1978, there has been "little or no overall change in the levels of five major water pollution indicators — faecal coliform bacteria, dissolved oxygen, total phosphorus, total mercury and total lead."

(JBG)

Morgeli, B. (1980), "ADVANCED EFFLUENT TREATMENT AS PART OF OPTIMISED SYSTEMS," Water Services, **84** (108), 110.

Advanced effluent treatment eliminates objectionable substances which are still present in wastewater after mechanical and biological treatments. Three substances viz., suspended solids, phosphates and nitrogen compounds were dealt with in this work. The advanced treatment system had a fixed bed reactor made up of open concrete filters by which deep-bed filtration was achieved. The system which could save chemicals, is reported to be achieving significant success, especially in Switzerland. (2 Figs.)

(JBG)

(1980), "WASTE WATER TREATMENT FOR JAPAN'S RESEARCH INSTITUTE," Water Services, **84** (1008), S33.

Japan's Tsukuba Research and Academic City is a centre being developed into an international-level research and academic spot, with 43 research institutes, a university and a population of 220,000. A wastewater treatment system was completed in 1979 for one of the research institutes, incorporating some of the highest technology for the treatment of wastes discharged from the institute's 48 facilities. Physical and chemical treatment systems are employed. In the chemical processes, four types of wastes are treated. These are cyanide, mercury, chrome and heavy metal wastes. There are processes for treating salty wastes, organic wastes and sludges. Some of the advanced waste treatment processes incorporated are reverse osmosis, electrodialysis, active carbon adsorption and resin adsorption. (5 Figs.; 2 Tabs.)

(JBG)

Corwin, T.K. (1980), "THE ECONOMICS OF POLLUTION CONTROL IN JAPAN," Environmental Sci. & Tech., **14** (2), 154.

About 3% of the GNP of Japan was spent on pollution control in 1975; this is higher **than estimates for other countries. In particular, copper smelters spent 20 — 30% of production costs on pollution control. Pollution control expenses are based on the** "Polluter Pays Principle" (PPP), whereby polluters rather than the government bear **the costs. The costs are then passed on to the consumers rather than tax payers. Payments are used to cover (a) restoration of polluted environment, (b) monitoring and surveillance programs and (c) compensation of pollution victims. Pollution control is enhanced by favourable government policies on loans, grants, subsidies, taxation, contract awards and licence approvals, and penalties on pollution cases. There is good understanding and cooperation between government and industries, and pollution control is achieved generally by the goodwill of polluters rather than by force of government. The burden of pollution control costs is shared when more than one industry is involved either in the pollution control or in benefiting directly from controls implemented by others. Group**

Russell, T.W.F. and Bogaert, R.J. (1980), "APPLYING MICROECONOMICS TO PROCESS DESIGN," Ind. Eng. Chem. Process Des. Dev., **19** (2), 282.

A new procedure has been developed which allows a process designer to determine the price, the market share, the optimal size of a process unit and the optimal method of operation which maximizes a firm's profits. This information is obtained by consideration of the type of competition that a firm may face and the procedure can be used to determine whether a firm should or should not enter the market. The procedure has been tested on the design of a simple chemical process for important situations: (1) monopoly becoming a duopoly and (2) two firms entering a new market at the same time. For each scenario, a range of process unit sizes along with estimates of market share, price, output and profits has been determined. Tables have been prepared which can serve the process designer as quick, qualitative guides for the determination of a firm's optimal behaviour. (4 Figs.; 8 Tabs.; 6 Refs.)

(Authors' Summary)

TECHNICAL EDUCATION AND TRAINING

Prentice, W. (1980), "THE GRADUATE THRESHOLD," Chem. and Ind., **16 Feb.** (4), 130.

January is the month for recruitment of fresh graduates by employers and it is also the month for seeking employment by university graduates in U.K. The trend of graduates' turn-out is observed to be decreasing for arts and pure sciences while it is increasing for employment in the private sector and decreasing for employment in the public sector; the balance between demand and supply differs from one degree subject to another. It is forecasted that, for the chemical industry, because of the short supply of engineers and computors, more chemists, physicists and mathematicians would be employed not only in their right but to compensate for the former. More graduates are expected in geology, biochemistry and biology, as required. The forecast is said to be reliable since the exercise is carried out joitly by the Standing Conference of Employers of Graduates (SCOEG), the Association of Graduate Careers Advisory Services (AGCAS) and the Central Services Unit for Careers and Appointments Services (CSU), all of which professionally involved in graduate recruitment. However it is stated that there is no yard-stick to actually judge the demand forecast as this requires the knowledge of actual number of existing vacancy, filled and unfilled at the end of the season. (3 Tabs.)

(BBD)

Thomas, B.J. (1980), "EDUCATION AND TRAINING FOR PRODUCTION IN THE 1980s: THE SOFTWARE ERA," Chem. and Ind., 16 Feb. (4), 138.

Most forecasters see the prospects for UK Manufacturing Industry as anything but gloomy. The problems and challenges facing the industry's production personnel are discussed in the light of deepening international recession, world-wide over-capacity, stagnation in growth and rising costs of hydrocarbon feed-stocks, fuels and other raw materials. The need for improved process control technologies and the influence of social and legislative pressures for environmental control, health and safety protection at work are also discussed. Uncertainty in the investment situation for new plants and products in the chemicals sector, whether to replace or modify old plants of the 60's or 70's, is seen as a serious problem and challenge. Skill shortages are also identified as problems in the chemical and allied products industries. Development of training resources for production operations with special emphasis on process operators and technicians, production management and process maintenance is observed to be inevitable. To promote better understanding between education and industry, strong links among them are emphasized.

(BBD)

Bradbury, F. and Russel, J. (1980), "TECHNOLOGY CHANGE AND ITS MANPOWER IMPLICATIONS. A COMPARATIVE STUDY OF THE CHEMICAL AND ALLIED PRODUCTS INDUSTRY IN THE UK, US AND JAPAN. PART I: PETROCHEMICALS AND POLYMERS," Chem. and Ind., 16 Feb. (4), 148.

An earlier paper on this topic is briefly reviewed as it provided a lead to how to deal with technological change. Information is collected from a group of senior managers of representative firms belonging to seven major sectors of the industry in UK, USA and Japan viz., petrochemicals, polymers, pharmaceuticals, agrochemicals, fertilizers, chloralkalis and surface coatings. The situation in these countries are compared and discussed in terms of economic prospects, impact of OPEC manufacture, changes in feedstocks besides structural and technical changes. It is observed that petrochemicals and polymers are the most severely affected in terms of economic prospects. In view of the rising cost of oil, Japan is the most adversely affected followed by UK, the least affected being USA. The impact of OPEC manufacturing would not be seriously felt, even though it might offer some competition. It is also observed that changes in feedstocks are not likely, while structural changes are inevitable in USA and UK and the same is being delayed in Japan by the governmental measures. Technical changes in all the three countries are inevitable and the scene in the petrochemicals and polymers sectors is tough; the position in USA is, however, comparatively relaxed. (1 Fig.; 1 Ref.)

(BBD)

DISSEMINATION

Halperin, M. and Strazdon, M. (1980), "MEASURING STUDENTS' PREFERENCES FOR REFERENCE SERVICE: A CONJOINT ANALYSIS," The Library Quarterly, 50 (2), 208.

Library reference service has various constituents that vary widely from library to library. This article deals with the measurement of students' preferences for reference service. Owing to varied nature of service characteristics, the one preferred by patrons would enlighten the library administrators to recognise and emphasise the combination that is most attractive to users. The libraries used in the study, each offering an apparent type of service, were compared in services A and B. Various methods of non-multidimensional scaling were provided to give a clue to the question that arises:- "Which one of these two services will the users prefer?" A standard marketing technique, conjoint analysis provides solutions to the Methodological problems. By using conjoint analysis, a technique that gives a way for quantifying some of the seeming intractable qualitative aspects of the library is arrived at; there is an established evidence that it is an effective method for determining the relationship of the library services to user needs. (3 Figs.; 6 Tabs.; 8 Refs.)

(EOAF)

Weintraub, D.K. (1980), "FUNCTIONS AND TYPES OF ENTRY: A REVIEW OF EARLIER CODES FOR CORPORATE ENTRY," The Library Quarterly, 50 (2), 225.

The role of a card catalog is that of providing effective communication between readers and the collection is invaluable. Those functions that have been fulfilled by earlier practices of entry for corporate bodies are identified. This is said to have been achieved by reviewing some of these earlier practices. The practices that were codified in earlier catalog codes were said to have been so because they represented the known needs of the users. The usefulness of additional types of access to library materials is asserted. The paper enumerates some of the functions that a catalog should fulfil. It is suggested that the implications of additional types of access that have been identified should be tested before their implementation. (18 Refs.)

(EOAF)

GENERAL

Winters, D. (1980), "FEW TANGIBLE ADVANCES WITHIN AFRICAN CONTINENT," Leather, 182 (4456), 35.

In spite of massive investment for the processing of hides and skins in the African continent in 1970, at the beginning of the decade, real advances were relatively few. The different economy settings in the continent are fully discussed. The socialist and centrally planned economy countries, like Ethiopia, Tanzania, Sudan and Libya, some of which, with their massive investments in tanneries, operated only on 30% capacity. With massive government participation, Tanzania is expected to process 95% of the country's raw hides and skins and a significant progress is anticipated in the footwear sector also to produce two million pairs of shoes annually. Libya, with her oil wealth, tans less than 30% of her hides and skins and produces 1.5 — 2 million pairs of footwear in a year, as it had started late. Although Sudan has the necessary facilities to process all the hides and skins available in the country, only 50% capacity is being operated due to poorly organised hide and skin collection and marketing. In the free market economy countries like Kenya, the positive steps taken by the governments have started yielding high dividends as new tanneries are coming up particularly in the skin sector. Botswana, with her superior quality hides, has a wet-blue plant processing 400 hides/day in close association with the abattoir. In the Sahelian countries like Chad, Niger, Mali, Upper Volta etc., the expansion of leather sector has been slow due to lack of capital and poor infrastructure, in spite of high per capital availability of skins. On the whole, lack of management skills, poor quality of hides and skins, inefficient collection net works and fluctuation in world market prices for raw materials are common to the African leather industry. Nevertheless, North Africa and Nigeria have increased export of leather products than the rest of the countries in Africa. The hope for the 1980's must be the consolidation of the tanning sector leading to a significant entry into the labour-intensive and economically potential leather products sector.

(ETO)

(1980), "INSIGHT INTO CHINA'S LEATHER INDUSTRY," Leather, 182 (4456), 39.

The assessment of leather industry in China is now possible since the latter has opened its doors to the world since the end of World War II. On a rough estimate, it is assumed that there are 40 — 50 tanneries in China sited at important towns like Shanghai, Canton, Tientsin and Peking and other places. In addition there are 50 — 100 small and medium tanneries. Basic chemicals and machines are indigenous. Modernisation and expansion of China's leather industry is expected to put pressure on world's hide market. China produces six million hides annually but this is considered inadequate in relation to human population of about 1 billion. China is the largest producer of pigskin (20 — 25 millions) in the world; yet this represents only 20% of the potential supply. The cattle and buffalo population is discussed. The quality of hides is generally poor as animals are slaughtered at about 14 years. 71 — 85 and 60 — 75 millions are estimated for sheep and goats respectively. With increasing rate of domestic consumption of goats, only 3 million skins are claimed to be available for export market. Production technology is stated to be obsolete. Modern spraying and drying equipment are absent. Between 70 and 120 million pairs of leather shoes and 600,000 pairs of military boots lined with wool-on sheepskin are produced annually. In addition, 150,000 wool-on sheepskin jackets for armed forces and 600,000 civilian leather garments are produced in a year. China imports about 250,000 wet salted hides and 20—23 million sq. ft. of finished leather yearly due to lack of sufficient quantity of raw hides. Steps are said to be under way to raise cattle on special farms for milk, meat and hides and results are expected in about 8 — 10 years. As an immediate alternative, machine skinning of pigs is being suggested to obtain high grade skins of only 7 — 8% fat content, leaving a 7 — 14% higher "meat value" for human consumption. These observations are made in the papers presented at the IULTCS Congress — 1979 at Versailles.

(ETO)

(1980), "NIGERIA AWAITS CIVIL GOVERNMENT INITIATIVES," Leather, 182 (4456), 50.

The granting of special licences for the export of raw goat and sheep skins by the new civilian government in Nigeria has contributed to a sudden rise in local prices resulting in the shortage of materials to the shoe manufacturers at home. Total Nigerian rawstock production is discussed; exact figures for the hides are hard to obtain since hides are purchased also for food. The Sokoto red goatskins of Nigeria are of world renown and the famous Morocco leather originated from them. The sheepskins are generally considered to be better than their East African counterparts. Besides the supply of raw material, the major problem is the cost of production; the wet blue cost, for instance, is estimated to be two to three times more than in Europe. The Nigerian Enterprise Promotion Bill which came into being in 1977 is fully discussed. The Bill split up all activity into trading and manufacturing, the former solely reserved for the Nigerians and the latter permitting foreign companies 40% of shares in private companies and the rest to be held by Nigerians. The major Nigerian tanneries and their production capacities are also discussed.

(ETO)

Rich, V. (1980), "SCIENCE PLANNING PRAISED—BUT IMPROVEMENTS STILL NEEDED," Nature, 283 (5748), 612.

Poland's special approach to science planning is said to have brought tremendous success to its research aim. Some difficulties to be overcome were analysed. The "guidelines" issued for the Eighth Congress of the Polish United Workers' Party are said to have put forward areas of improvement. The lay-out of the guidelines consists of a number of "tasks" for the adequate attention of science and technology planners. The guidelines however, show a certain amount of uncertainty on the details of research planning. Among the improvements specified is the advice to the science planners and civil servants of science-related ministries to improve their standard of education.

(EOAF)

Ritter, J. (1980), "FRIENDS AND FOES OF SCIENCE DEBATE IN FRANCE," Nature, 283 (5748), 618.

Les Amis de la Terre staged a French Public debate on Science and Technology after a long silence. The organisers assembled top administrators, active researchers, authors and journalists at the debate. The debate panel met sessionally. There was more concentration on the "biological determinism." The debate on the idealistic nature of Copenhagen interpretation of quantum mechanics was inconclusive. There was the bioengineering session where the mandarins argued for the prosecution of genetic manipulation and the point of research was questioned by the two opponents. In the sociobiology session, there was a more unanimous attitude. The session on systems analysis dealt with the merits of a general systems approach. There was a final session on social responsibility which turned out not to be strange to the Anglo-Americans.

(EOAF)

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NOTES ON CONTRIBUTORS OF PAPERS

The scope for the papers intended for publication in the JLR could project the research and development work conducted on science and technology of leather and leather-products such as footwear and all types of leathergoods, chemistry, biochemistry, physics, biophysics, biology, microbiology, environmental engineering, by-product utilisation, quality control and standardisation, machinery and equipment, industrial chemicals, management, technical education and training, economics, marketing and dissemination as applicable to leather and leather-products industries.

As regards the methodology of publication of articles, please go through the papers appearing in JLR. The format and arrangement of various Sections of the article shall be:- Abstract, Introduction, Materials and Methods, Results along with Figure(s)/ Table(s) if any, Discussion, Acknowledgement(s) if any and Reference(s). The names of Sections of the paper "Abstract" etc., shall be at the middle of the line and in block letters. Sub-sections (sub-headings) can start at the margin and normal-typed and underlined or italicised. References shall be given within brackets in the running line eg., (Author's name, year); in case, there are only two authors, the names of both the authors be given eg., (—and—, year); references to articles contributed by more than two authors be indicated as follows: (Name of the first author et al., year); references to more than one article by the same author/s in the same year are to be indicated as follows: (first reference, year a); (second reference, year b) and so on. Reference to books shall indicate the name(s) of the author(s), (year of edition/publication), "title of the book", (name of the editor), name of the Press and page number (p.--). The "References" shall contain the names of all the authors who have contributed the article, arranged in alphabetical order, (year), name of the journal, **Vol. No.** (Issue No.) or **Month**, Page Number.

The expression shall be in lucid language and shall follow the mode of construction under each Section. The article could be of about 10 typewritten (double spacing) quarto-size pages. The contents of the paper shall be original and not reproductions of earlier publications. Three copies of the paper are requested to be forwarded for publication. The author(s) of the paper will be provided with 25 numbers of reprint of their publication; request for extra copies of reprint may be made while forwarding the paper and the same will be available on payment of nominal charges.

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CONTENTS

STUDIES ON THE CHEMICAL COMPOSITION AND LEATHER-MAKING PROPERTIES OF SKINS OF THE NIGERIAN GOAT *(CAPRA HIRCUS)*

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ABSTRACT

The Chemical composition of the skin of goats from Zaria area of the Guinea Savannah Region of Nigeria was determined. Slight differences in the distribution of the chemical constituents were found in various parts of the skin. Generally, the chemical composition of the skin of the Nigerian goats compared favourably with that of the goats of other lands. The physical and chemical properties of shoe upper leather processed from the skin of the Nigerian goat, *capra hircus,* were investigated and found to compare favourably with international standards for such leathers. The studies confirm high competitiveness of Nigerian goatskins in the international market.

INTRODUCTION

The supplies of hides and skins to the leather industry will inevitably be influenced by production trends and practices designed to improve the yield, market quality and nutritional value of the primary product, namely meat (Russel *et al.,* 1977).

From time immemorial, the Guinea Savannah zone of Nigeria has been supplier of high quality skins to the regions of the Sahel, Sahara desert and of course North Africa. In fact, the so-called ''morocco leather'' which is very famous for its outstanding upper leather quality is a product of the skins originated from Nigeria. The high demand for Nigerian skins must of necessity be correlated with their high quality which could be assumed to be initmately associated with their chemical constitution.

As regards the leathers made out of the skins taken up for the studies, a thorough knowledge on their physical and chemical characteristics is required to judge their performance. This paper deals with the chemical composition of the goatskins of Zaria and the quality of the shoe upper leather prepared from them.

MATERIALS AND METHODS

For the present studies, ten goat skins were collected from Zaria (7° 20' E, 11° 20' N), Kaduna State, Nigeria. Each skin was cut along the backbone into two halves. The left side of the skins was used for chemical analysis, while the right side was used for processing into leathers which were then subjected to physical tests and chemical analyses.

Skins

Samples for analysis were taken from the neck, belly, shank, backbone and butt regions of each of the left side of the skins. Chemical characteristics, such as moisture, fatty matter and hide substance (collagen), were determined as per the Official Methods of Analysis (Society of Leather Technologists and Chemists, 1965).

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Leathers

The right side of the skins were processed into chrome leathers as per the usual method, employing 2% $Cr_2 0_3$ on delimed pelt weight. The physical characteristics, such as tensile strength, elongation at break, shrinkage temperature and flexing endurance, as well as chemical characteristics, viz. moisture, fatty matter and hide substance, were determined as stipulated by the official Methods of Analysis (Society of Leather Technologists and Chemists, 1965).

RESULTS

Skins

The skin of the Nigeria goat, *Capra hircus,* was found to contain 62.66% moisture and volatile materials, 30.85% collagen and 1.12% fatty matter (Table I). Slight differences in the concentrations of these constituents were noted in the different locations of the skins. Collagen was generally found to be evenly distributed.

Leathers

The results of the physical tests carried out on the leathers are shown on Table II. The tensile strength values ranged from 20.6 — 27.4 MN/m^2, elongation at break from 50 to 68% and shrinkage

TABLE I

CHEMICAL COMPOSITION OF NIGERIAN GOATSKIN

Character-istics	Neck	Belly	Shank	Back bone	Butt	Whole Skin	
						As-is-basis	On moisture-free basis
Moisture, %	62.70	62.62	62.64	62.70	62.65	62.66	—
Fatty matter, %	1.03	1.26	1.25	1.01	1.07	1.12	3.00
Collagen, %	31.12	30.39	30.62	31.25	30.89	30.85	82.61

TABLE II

PHYSICAL CHARACTERISTICS OF THE LEATHERS MADE FROM THE GOATSKINS OF NIGERIAN ORIGIN

Sample No.	Tensile Strength, MN/m^2	Elongation at Break, %	Shrinkage Temperature, °C	Flexing Endurance (100,000 Flexes)
1	26.1	66.1	96	No damage
2	21.8	59.7	95	— do —
3	27.4	62.4	95	— do —
4	20.6	50.0	92	— do —
5	27.3	72.1	98	— do —
6	23.1	60.0	97	— do —
7	24.1	69.7	97	Slight crackiness of the grain
8	27.2	68.0	96	No damage
9	22.6	54.4	94	— do —
10	22.1	58.6	91	Slight crackiness of the grain

TABLE III

CHEMICAL CHARACTERISTICS OF LEATHERS PRODUCED FROM THE GOATSKINS OF NIGERIAN ORIGIN

Sample No.	Moisture, %	Fatty Matter, %	Hide Substance, %
1	10.51	6.03	61.31
2	10.42	6.17	62.66
3	11.15	6.14	61.88
4	11.06	5.64	58.22
5	10.71	5.71	62.10
6	11.04	6.11	57.94
7	10.74	6.24	62.21
8	10.81	5.86	60.47
9	11.10	6.08	59.88
10	11.21	6.01	57.38

temperature from 92 to 98°C. Apart from two out of the ten samples, the leathers survived the 100,000 flexes. Table III shows the chemical characteristics of the upper leathers prepared from the skins taken up for the studies. While the values for moisture ranged between 10.42 and 11.21%, the figures for fatty matter recorded a minimum of 5.64% and a maximum of 6.24%; the range of values for hide substance was from 57.38 to 62.66%.

DISCUSSION

Skins

The chemical composition of the Nigerian goatskin compared favourably well with the values obtained by other workers for goatskins, in general. For instance, 62.66% moisture content of the skin of the Nigerian goat is nearer to the figure of 65% observed earlier (Sarkar, 1981). The hide substance, in terms of collagen, works out to 82.61% on moisture-free basis and this is in line with the values of 84—87% obtained for dried goatskin (Mclaughlin and Theis, 1924). Also, the fat content of 3.00% on moisture-free basis, for the fresh goatskin, is within the range of 2 — 10% already reported (Sarkar, 1981). The observation that different constituents of the skin are concentrated to different levels in different parts of the skin confirms earlier findings (Kelly, 1926). Nigerian goatskins are thus found to possess fairly similar chemical constituents as those from other lands. The ratio of protein to fat in the Nigerian goatskin stands at about 27.5:1. It is reported that those skins with relatively low fat content are better suited for processing into leathers (Mackenzie, 1967). The high protein-fat ratio of Nigerian goatskins is one of the factors that contributes to their high quality.

Leathers

The figures for tensile strength, one of the valuable indices of leather quality (UNIDO, 1976), as recorded by the leathers made from the Nigerian goatskins, ranged from 20.6 to 27.4 MN/m^2 as against the recommended minimum 20.0 MN/m^2 for shoe uppers. As regards the elongation at break, the experimental leathers recorded values between 50 and 72.1%, well within the international maximum of 80%. Another important physical characteristic of the leathers viz. shrinkage temperature that gives an idea of the extent of cross-linking within the leather matrix is found to be between 91 and 98°C, which of course could be augmented to the desired level by increasing the chromic oxide input, thorough basification etc. processing techniques. The results of flexing endurance test revealed that majority of the leathers satisfactorily with-stood 100,000 flexes. As regards chemical characteristics, both the hide substance and moisture contents are quite normal with the respective minimum values of 57.38% and 10.42% and maximum values of 62.66% and 11.15%. The figures for fatty matter ranging between 5.64% and 6.24% also fairly correspond with the maximum of 6% as recommended in the international standards for upper leathers.

Judging from the physical and chemical parameters of the leathers obtained from the goatskins of Nigerian origin, it can be said that the latter are capable of producing leathers meeting the international standards.

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ROLE OF LEATHER RESEARCH IN NIGERIA ECONOMY

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ABSTRACT

The ability of leather and leatherproducts industries to increasingly contribute to the nation's exchequer that could be realised through appropriate research and development (R & D) efforts within the country is projected. The approach to such R & D activities in terms of technology choice, technology transfer, technology management and technology dissemination as applicable to Nigeria is spelt out.

INTRODUCTION

The nations where agriculture is a profession by tradition, often possess sizeable livestock population and hence hides and skins. Present-day farm management does recognise the potential of animal-power and full advantage could be derived through its maximum utilisation alongside the use of mechanical implements. The demand and supply position in respect of edible proteins of animal origin in the developing countries is well-known. The importance of livestock population in most of the third world countries both as food and as a means of livelihood cannot therefore be under-estimated.

Trading in leather and leatherproducts containing wholly or partly leather has been in vogue traditionally in these countries, contributing in a majority of them, to the foreign exchange earnings besides catering to the local market. By and large, these countries continue to remain exporters of hides and skins either in raw and pickled condition or in semi-tanned state in the form of vegetable crusts and of-late wet blues, i.e wet chrome-tanned leathers. Those countries among them that have had an awareness as to the additional unit value realisation from these materials, after processing them into final finished products, have strengthened/initiated R & D work on local production. Such R & D work had a phenomenal impact on not only diversifying and maximising production but greatly enhanced the quality to a level that is acceptable at the international market. This way, the potentials of leather and leatherproducts were tapped and the contribution to the national economy greatly enhanced. The areas of R & D activity in respect of suitable technology choice, technology transfer, technology management and technology dissemination based on the present-day Nigerian leather and leather-products industries are to be properly identified towards augumenting the nation's economy.

THE INDIAN EXPERIENCE

India, with fairly similar climatic conditions over a good proportion of topography as Nigeria, has increased her revenue in foreign exchange alone by more than ten-times over a quarter-century period, as can be seen in Table I (Statistics of Foreign Trade of India, 1957 — 1982).

TABLE I

EXPORT EARNINGS OF INDIA THROUGH LEATHER AND ALLIED PRODUCTS

A QUARTER — CENTURY DEVELOPMENT

Items	Naira Equivalents, in millions	
	1957 (12 months)	April 1981 — January, 1982 (10 months)
Raw skins	5.0	Nil
E.I. hides & skins	14.4	19.9
Wet Blue hides & skins	Nil	14.6
Finished leather	1.0	119.5
Footwear	1.7	11.4
Footwear Components	Nil	36.3
Leathergoods	0.1	14.8
Other Leather manufacturers (e.g. Industrial Leather Manufacturers)	0.1	7.7
	22.3	224.2

As can be seen from the Table I, the export earnings by raw skins stood at 22.5% of total exports during 1957; raw exports were, however, no longer the case even as early as in the 60's. E.I. exports that were quite significant during that time (65%) have drastically dropped to a meagre 9% in 1981 — 82, in line with the policy decision taken by the government to curtail exports in semi-tanned condition and increase those of value-added commodities. Even after adding the wet blue exports which made their appearance in the mid-60's, the share of leather exports, prior to finishing (E.I. and wet blue), constituted only 15% of total export earnings. The exports of finished leathers, footwear, footwear components, leathergoods and other leather manufacturers have all recorded remarkable increases over the period covered by the studies.

The over-all export performance of Indian leather and allied products ranked generally around the fifth among the various foreign exchange earning export commodities. It will not be out of place to mention here that such a sizeable contribution to the national exchequer is maintained by the leather sector amidst increasing exports of engineering and other agricultural products. This has been possible through positive implementation of the ban on raw exports and diversification of production and exports of value-added items such as finished leathers, footwear components, footwear and other leatherproducts including industrial leather manufactures, backed by massive indigenous R & D efforts coupled with assimilation of research results by the leather and leatherproducts industries. There has indeed been a close cooperation between the government, industry and research organisation. The programmes of research to be conducted by the research organisation were formulated in line with the priorities set by the government and in close rapport with the industry. Research results were efficiently disseminated through publications in reputed journals and patents. The fruits of research that were of immediate practical significance were successfully demonstrated at the tanneries throughout the country. Eminent scientists, technologists and tanners from within the country and abroad were invited as 'guests', to share their experiences with the staff of the research organisation. International 'get-togethers' of representatives of the industry, government and research organisation relating to leather trade, leather science and technology were organised periodically to discuss on the current problems facing the industry and to decide on further course of action with the ultimate aims of achieving greater scientific/technological capabilities and generating higher foreign exchange earnings through the adoption of improved technology and marketing techniques. The role of research on leather science and technology on the economy of the nation is thus quite evident.

THE NIGERIAN SCENE

With the Indian case in mind, the position obtaining in Nigeria and measures to generate greater contribution to the nation's exchequer through appropriate choice, transfer, management and dissemination of technology in the leather and leatherproducts sectors could now be examined. With the background of all-round recession, protectionist tendencies of importing nations and vagaries of international trade and regulations, the ills of dependence on single-commodity economy have come to be increasingly felt by both the government and the populace of Nigeria. There is no alternative than to revive the export-oriented efforts and modernise the style of functioning in the respective sectors.

Nearly one-tenth of the foreign exchange earnings of Nigeria used to be contributed by the hides and skins prior to the present-day dominant role of petroleum (Mshelbwala, 1983). With concerted efforts, this industry can be geared to occupy a more significant position, as a major contributor to the nation's economy.

RAW MATERIALS

Although the requirement of input materials is of paramount importance to any industry, the position regarding their supplies to the leather industry in Nigeria, particularly the supply of hides and to some extent skins, is extremely acute. As against an estimated cattle leather requirement from 1.4 million hides, only 0.5 million is available to the industry. Table II illustrates the livestock population, off-take rate and availability of hides and skins (Bello, 1983).

TABLE II

LIVESTOCK POPULATION, OFF-TAKE RATE AND AVAILABILITY OF HIDES & SKINS IN NIGERIA

(1970's)

Category of Livestock	Population, mill.	Off-take Rate, %	Availability of Hides & Skins to the Leather Industry, Mill.
Cattle	12.5	10	0.5
Goats	25	50	11.0
Sheep	12	20	2.0

It is quite evident from the above Table that the generated supplies of hides and skins are not fully utilised by the industry. Goats and sheep, as whole animals, are eaten along with the skins in most parts of the country but their ratio is however rather small as against the extent of availability to the industry. The position regarding cattle is quite different in that a significant amount of hides is consumed as human food ("ganda"/"pomo"). It is also observed that hide arrivals in the tanneries suffer from both quality and substance. About 60% of hides and 10 — 20% of skins are thus lost to the tanning industry. Due to the fairly liberal channelisation of exports of raw skins, many-a-times, even the available skins are not able to be fully utilised by the industry. The tanneries are thus made to work much below their installed capacity; only about 0.5 million hides and 7.5 million skins are processed locally into upper leathers and lining leathers and are entirely utilised by the domestic leather-products industry.

Nigerian goatskins have earned international reputation for their tight texture but the present-day flaying practices leave much to be desired. There is a great scope for upgrading the quality of sheepskins from the point of view of their leather-making properties. Better animal husbandry techniques, protective measures against diseases, better flaying, efficient collection, improvements in curing and storage conditions (Femi Ilori, 1980), large scale breeding (Shehu Bida, 1980), proper mass media approach to dissuade the public from eating the hides and skins in view of their low nutrient value but high potential for generating employment and revenue through processing are suggested to ensure a constant and increased supply of raw material to the leather industry. Also suggested for the same reason is proper harnessing of the available pig skins and reptile skins. Consequently the leatherproducts industry will be relieved of its perpetual problem of scant availability of its major raw materials víz., the different types of leathers.

CHOICE OF TECHNOLOGY

A Technology for better returns from rural units

Once the raw materials position is made comfortable i.e., when the demand and supply position assumes even proportions or concerted efforts are initiated along the above lines to provide the industry assured supplies of raw material, a proper choice of technology is to be made. With more than 25 percent of the tanning activity in the rural sector, the technology choice obviously centres on its upgrading. Apart from the unhygienic conditions prevailing in this sector, the quality of the leather produced therein is far from satisfactory. Although such leathers find some acceptance in the domestic market, the quality of the leatherproducts made from them needs good amount of improvement and the value potentials is appreciably lost. The unit-value realisation from out of the hides and skins is thus not derived to the full extent. Proper choice of technology that is essentially of low-cost and which ultimately yields fuller, softer and stronger leathers is the need-of-the-hour and R & D work on this line is of immediate necessity. The small scale leatherproducts units that account for about 20% of total output of the country deserve to be provided with better quality leathers and all the necessary assistance in the form of supply of newer designs and marketing facilities.

Emphasis on the use of Local materials and skills by the mechanised sector

As regards the mechanised establishments, apart from the scarcity of raw material, the availability of processing chemicals, spares for machinery, gindery items and ornamental fittings are not quite satisfactory. The present status of technology is heavily dependent on imported auxiliary chemicals with all their inherent constraints. This is not conducive for healthy running of the enterprises and there is no alternative except to make suitable changes in the current technology based on locally developed materials, if production is to be maintained uninterruptedly. There is thus an immediate need for R & D work on the identification of locally available alternate materials that could be used in the various unit processes of leather-making and the development of process know-how involving the use of such alternate materials, as was initiated in case of utilisation of enzymes of *Adenopus breviflorus* fruits (Adewoye and Bangaruswamy, 1983) for unhairing and bating of hides and skins, a process found readily acceptable to all mechanised tanneries that have tried it. Likewise, efforts could be stepped up to successfully locate the local materials towards successive replacement of other imported auxiliaries. Nigeria possesses a good amount of lime deposits and with a marginal input of R & D efforts, the use of local lime should be a reality in the near future. Alongside with *Adenopus breviflorus ("tagiri")* fruits, the leaves of "gaba-gaba" *(Cissus aralioides)* and *"fataka" (Pergularia tormentosa)* could be harnessed to assist the tanner in the beamhouse. From out of the unlimited possibilities of utilisation of many of the by-products of the slaughterhouse and tannery, the formulation of bates from pancreas could be attempted forthwith. The petro-chemical industry should be able to come to the rescue of the tanning industry in providing wetting agents, syntans, sulphochlorinated oils etc. Production of *"bagaruwa" (Acacia nilotica var. adansonii)* tannin extract, alone as well as in blends, be given a priority to rationalise tannages involving this tanning material. Also, identification of other viable tanstuffs and exploration of mineral tanning agents as well as local dyeing materials are of great importance. Suitable technology choice should be made to produce these materials in commercial quantities and accommodate them in large-scale production. A well-organised chemical industry within the country is considered quite essential to the supply of basic chemicals to the leather and other chemical-based industries. Although the development of a leather and leatherproducts machinery industry within the country is not of immediate necessity in its entirety, availability of newer types of machines and spares be ensured to infuse modernisation in the production lines. The mechanised leatherproducts industry, through proper market intelligence, could adopt indigenous designs and patterns with a view to manufacturing products that are best suited to local conditions. Such newer developments could result in additional turnover of these establishments with greater patronage from the local people and tourists alike. All these open up new challenges to develop suitable technologies to produce leathers and leatherproducts to international standards which will ultimately boost the nation's economy.

Technology for the 80's

With the official ban on exports of hides and skins and imports of footwear, greater activity at the tanneries and footwear units is expected. The tanning sector may do well to consolidate its activities during this decade leading to a significant entry into the much more labour-intensive and economically viable leatherproducts sector (Winters, 1980). Necessary immediate steps are to be taken by all concerned to provide the leather industry good quality hides and other input materials to facilitate increased hide-processing activity within the country. As regards the skins, every effort is needed to process all of them into finished leathers by progressively curtailing the exports in the pickled/wet blue condition and by enforcing more efficient controls in arresting the exports in the raw state. The sooner the present-day situation of mechanised footwear units being unable to obtain sufficient quantities of leathers is changed, the earlier the nation's economy will be augmented. The planning for diversification in the production of different types of leathers and consequently leatherproducts must take into account a viable technology choice that could generate maximum returns. Production of chrome-bagaruwa combination tannages for the manufacture of upper leathers and light-weight flexible sole leathers can make the indigenous footwear industry greatly self-reliant. Judging from the high export-potential of semi-chrome and semi-alum goat and sheep skins for use as suedes, clothing leathers etc. utility items, the conversion of bagaruwa tanned goat and sheep crusts into such types of value-added exportable leathers should be given top-most consideration. The importance of formulation of Nigerian Standard Specifications for different types of input materials, leather and leatherproducts coupled with quality-oriented production is of paramount importance in such a national venture. International support and assistance will be easily forthcoming and prove more meaningful with such overall orderly development of the leather and leatherproducts industries.

TRANSFER OF TECHNOLOGY

Present day Nigeria, as most other developing countries, needs certain degree of technology transfer from other sources. Industrial scale production of active enzymes from *Adenopus breviflorus* fruit, manufacture of bagaruwa tannin extract and petrochemical ventures may be cited as possible areas requiring immediate attention. Diversification of processing activity in the tanneries, formulation of designs for leather products, newer areas of expansion in other allied fields such as furs, furgoods, garments, sportsgoods etc. add up further avenues for such technology transfer. Assistance through bilateral arrangements as well as international agencies, in addition to multinational joint ventures with major Nigerian participation may be thought of as the means to channelise such technology transfer.

TECHNOLOGY MANAGEMENT

Having ensured proper choice of technology and identified areas of transfer of technology, a concerted effort on the part of R & D aspects and industry cooperation through planned management is essential. It is quite appropriate to point out herein that sufficient care should be bestowed on assimilation and adoption of the technology so chosen/transferred, as a follow-up action. For a meaningful scientific/technological/ industrial activity, all the necessary infrastructure in the form of inputs must be assured to the respective entities of activity. Research work should be programmed as to fix right men for a given/identified project. Various aspects of leathers and leatherproducts, encompassing also the relevant fundamental research, could be covered while venturing such programming. As the industry needs quick results from R & D exercises, those projects that could prove successful for immediate application are also better accommodated, alongside long-range ones. Technology build-up may thus be aimed at all areas of interest to the industry, enabling adoption at the appropriate and favourable cost-beneficial periods. With the present-day shortage of imported auxiliary chemicals, any R & D effort towards the development of local materials will be appreciatively received by the industry. As the country's mechanised sector is fairly young, any attempt to plan the effluent-treatment system will become handy to all those concerned — industrialists, governments and public at large. Apart from development of R & D techniques, ways and means could be found to establish common facility centres at selected regions for the benefit of traditional tanners which can be followed up for rural footwear units as well.

An important requirement for a sound management is the provision of adequate manpower at appropriate levels, particularly while embarking on such rapid development. In addition to floor-level technicians, technologists at supervisory level will be required in due course and establishment of degree courses in leather science and technology, incorporating all the necessary aspects of leatherproducts in the course-content, can no longer afford to wait. Machinery mechanics for leather and leatherproducts industries should also be provided through proper training. The industry-university-research combine will thus become a reality and form a strong base for eventually acquiring greater foreign exchange earnings for the nation. Quality control and standardisation form yet another facet of management. Production of leathers and leatherproducts satisfying international quality levels and standards is a pre-requisite for healthy marketing. Formulation of Nigerian Standard Specifications for various types of leathers and leatherproducts should be given a national priority. Quality-oriented and standardised leathers and leather-products help in not only realising higher foreign exchange earnings per unit-value but in sustaining and promoting the nation's reputation world-wide.

TECHNOLOGY DISSEMINATION

In the face of stiff competition to the use of leather from synthetics even as early as in the 50's, a strong urge on the part of the industry not to state merely the merits of leather and embellish with pretty illustrations but to prove and demonstrate the same existed (Turley, 1960). In the case of developing countries, the industry had to be induced and enthused to modernise itself to meet the challenges. Package assistance from government and R & D organisation really proved to be a great success. A good understanding of the conditions existing in the country and field experience in similar conditions automatically form the pre-requisites for a successful technological effort in respect of dissemination of the fruits of research to the industrial units. Nigerian leather and leatherproducts industries too could derive the benefits accruing through such approaches

Right now, there is an urgency to effect the impact of R & D work on the industry and the role of scientists and technologists in this area is as important as the identification and generation of technologies. A balanced approach is highly recommended if newer technologies are to be dispersed, particularly in traditional units associated with strong notions and outlooks on the mode of their functioning. As a rule, only those technologies that are well-tried and capable of affording one or more benefits — less-costly, less-time-consuming, less-manual, pollution-free, quality-oriented, easily-marketable — to the industry, traditional/mechanised, will be found acceptable and with careful planning, the art of dissemination could be profitably perfected. A closer rapport with the suggestions made herein is expected to justify and fructify the positive role of R & D work in leather and allied industries in the generation of Nigeria's economy.

ACKNOWLEDGEMENT

The author is grateful to the Director, Leather Research Institute of Nigeria, Zaria for having provided permission to publish this article.

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ABSTRACTS
(FROM OTHER PUBLICATIONS)

BIO—SCIENCES AND TECHNOLOGY

Flanagan, M.T. (1980), "MORE LIGHT ON MEMBRANE PROTEIN MOBILITY," Nature, **284** (5752), 126.

The application of fluorescence recovery after photobleaching (FRAP) which is one of the simplest and most useful techniques for measuring the mobility of proteins in a membrane has been discussed. This technique involves specifically labelling a cell by saturating a membrane-localised receptor with its ligand which has been previously labelled with a fluorescent dye. Subsequent exposure of the cell to a focused laser beam of appropriate wave length produced a bleached, small, circular spot on the cell surface. The appearance of fluorescence within the circle could only be attributed to the diffusion of unbleached material into the spot. The rate of diffusion has a simple relationship to the diffusion constant of the labelled molecular complex. Results obtained from FRAP experiments carried out on mitogens and antibodies bound to cell membrane receptors showed that their mobilities depend on their size as well as other factors not yet fully understood. The diffusion constants obtained using small fluorescent lipid probes agreed with values obtained from magnetic resonance studies. The observation that diffusion constants in liquid crystalline phases of pure lipids, but not those in the gel phase, could be measured led to the introduction of two modifications of the FRAP technique which resolves the problem. FRAP experiments have provided evidence supporting the contention that there is a physical link between some membrane receptors and the cytoskeletal structure underlying the membrane. Among proposed applications of FRAP technique are studies on the effect of the multicomponent nature of the lipid membrane on protein diffusion and reconstituted systems containing enzymes whose activity has been shown to depend on the state or nature of the surrounding lipid.

(GE)

ANALYTICAL CHEMISTRY

Fernandez, T., Luis, A.G. and Montelongo, F.G., (1980), "SPECTROPHOTOMETRIC DETERMINATION OF SULPHATE FOR MEASURING SULPHUR DIOXIDE IN AIR," The Analyst, 105 (1249), 317.

A simple spectrophotometric determination of sulphate for measuring sulphur dioxide in air is described. The method involves precipitation of barium sulphate and formation of a blue complex between unreacted barium and Sulphonazo III reagent. The absorbance is inversely proportional to sulphate content and the working range for the method is from 3 to 30 μg (as $SO_4{}^{2-}$) per 5 ml of sample (0.6 x 10^{-5} to 6 x 10^{-5}M). For standard sulphate solutions (0.6 — 6 μg ml $^{-1}$) the standard deviation is less than 0.1 μg ml. $^{-1}$. Studies were made of the interferences due to the presence of some anions ($ClO_4{}^-$, Cl^-, $NO_3{}^-$, $PO_4{}^{3-}$ and F^-) and cations $NH_4{}^+$, K^+, Mg^{2+} and Ca^{2+}). The proposed method could also be used for the determination of sulphate content in waters, absorbing solutions, aqueous extracts etc. (9 Figs.; 4 Tabs.; 18 Refs.)

(FAL)

Howard, A.G. and Arbab—Zavar, M.H. (1980), "SEQUENTIAL SPECTROPHOTOMETRIC DETERMINATION OF INORGANIC ARSENIC (III) AND ARSENIC (V) SPECIES," The analyst, **105** (1249), 338

A modification of the silver diethyl dithiocarbamate (SDDC) spectrophotometric method for differential determination of inorganic arsenic (III) and arsenic (V) species is described. Based on pH control of the reduction characteristics of the borohydride ion, arsine is generated at pH 6 from arsenic (III); following acidification, arsine is then generated and trapped from arsenic (V) species. The procedure is appropriate to the determination of 2 — 40 μg of each arsenic species. Interference is observed from antimony (III), bismuth (III), platinum (IV), copper (II), gold (III), nickel (II), chromium (VI), silver (I), tellurium (IV) and tin (II) in the determination of arsenic (III); "methylarsenic" and "dimethylarsenic" species, platinum (IV) and silver (I) interfere in the determination of arsenic (V). Interference from platinum is overcome by masking with 1, 10 — phenanthroline while that due to bismuth, copper, gold, nickel, silver, tellurium and tin can be overcome by preliminary extraction of the interferents from the sample (at pH 2.0) with 0.005M dithizone in methylene chloride prior to the reduction procedure. (4 Figs.; 3 Tabs.; 8 Refs.)

(FAL)

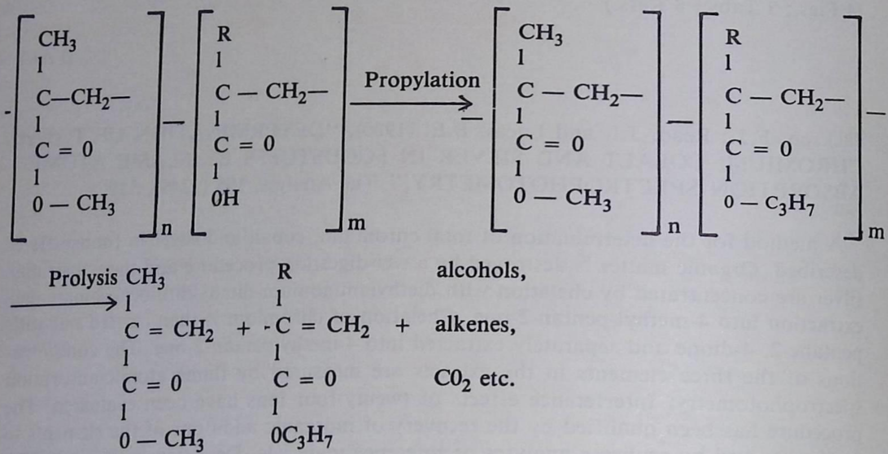
Jackson, F.J.; Read, J.I. and Lucas, B.E. (1980), "DETERMINATION OF TOTAL CHROMIUM, COBALT AND SILVER IN FOODSTUFFS BY FLAME ATOMIC-ABSORPTION SPECTROPHOTOMETRY," The Analyst, **105** (1249), 359.

A method for the determination of total chromium, cobalt and silver in foodstuffs is described. Organic matter is destroyed by a wet-digestion procedure and the cobalt and silver are concentrated by chelation with diethylammonium diethyldithiocarbamate and extraction into 4-methyl-pentan-2-one. Chelation of chromium is then carried out with pentane-2, 4-dione and separately extracted into 4-methylpentan-2-one. The concentrations of the three elements in the extracts are measured by flame atomic-absorption spectrophotometry. Interference effects of twenty-four ions have been evaluated. The procedure has been qualified by the recovery of inorganic additions of the elements to foodstuffs and by replicate analyses of reference materials. Detection limits and 95% confidence intervals based on these exercises have been derived. (1 Fig.; 12 Tabs.; 25 Refs.)

(FAL)

Sharp, J.L. and Paterson, G. (1980), "IDENTIFICATION OF SMALL AMOUNTS OF COPOLYMERISED UNSATURATED CARBOXYLIC ACID IN ACRYLIC POLYMERS BY AN ALKYLATION-PYROLYSIS-GAS CHROMATOGRAPHIC-MASS SPECTROMETRIC PROCEDURE," The Analyst, **105** (1250), 517.

Acrylic lattices and solutions for surface coating applications often include 1 — 10% of copolymerised acid and/or amide, such as acrylic acid, methacrylic acid and acrylamide to promote adhesion to the substrate. The ester units in acrylic polymers has been identified with methods based on infrared spectroscopy, nuclear magnetic resonance spectroscopy, pyrolysis-gas chromatography and pyrolysis-gas chromatography-mass spectrometry (pyrolysis-GC-MS). Information can be obtained regarding the presence of acid and amide groups in the polymer from its infrared spectrum in the regions 3450—2630 cm^{-1} (2.9 — 3.8 μm) and 1715 — 1500 cm^{-1}(5.8 — 6.7 μm). The amounts of copolymerised amide and carboxylic acid of the polymer can be deduced from nitrogen content and base titration of the solution respectively. Based on precise measurement of the wave-length of the carboxylic acid absorption maximum at about 1700 cm^{-1} (5.9 μm), an infrared technique for distinguishing between copolymerised acrylic and methacrylic acids in acrylic polymers containing more than 10% of the acid has been described. The identification of the acid in compositions containing less than 10% of acid has hitherto not been possible except when unpolymerised acid residues can be separated from the polymer. A pyrolysis-gas chromatographic-mass spectrometric procedure is described that is applicable to polymers containing 1% or more of carboxylic acid. The acid groups are propylated and the polymer is pyrolysed according to the following reaction scheme:-



(1 Figs.; 6 Refs.)

(FAL)

Merry, R.H. and Zarcinas, B.A. (1980), "SPECTROPHOTOMETRIC DETERMINATION OF ARSENIC AND ANTHIMONY BY THE SILVER DIETHYLDITHIOCARBAMATE METHOD," The Analyst, **105** (1251), 558.

Significant antimony interference may occur when sodium tetrahydroborate (III) is used for hydride generation in the spectrophotometric determination of arsenic using the silver diethyldithiocarbamate method. This can be overcome by reading the absorbance at a wavelength other than the absorption maximum or both elements can be determined by reading at two wavelengths. Wet digestion techniques of sediment, soil and plant material for arsenic and other metals is not suitable for antimony. This can be overcome by treatment of the digest with a reducing agent prior to hydride generation. A system using sodium tetrahydroborate (III) for simultaneous generation of arsine and stibine with subsequent spectrophotometric determination using silver diethyldithiocarbamate in pyridine is described. Suitable digestion procedures for contaminated sediment, soil and plant materials are also discussed. (2 Figs.; 2 Tabs.; 16 Refs.)

(FAL)

Thompson, K.C. and Wagstaff, K. (1980), "SOME OBSERVATIONS ON THE DETERMINATION OF IRON BY ATOMIC-ABSORPTION SPECTROPHOTOMETRY USING AIR-ACETYLENE FLAMES," The Analyst, **105** (1252), 641.

Anomalous calibration graphs exhibiting inflections and even maxima have been observed for determination of iron by atomic absorption spectroscopy using air-acetylene flames. The response for a given standard can also depend on the age of the solution. Under fuel-rich air-acetylene conditions, iron (II) and iron (III) gave significantly different calibration graphs. While these effects disappeared in a fuel-lean air-acetylene flame, considerable loss in sensitivity was observed. In fuel-rich flames low levels (0.5 — 5 $\mu g\ ml^{-1}$) of silicon were found to enhance the iron response significantly. The degree of enhancement increased with increasing iron concentration for a given concentration of silicon. The presence of 100 $\mu g\ ml^{-1}$ of calcium was found to suppress the response slightly at the 0.5 $\mu g\ ml^{-1}$ iron (III) level whilst giving a very significant enhancement at the 5 $\mu g\ ml^{-1}$ iron (III) level. In the fuel-lean flame up to 10 $\mu g\ ml^{-1}$ of silicon or 100 $\mu g\ ml^{-1}$ of calcium had a negligible effect on iron (III). Since anomalous calibration graphs, age of solution effects and inter-element effects of silicon and calcium were not observed in the presence of 2% m/V ammonium perchlorate, a condensed phase effect is thought to be responsible for the observed phenomena. This study clearly shows that for iron determinations in the absence of ammonium perchlorate, fuel-rich flame conditions that correspond to maximum iron sensitivity should not be used and fuel-lean flame conditions that result in a decreased sensitivity is recommended. (5 Figs.; 5 Tabs.; 14 Refs.)

(FAL)

Prasada Rao, T. and Ramakrishna, T.V. (1980), "SPECTROPHOTOMETRIC DETERMINATION OF ZINC WITH THIOCYANATE AND RHODAMINE 6G," The Analyst, **105** (1252), 674.

A sensitive and selective method for the spectrophotometric determination of zinc is described. The method is based on the reaction of Rhodamine 6G with the tetrathiocyanatozincate (II) anion to form a pink product that is stabilised by gelatin. The colour development is rapid and remains stable for at least three hours. The method is applicabl for determination of zinc contents as low as 0.2 — 5.0 μg in 10ml samples. The method is precise and has been applied to the determination zinc in synthetic matrices and soil samples. Interference observed from a few elements was overcome by suitable pretreatment prior to spectrophotometric determination. (2 Figs.; 3 Tabs.; 10 Refs.)

(FAL)

Shaw, I.C. (1980), "MIRCRO-SCALE THIN-LAYER CHROMATOGRAPHIC METHOD FOR THE COMPARISON OF DYES STRIPPED FROM WOOL FIBRES," The Analyst, **105** (1252), 729.

Textile fibre transfer is an important factor in many forensic investigations and the forensic scientist often has to compare fibres recovered from a suspect's belongings with control fibres from, for example, an injured party's clothing or *vice versa*. A simple, rapid and conclusive thin-layer chromatographic (TLC) technique is proposed for the extraction of dyes from the fibres which are used for comparison purposes. The method is suitable for use in routine forensic case work. (2 Refs.)

(FAL)

Cheam, V. and Agemian, H. (1980), "PRESERVATION OF INORGANIC ARSENIC SPECIES AT MICROGRAM LEVELS IN WATER SAMPLES," The Analyst, **105** (1253), 737.

The investigation of stability of inorganic species of arsenic as As (III) and As (V) in distilled and natural waters is carried out for a duration of 125 d. Various conditions of storage, such as pH, level or arsenic, type of container material and size of container are studied. It is found that acidification with 0.2% V/V sulphuric acid satisfactorily preserved As (III) and As (V) in both distilled water and natural waters at 1 and 10 μg 1^{-1} levels at room temperature in polyethylene containers or pyrex bottles. (4 Figs.; 1 Tab.; 19 Refs.)

(FAL)

Arbab-Zavar, M.H. and Howard, A.G. (1980), "AUTOMATED PROCEDURE FOR THE DETERMINATION OF SOLUBLE ARSENIC USING HYDRIDE GENERATION ATOMIC-ABSORPTION SPECTROSCOPY," The Analyst, **105** (1251), 744.

An automated procedure for the determination of soluble arsenic using arsine generation and subsequent atomic absorption spectroscopic measurement is described. Optimisation of experimental conditions such as pH control, sampling time, wash time, nitrogen flow rate are considered. Interferences are observed in the presence of silver (I), gold (III), iron (III), platinum (IV), antimony (III), strontium (II), fluoride and sulphide but can be overcome by suitable pretreatment techniques. The detection limit (based on twice the standard deviation for 15 blank measurements) is 0.90 ng ml.$^{-1}$ of arsenic for arsenic (III), arsenic (V) and methylarsenic species. A 10% negative bias of the results is observed in the determination of dimethylarsenic species. (6 Figs.; 2 Tabs.; 20 Refs.)

(FAL)

Thompson, K.C. and Wagstaff, K. (1980), "SIMPLIFIED METHOD FOR THE DETERMINATION OF CADMIUM, CHROMIUM, COPPER, NICKEL, LEAD AND ZINC IN SEWAGE SLUDGE USING ATOMIC-ABSORPTION SPECTROPHOTOMETRY," The Analyst, **105** (1254), 883.

Various digestion techniques are examined for the efficient dissolution/extraction of cadmium, chromium, copper, nickel, lead and zinc in typical sewage sludges. The conventional wet digestion techniques are found to have various disadvantages when routinely applied to sludge analysis. It is concluded that a simple nitric acid digestion in 50 ml calibrated glass tubes is an accurate, rapid and safe dissolution method for the routine atomic absorption determination of the above six metals in sewage sludges. (1 Figs.; 13 Tabs.; 34 Refs.)

(FAL)

Nemoto, Y. and Funahashi, H. (1980), "THE INTERACTION BETWEEN DYES AND NONIONIC SURFACTANTS: THE MODE OF ACTION OF NONIONIC SURFACTANTS IN DYEING," Ind. Eng. Chem. Prod. Res. Dev. **19** (2) 136.

The theoretical basis for the interaction between dyes and nonionic surfactants in textile dyeing and finishing has been highlighted. Spectrophotometric studies revealed the formation of hydrophilic small complexes while surface tension studies pointed to the formation of hydrophilic large complexes and hydrophobic ionic bonding complexes. Cloud point measurements suggested the formation of a third type of complex regarded as a liquid crystal termed mixed micelles which form a layer around the fibres. The formation of these complexes help to explain the ability of nonionic surfactants in improving the levelling and fastness properties of acid dyes in textile finishes. (14 Figs.; 5 Tabs.; 17 Refs.)

(AAN)

Sykes, R.L. and Cater, C.W. (1980), "TANNAGE WITH ALUMINIUM SALTS. PART I. REACTIONS INVOLVING SIMPLE POLYPHENOLIC COMPOUNDS," JSLTC, 64 (2), 29.

The background history of aluminium tanning was fully reviewed. With a correct choice of polyphenolic masking agents, aluminium tanning liquors for the processing of white leathers with mineral characteristics could be produced. On addition of polyhydroxy compounds, the pH of the aluminium sulphate solution was reduced by 0.5 — 1.0 unit, thereby indicating complex formation. The location of the hydroxyl function on the benzene ring seems very significant as 1.5 and 3.0 mol of pyrogallol and catechol respectively per mol of aluminium were required to inhibit precipitation. Tanning trials with acetone dehydrated pelt as the substrate were carried out. The observed elevated shrinkage temperature was believed to be the function of hydroxyl group; the highest recorded shrinkage temperature for aluminium sulphate masked with carboxylic acids was 85°C. Although increased shrinkage temperatures were observed in semi-alum and with certain proprietary syntans used in the production of white leathers, in conjunction with acetate masked aluminium sulphate, it was found that only with natural organic tannins that shrinkage temperatures above 100°C could be achieved. It was confirmed that at least two trihydroxyaryl units per molecule are required to obtain shrinkage temperatures greater than 100°C. The use of phenolic compound as a pre-tanning agent followed by the treatment with aluminium salt is preferred. (3 Tabs.; 30 Refs.)

(ETO)

Sykes, R.L., Hancock, R.A. and Orszulik, S.T. (1980), "TANNAGE WITH ALUMINIUM SALTS. PART II. CHEMICAL BASIS OF THE REACTIONS WITH POLYPHENOLS," JSLTC, 64 (2), 32.

Initial experimental tannages with a 65% basic aluminium chloride liquor were attempted using acetone dehydrated sheep pelt as the substrate. The number of hydroxy groups and their relative locations on the aromatic structure influence pH, shrinkage temperature, colour and lightfastness of the resultant leathers. Synthesis and purification of some polyhydroxy diphenyl sulphones were difficult and instead 3, 3', 4, 4' — tetrahydroxy diphenyl sulphone was used in conjunction with basic aluminium chloride in the tanning experiments. The rise in shrinkage temperature was observed and colour appeared pale pink, but became red on exposure to light. A consistent pale pink colouration was observed in the final series of tanning trials using three isomeric hexahydroxy diphenyl sulphones and among other things the results appeared to confirm the importance of 3, 4, 5 disposition of the hydroxyl groups on the benzene ring structure. The infrared spectra of a film of gelatin before and after deuteration revealed that the absorption band at 1560 cm^{-1} due to — NH — deformation decreases, and the band at 1450 cm^{-1} increases upon deuteration and the carbonyl-CO-band at 1650 cm^{-1} was unchanged. The rate of deuterium exchange was reduced by the presence of polyphenolics indicating the formation of hydrogen-bonds with the collagen. It was also stated that the use of the diaryl sulphone, in the presence or absence of aluminium salt, results in a greater involvement of the polypeptide groups in H-bonding, but the additional H-bonds were unstable in the presence of aluminium. Paper chromatography, paper electrophoresis and potentionmetry were employed for the complex formation studies. Further work is reported to be in progress to develop masking agents which could help obtaining leathers with higher hydrothermal stability (110°C) and light-fastness. (2 Figs.; 6 Tabs.; 22 Refs.)

(ETO)

LEATHER PRODUCTS

Lynch, M. (1980), "NASRF STRIVE FOR BETTER UNDERSTANDING," Shoe and Leather News, **March 20, 58.**

Prospects and difficulties during the coming decades were among the issues discussed by delegates at the 39th annual general meeting of the National Association of shoe Repair Factories (NASRF). A need for greater co-operation among all sectors of the footwear industry was fully stressed since one sector is interdependent upon another. The UK footwear manufacturers were told to advertise the aftersales service provided by repairers as this would provide a stronger sales to back up their "Buy British Footwear' Campaign". Repair factories were faced with the problem of recruiting staff despite the substantially higher rewards being offered. It was suggested that the Repair Event should generate a good promotional campaign for the entire industry. Shoe manufacturing trends for the 1980's were fully discussed. It was stressed that the UK footwear industry will only survive if its quality standards are improved. It would be better that Shoe Repairs get the same sort of promotion as the footwear manufacturing.

(ETO)

(1980), "BFMF WELCOMES NEW SHOE LABELLING STANDARD," Shoe and Leather News, **March 27, 3.**

The new recommendation on footwear labelling by the British Standards Institution, stipulating among other things, that a notice be displayed in shops setting out the categories of footwear is highlighted. The British Footwear Manufacturers Federation (BFMF) hopes this practices will help to "iron out" some of the past misunderstandings between the manufacturers and the consumers. The items that are waterproof and those that are not waterproof are fully defined. The distinction between the categories will enable the customers to buy their exact requirements, the BFMF claims. The markings indicating brand name, country of origin as well as size and materials of manufacture as specified by the Standard will be of assistance to the consumers during buying as the hard-wearing British Shoes can easily be identified from the lighter construction of Italian, Korean or Brazilian shoes.

(ETO)

(1980), "NEW SOLE FOR BETTER TRACTION AND VENTILATION," Shoe and Leather News, **March 27, 48.**

Improvements in sports shoe outsoles with rubbery elastic properties are claimed. Over eighty features with nine illustrations associated with twenty-eight claims are described in the specification; the primary ones relate to soles with block projections. Each block has at least two V-shaped slots designed to increase the deformability and number of gripping edges of the blocks which allow easy adaptation to any slight unevenness in the ground. Further developments in later designs include hollow projecting elements in the central part of the sole that allow a pumping action in walking , running or jumping, thus causing a flow of air through openings communicating with the inside of the shoe. (3 Figs.)

(ETO)

(1980), "IMPROVING THE MOCCASIN," Shoe and Leather News, **March 27, 48.**

More economical use of leather is claimed in the construction of moccasin over the traditional type. The vamp is arranged in two panels joined to a sole panel by skived overlapped margins with a zig-zag stitch. The sole panel has an integral extension forming a heel panel, of which a short tongue extension is provided to help the wearer to pull the shoe on. The vamp panels are so shaped that when closed the projecting seam is clearly visible. The sole can be of direct — moulded or cemented construction. By providing longer facings and increased height at the rear, a boot can be made. A slip-on sole with an external tongue covering an elastic gusset forms another development. (2 Figs.)

(ETO)

CONTROL AND TREATMENT OF EFFLUENTS/ENVIRON. SC. AND TECH.

Bitcover, E.H., Cooper, J.E. and Bailey, D.G. (1980), "PILOT-PLANT STUDY OF FLOCCULATION OF SUSPENDED SOLIDS IN LIME-SULFIDE UNHAIRING EFFLUENTS," JALCA, **75** 64), 108.

The removal of suspended solids from commerical unhairing effluents by means of a pilot-plant continuous flow apparatus was studied. Effluents were obtained from tanneries which processed either fresh or salt-cured hides in paddle vats or hide processors. Approximately 80 — 85 percent of the suspended solids were removed from the effluents tested. The results substantiate earlier laboratory studies that established the ranges of effluent compositions (pH, salt content, suspended solids, and soluble organic content) for which specific flocculation treatments are effective. (2 Figs.; 7 Tabs.; 12 Refs.)

(Authors' summary)

Ramaswamy, P. and Krishnamurthy, V.S. (1980), "WATER POLLUTION BY TANNERY EFFLUENT," JALCA, 75 (6), 200.

The effect of effluent contaminants on the microbial flora of tannery well waters, which were either condemned or continued to be used for various processes, was studied. The well waters recorded high bacterial count, sodium chloride content, and hardness because of their location near the effluent disposal area. Rocky beds appeared to be more conducive to heavy bacterial contamination and sodium chloride concentration than sandy beds. Statistical analysis confirmed the above observations indicating a positive correlation for halophilic and halophilic proteolytic bacteria and a negative correlation between total count and sodium chloride. (2 Figs.; 4 Tabs.; 17 Refs.)

(Authors' summary)

Shivas, S.A.J. (1980), "THE EFFECTS OF TRIVALENT CHROMIUM FROM TANNERY WASTES ON PLANTS," JALCA, 75 (8), 288.

Tests with geranium and rhubarb plants grown in soils to which were added varying amounts of chrome leather shavings, tannery sludge, and/or chrome from tanning liquors demonstrated that these plants can tolerate massive amounts of trivalent chromium in the soil. Large amounts of chromium in the soil did not cause the plants to accumulate much chromium nor did they retard growth permanently. (8 Tabs.; 18 Refs.)

(Author's summary)

Shivas, S.A.J. (1980), "THE EFFECTS OF TRIVALENT CHROMIUM FROM TANNERY WASTES ON EARTHWORMS," JALCA, 75 (8), 300.

Earthworms were grown in soils to which various tannery byproducts containing chromium were added. The tannery byproducts and the chromium (Cr) contents of the experimental soil mixtures after they were added were as follows: blue shavings 670 ppm, tannery sludge 1,835 ppm, leather buffings 970 ppm. The Cr. content of the original control soil was 16 ppm. Incorporating the shavings into the soil had no effect on the population of worms, although it did increase the Cr content of the worms and their casts. The tannery sludge decreased the worm population and the leather buffings decreased the size of the worms produced. However, the worms survived in all of these experimental soils and evidently ate the chromium containing materials, since their gut contained 100 ppm or more of Cr. (2 Tabs.; 4 Refs.)

(Author's summary)

Cartier, J.E. (1980), "AN ASH STABILIZATION PROCESS FOR THE RECOVERY AND REUSE OF CHROMIUM FROM CHROME-LADEN TANNERY WASTE AND A TREATMENT PROCESS FOR POLLUTION CONTROL OF TANNERY WASTE WATER," JALCA, 75 (9) 322.

The leather tanning and finishing industry has been classified by Federal and State regulatory agencies as a generator of potentially hazardous waste. An engineering recommendation was made that the chrome-laden solids resulting from tannery operations could be properly managed by incinerating these wastes to an ash containing soluble chrome. A process was needed for extracting the chrome in the ash and recycling it to the tanning process. This paper presents a chromium recovery and reuse process that stabilizes the ash resulting from a thermal treatment system by removing all the soluble chrome, as well as a tannery waste water treatment process that provides for very efficient primary treatment. This recovery process recycles all the chromium in liquid and solid tannery waste and therefore provides for a "zero" chrome discharge to the environment. (1 Fig.; 1 Tab.)

(Authors' summary)

Cooper, J.E., Bitcover, E.H., Filachione, E.M., Harlan, J.W. Bailey, D.G. and Feairheller, S.H. (1980), "USE OF TOC AS AN ALTERNATIVE TO COD FOR MONITORING THE BIOOXIDATION OF TANNERY UNHAIRING,WASTE," JALCA, 75 (9), 331.

A test for chemical oxygen demand (COD), requiring approximately 4 hr, is commonly used to monitor the biooxidation of wastes. A test for total organic carbon (TOC), which requires only 3 to 5 min, was compared with the more time-consuming method to determine if it could be used to estimate the COD test and to monitor the biooxidation. Both TOC and COD were determined for various proteins and amino acids, and the results of the two methods correlated well. The bioxidation of tannery unhairing wastes, complex industrial wastes characterized by high solids contents, was moritored by both TOC and COD tests. The results obtained indicate that the TOC test is an acceptable alternative to the COD test when the composition of the waste does not vary significantly with time. (6 Figs.; 2 Tabs.; 15 Refs.)

(Authors' summary)

Lollar, R.M. (1980), "ARE CARCINOGENS A CHRONIC HEALTH HAZARD IN THE TANNERY WORKPLACE?" JALCA, 75 (12), 510.

Three clinical studies have associated employment in the leather and leatherproducts industries with cancer, but they have not identified tanning and finishing operations specifically. The dust that is characteristically created in the manufacture of leather goods is most often suggested as a significant factor. However, many of the chemicals used in the leather tanning industry are classified as carcinogenic. An analysis of the potential risks of exposure to these chemicals is presented in this paper, along with suggestions for proper practices of handling them. The classes of materials are nitrosamines, benzidine-based direct dyestuffs, chromate pigments, aromatic organic solvents, and tannins. (26 Refs.)

(Author's summary)

(1980), "EFFLUENT TREATMENT IN A DANISH ORGANIC PIGMENT PLANT," Water Services, **84** (1009), 153.

The treatment system, which improved the environment, consisted of a multistage treatment complex, linked to the various process units. In one stage, $100m^3$/day of phenolic wastewater was subjected to chemical decomposition using sodium hypochlorite as the oxidising agent. This gave a reduction of phenol concentration from 1000 mg/1 to 2 mg/1. Subsequently, copper was removed by electrolysis and stripping. Finally, ammonia was biodegraded in four basins, each with seven rotating biological discs of a total contact area of $392{,}000m^2$. As a test on the efficacy of the treatment of effluents, guppies which died in 5 to 10 minutes in the influent wastewaters were found to survive for about one year in the final effluent. (1 Fig.; 1 Tab.)

(JBG)

ECONOMICS AND MARKETING

Taylor, S. (1980), "HIDES AND SKINS MARKETING PATTERN SLOWLY CHANGING," Leather, **182** (4457), 36.

U.K. produces 3.5 — 4 million hides and calfskins and 12 million sheep and lambskins annually. Although the pattern of collecting these raw materials is still traditional in many ways, it is gradually changing. The meat market is becoming more concentrated and hide markets are seeking more efficient ways of handling the materials. Also new methods of preservation are being studied and cost-conscious tanners are questioning the appropriateness of weight as the best basis of sale. The number of slaughterhouses in England and Wales is on the decline while a pattern of fewer but bigger hide markets is already beginning to emerge. In terms of total trade, more than half the hide market is being controlled by the meat producing firms. The hide marketeer who originally acted as a middleman between the butcher and the tanner now buys on his own account and has virtually become a merchant. The Hides and Allied Trades Improvement Society (HATIS) is of the view that monetary incentives should be given to slaughter-men to encourage better take-off and that the farmer should also receive a premium for producing good quality hides or skins. Grading a hide is a function of the skill and visual judgement of the classer, who must also make a fair assessment of weight to allow for excess moisture, dung and flesh left on the hide. The BLMRA, after studying the possibilities of hide freezing and chilling, sees the latter as the most likely alternative to hide preservation through salting. Less than half the total of UK hide sales are made through auction. Auction prices are used as the buying guide both at home and for international transactions and are telexed round the world within minutes. (1 Fig.)

(AAL

Clarkson, M. (1980), "MANAGEMENT IN THE EIGHTIES," Chem. and Ind. 15 Mar. (6), 233.

Management is the central resource of the developed countries. In the late 1950's, the function of the manager was to get things done at profit. But in the present decade, the ease with which the manager performs this function depends on his ability to negotiate with all interested groups or stakeholders. In the 1950's and 1960's, the manager was close to the centre of his organisation while other members of staff performed various functions at the periphery, where the organisation met and joined with the environment; appropriate decisions were finally taken at the centre. In the late 1970's to-date, the managers had to be at the periphery itself, managing the boundary conditions between the organisation and the constantly changing external, turbulent environment; this could be the case for the rest of this decade. The development of research based management is relatively recent and business schools have played a major role in this context.

(AAI)

(1980), "TRADING PARTNERS," West African Technical Review, March, 63.

Nigeria and Sweden have, in particular, during the 1970's, maintained an increasing level of political cooperation largely under the aegis of the United Nations and its various agencies. A cooperation agreement covering industrial, economic and scientific research and development fields was signed by the two countries in 1980. Most of the Nigerian exports to Sweden, presently, consists of crude oil and refined oil products. Before the advert of oil in Nigeria, Swedish imports from Nigerian consisted largely of agricultural products. Nigeria's imports from Sweden consist of forestry and industry products. As part of her measures to increase trade between the two countries. Sweden had arranged industrial exhibitions in Nigeria. Sweden also took part in the First Lagos International Trade Fair. Sweden and Nigeria have, since 1976, exchanged several ministerial visits which have yielded overwhelming results. Outstanding among these results are, the setting up in Nigeria, of industrial firms under joint venture arrangements between the two countries and the exploration of possibilities of starting a Nigerian-Swedish Chamber of Commerce. (1 Fig.)

(AAI)

Hulbert, J.M.; Brandt, W.K. and Richers, R. (1980), "MARKETING PLANNING IN THE MULTINATIONAL SUBSIDIARY: PRACTICES AND PROBLEMS," J. Marketing, 44 (3), 7.

The role of planning in the multinational firm is reviewed. Marketing planning practices of subsidiaries of Japanese, European and U.S. firms operating in Brazil are compared. Some of the common planning problems and the means to resolve them are also discussed. Data were gathered from managers of eighty MNC subsidiaries in Brazil. The planning system of the foreign subsidiary is typically modelled on that of its parent. Although the subisidiary's systems are often modified to suit its smaller size and its more limited resources, planning in some of them is as complex as the parent firm's domestic planning. Many subsidiary planning problems are caused by scarcity of resources at the subsidiary level and compounded by lack of appreciation of these conditions by managers in the home office. Some of these problems include, obtaining adequate information for marketing planning, coordinating flows within the company, lack of trained manpower and over-emphasis on plans as control devices. The suggested solutions to these problems include joint participation in objective setting, development of home — office capability, better management of planning and communications systems and development of collaborative attitudes. (1 Fig.; 2 Tabs.; 39 Refs.)

(AAI)

Fouss, J.H. and Solomon, E. (1980), ''SALESPEOPLE AS RESEARCHERS: HELP OR HAZARD?'' J. Marketing 44 (3), 36.

An attempt by the marketing department of an overseas airline to determine the criteria by which travel agents select or recommend airlines for overseas travel and to identify their own airline's image among the agents is described. Market research results achieved by airline representatives are compared with those achieved by professional interviewers. Questionnaires were used to sample out responses from travel agencies. Results of the study showed that sales representatives cannot obtain unbiased information from customers. Marketing and research directors of business corporations are suggested to follow the conventional practice of conducting the market research by a neutral party in order to minimise potential bias. (3 Tabs.)

(AAI)

Lyons, W. and Durant, R.F. (1980) ''INTERVIEWER COSTS ASSOCIATED WITH THE USE OF RANDOM DIGIT DIALING IN LARGE AREA SAMPLES,'' J. Marketing, 44 (3), 65.

Studies are conducted on the amount of extra interviewer expense through the use of a Random Digit Dailing (RDD) as opposed to a directory-based sample selection method in large area residential surveys. The attendant costs of face-to-face interviewing have led to the rising popularity of telephone survey research. A serious limitation of this technique however, is its biasedness. In an attempt to rectify this problem, many have resorted to the sample selection technique of RDD. One of the merits of the RDD is that it reduces sample bias. The second is that RDD allows for easier multi-stage and stratification sampling techniques which subsequently produce more statistically reliable results. A third advantage of the RDD is that it can randomly select respondents within given households and program call-backs based on the criteria chosen by the researcher. A formula is used to estimate the extra cost of interview, when RDD technique, as opposed to directory-based method, is employed. Results of the study showed that the ratio of RDD to directory-based interview costs decreases as interview length increases. The results also revealed that the actual cost difference between RDD and directory-based interview remains a function of interview wage rates and sample size, regardless of interview length, (1 Fig.; 1 Tab.; 12 Refs.)

(AAI)

Lodish, L.M. (1980), "A USER-ORIENTED MODEL FOR SALES FORCE SIZE, PRODUCT, AND MARKET ALLOCATION DECISIONS," J Marketing, **44** (3), 70.

A relatively easy-to-understand macro-model which has been used to help the management to take decisions relating to sales force size, product and market allocations is described. This model has two components. The first component is a predictive model used to predict sales and profit effects of a product allocation-sales force size policy and operates at the level of market segments. The second component is a search procedure to isolate more profitable policies within the constraints imposed by the firm. Limitations of the macro-model are discussed. The abridged description of the input required for the model in the pharmaceutical industry is also discussed. (2 Tabs.; 12 Refs.)

(AAI)

Stasch, S.F. and Lanktree, P. (1980), "CAN YOUR MARKETING PLANNING PROCEDURES BE IMPROVED?" J. Marketing, **44** (3), 79.

In view of the virtual lack of research on the subject of marketing planning, a comparative study of the procedures and practices used by six large, consumer package goods organisations when developing their annual marketing plans is undertaken. The research focussed on three areas, namely, the marketing planning procedure, sources of new planning ideas and other organisational and motivational factors which encourage continued good planned over time. The study provided senior marketing executives and other marketing professionals with "benchmarks" for assessing the planning procedures used in their own organisations and expose them to new ideas for improving marketing planning procedures. Two difficulties are apparent in the study. The first difficulty concerns the criteria to use in judging the effectiveness of planning processes. The second is that the research was limited to only one type of industry. (3 Tabs.; 26 Refs.)

(AAI)

Batsell, R.R. (1980), "ON THE USE OF HIDDEN SURFACE ROUTINES IN THE ANALYSIS OF MARKETING DATA," J. Marketing, **44** (3), 102.

A set of routines that used transformations and perspectives to portray a three dimensional surface or a set of points on a two dimensional surface is provided. In doing this, the technique of choice probabilities is used to estimate a multi-attribute choice model. Data from a study on consumer preferences are used to illustrate the process. The estimated multivariate functions and surface plots are presented in eight separate diagrams. These routines find wide application in the following areas viz., examination of the results of a two-way analysis of variance; simultaneous portrayal of objects as points in three dimensions when a factor analysis results in three factors; examination of residuals from a regression run using two predictor variables; portrayal of market penetration or demand data over a geographical area; and, consumer preference analysis. (8 Figs..; 7 Refs.)

(AAI)

White, H.S. (1980), "FACTORS IN THE DECISION BY INDIVIDUALS AND LIBRARIES TO PLACE OR CANCEL SUBSCRIPTIONS TO SCHOLARLY AND RESEARCH JOURNALS," Library Quarterly, **50** (3), 287.

A grant provided by the National Science Foundation Division of Information Science and Technology in 1978 and 1979, is said to be used by Indiana University Research Center for Library and Information Science to seek information through questionnaires on relevant factors that urges both individuals and libraries to place new subscriptions or cancel the existing ones to established scholarly and research journals. The study evaluates the influence of library action on individual subscriptions. Through the survey, the effects of development of co-operative acquisitions policies and emergence of awareness of consortia and networks on library decisions were evaluated. The study suggested that individual's decision to subscribe is not being influenced by the availability of a journal in a library. It is found that a majority cancelled subscriptions because of lack of interest in such journals; 10 — 15 percent of them cancelled unwillingly for financial reasons. Libraries that cancelled subscriptions due to financial reasons are beginning to be affected by an increasing awareness of consortium and network policies and knwoledge of the availability of titles in other libraries. (14 Tabs.; 12 Refs.)

(EOAF)

Stead, B.A. and Scamell, R.W. (1980), "A STUDY OF THE RELATIONSHIP OF ROLE CONFLICT, THE NEED FOR ROLE CLARITY AND JOB SATISFACTION FOR PROFESSIONAL LIBRARIANS," Library Quarterly, **50** (3), 310.

The article analyzes the variables of role conflict, role clarity, role ambiguity and job satisfaction for professional librarians. Thirteen empirical studies of all the role variables in different occupational groups were reviewed. Investigations were carried out on the relationship between each role and job-satisfaction variables, taking sixty-eight professional librarians as a sample. The study revealed that role ambiguity and role conflict are both related to job satisfaction and that the need for role clarity does not affect the relationships between role ambiguity and job-satisfaction. Three hypotheses studied in the paper explicitly indicated how important role dynamics could be to the job-satisfaction of librarians. (5 Tabs.; 33 Refs.)

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White, H.S. (1980), "FACTORS IN THE DECISION BY INDIVIDUALS AND LIBRARIES TO PLACE OR CANCEL SUBSCRIPTIONS TO SCHOLARLY AND RESEARCH JOURNALS," Library Quarterly, 50 (3), 287.

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[EOAJ]

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The scope for the papers intended for publication in the JLR could project the research and development work conducted on science and technology of leather and leather-products such as footwear and all types of leathergoods, chemistry, biochemistry, physics, biophysics, biology, microbiology, environmental engineering, by-product utilisation, quality control and standardisation, machinery and equipment, industrial chemicals, management, technical education and training, economics, marketing and dissemination as applicable to leather and leather-products industries.

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CONTENTS

STUDIES ON SOME IMPORTANT MINERAL ELEMENTS IN THE SKIN OF THE NIGERIAN GUINEA SAVANNAH GOAT *(CAPRA HIRCUS)*

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Ahmadu Bello University
Zaria, Nigeria

ABSTRACT

The composition and distribution of some physiologically important mineral elements in the skin of goats from the Guinea Savannah region of Nigeria were investigated. Nine mineral elements were found to be present, their distribution being uneven at different locations of the skin. The mean mineral-contents were 0.14% Ca, 0.42% Na, 0.24% K, 0.06% Mg, 0.05% Zn, 0.20% Fe, 0.02% Cu, 0.08% Ni and 0.04% Co, on dry basis.

INTRODUCTION

Mineral elements in the skin have influence on those qualities that are desirable in the final leathers. It is observed that deficiency of copper in the animal results in depigmentation of the skin with changes in the physical properties of the skin fibres (Lee, 1956). Copper ions are involved in the cross-linking of collagen fibres (Rucker *et al.,* 1969) and elastin fibres while zinc-deficient animals have a decreased incorporation of amino acids in the skin proteins, collagen in particular (Hsu and Anthony, 1973). The more the cross-linkages the greater the strength properties of the leather.

Much work has been done on the mineral element composition of the skins of animals but only very little has been done on the goat and this paper deals specifically with the mineral element composition of the Nigerian goat skin. Nine elements, namely, Zn, Cu, Ni, Co, Fe, Mg, Na, Ca and K have been chosen for these studies because these are the mineral elements that have been frequently encountered in other animal skins investigated.

MATERIALS AND METHODS

Ten adult goats chosen from different localities within the Guinea Savannah vegetative region of Nigeria were slaughtered and flayed on the same day. Sample pieces of the skin of the same surface area were punched out from the neck, chest, anterior and posterior shanks, belly, mammae, butt proper, front butt, back-bone and tail regions of each skin using a silver coated cork borer of diameter 3.50 cm. such that a total of one hundred samples of the same surface area were obtained.

Drying and ashing of each sample were carried out as per the procedures mentioned in the Official Methods of Analysis (Society of Leather Technologists and Chemists, 1965). The ash was brought into solution using 1 ml. 50% HCl and 3 ml. conc. H_2SO_4. The volume of the resulting solution was made up to 100 ml. with de-ionized distilled water. All sample solutions were finally stored in P.V.C. sample bottles to eliminate contamination with other mineral elements. Analysis was done for Na, Ca, K, Mg, Zn, Fe, Cu, Ni and Co using Atomic Absorption Spectrophotometer (Perkin-Elmer Model 290 B).

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RESULTS

The nine elements taken up for the studies were found to be present in the goat skin, in varying amounts, in the various locations chosen for the investigation. Table I gives the mean concentrations of the mineral elements found in the hundred skin samples taken from ten different locations of ten goat skins. The mean concentrations of the mineral elements found in ten skin samples, each set representing ten different locations of the skin are presented in Table II.

TABLE I

ASH AND MINERAL ELEMENT CONTENTS OF NIGERIAN GOAT SKIN

Ash/Mineral Element	Values, Percent, on moisture-free basis
Ash	4.73
Ca	0.14
Na	0.42
K	0.24
Mg	0.06
Zn	0.05
Fe	0.20
Cu	0.02
Ni	0.08
Co	0.04

TABLE II

ASH AND MINERAL ELEMENT CONCENTRATIONS IN DIFFERENT LOCATIONS OF NIGERIAN GOAT SKIN

(Percent, on moisture-free basis)

Locations	Ash Content	Mineral Element Content								
		Ca	Na	K	Mg	Zn	Fe	Cu	Ni	Co
Neck	3.58	0.10	0.26	0.10	0.03	0.04	0.17	0.01	0.06	0.02
Chest	3.48	0.09	0.24	0.21	0.03	0.03	0.14	0.02	0.09	0.02
Anterior Shank	5.23	0.14	0.36	0.27	0.06	0.05	0.14	0.02	0.03	0.02
Belly	3.30	0.06	0.25	0.13	0.03	0.03	0.13	0.01	0.04	0.02
Mammary Area	5.41	0.12	0.36	0.27	0.05	0.04	0.03	0.02	0.04	0.02
Posterior Shank	5.24	0.14	0.52	0.24	0.07	0.05	0.21	0.01	0.11	0.04
Butt	4.07	0.15	0.26	0.10	0.04	0.04	0.12	0.01	0.07	0.05
Back-bone	5.35	0.18	0.36	0.20	0.05	0.04	0.17	0.09	0.10	0.05
Front Butt	4.84	0.08	0.32	0.35	0.04	0.04	0.14	0.01	0.05	0.02
Tail	4.91	0.35	0.83	0.42	0.05	0.04	0.15	0.12	0.12	0.05

DISCUSSION

The data on the mean concentrations of mineral elements as seen in Table I, when arranged in descending order, present the following pattern:

Na > K > Fe > Ca > Ni > Mg > Zn > Co > Cu.

It is clear from the results of the analysis that, among the cations investigated in this experiment, Na, K, Fe, and Ca are the predominant ones in the skin of the Nigerian **Guinea Savannah goat, *Capra hircus*. The ratio of Na to K was found to be 2:1** but work done on human and mouse skins showed that the predominant cation was K and that the Na content was half the K value (Rothman, 1954). The Na — K relationship found in the Guinea Savannah goat skin is, interestingly, the same as that found in new born mammals (Rothman, 1954).

Since mineral elements are associated with deficiency diseases in live animals, their presence in the skin of the animal may be an index to the health state of the animal before slaughter. Zn, Cu, Co and Ni have all been shown to be closely associated with the skin deficiency diseases in animals. The Zn content of hair reflects the dietary intake of the mineral in the case of goats and cattle (Miller *et al.*, 1965). It is also reported that the rate of wound closure is directly proportional to hair — Zn levels (Pories *et al.*, 1967).

There were significant differences in the concentrations of the mineral elements in the various locations of the skin as observed from Table II. The concentrations of Ca, Na and K were highest in the Tail region, Mg and Zn had their highest levels in the Shanks. Fe was high in the Posterior Shank while Cu was high in the Tail and Back-bone regions. Ni showed high levels in the Posterior Shanks, Back-bone and Tail areas while Co had its highest levels in the Butt, Back-bone and Tail regions. Compared to other areas of the skin Ca level is low in the Belly, Front Butt and Chest areas. Relatively speaking the Tail, Back-bone and Shanks had higher concentrations of the mineral elements than the other locations where the distribution of the elements was found to be more even.

The factors responsible for the distribution of mineral elements throughout the skin have not been determined but it is not unlikely that the structure and quantity of the collagen fibres present in the skin may be implicated since it is known that many metal ions are preferentially incorporated into the collagen structure. Thus, Cu would be expected to be present in higher concentrations in those areas of the skin with the greatest tensile strength as Cu ions are involved in the cross-linkages between collagen fibres (Rucker and Riemann, 1972). Skins with pigmented hair are more likely to contain more Cu ions than those with non-pigmented hair since Cu is associated with pigmentation in the skins.

Again the mineral element status of an animal may influence incorporation of certain other mineral elements into the body tissue. Thus the presence of high inorganic phosphorus in the body can aggravate Zn deficiency in rats, while cadmium aggravates the same condition in poultry, pigs and calves. (Powell *et al.*, 1964).

Mitchell and Edman (1962) assessed the average loss of Fe through the skin of a healthy adult man as 0.5 mg./day and stated that there is continual dermal loss of this element through the sweat, hair and nails. The number of sweat glands in the skin may therefore be associated with the quantity of Fe present in the skin, all other factors remaining constant.

From the foregoing, the skin of the typical Nigerian Guinea Savannah goat is found to contain the nine biologically important elements taken up for the studies. The concentration and distribution of these elements in the skin might be associated with the leather making quality of the Nigerian skins. Further studies are required to investigate the relationships between the diet of the goats and the differential accumulation of mineral elements in their skin as well as the relationships between the concentrations of mineral elements and the physical properties of the leathers made from them.

ACKNOWLEDGEMENT

The authors are grateful to the Chairman, Research Board of Ahmadu Bello University, Zaria and the Director, Leather Research Institute of Nigeria, Zaria for their encouragement and support during the course of this work.

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OPTIMUM CONDITIONS AND MECHANISM OF TITANIUM TANNAGE-PART IV*

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Central Leather Research Institute, Adyar, Madras, India

ABSTRACT

Investigations to find out the optimum basicity, pH and concentration of the basic titanium tanning solutions for tannages involving titanium are dealt with. Detailed studies were conducted on titanium tannages using standard and modified hide powders (deaminated, decarboxylated as well as deaminated and decarboxylated hide powders) in order to arrive at the mechanism of titanium tannage. The optimum conditions for titanium tannage were found to be basicity 50 percent, pH 4.0 and concentration 5 percent TiO_2. In addition to studies on fixation, microscopical studies on leathers obtained with different concentrations of TiO_2 confirmed that the concentration at 5 percent TiO_2 was optimum. The carboxyl groups of collagen were found to play a major part in the fixation of cationic titanium while anionic titanium forms weak, salt-like linkages with the amino groups; cationic fixation, however, takes place in a manner similar to chromium. Leathers with hydrothermal stability of 85°C were obtained with titanium tannage under optimum conditions.

INTRODUCTION

Having dealt with the selection of the best masking anion and its optimum concentration required for titanium tanning solution in Part-II (Swamy *et al.*, 1983) and subsequently discussed the results obtained through different instrumental techniques carried out for finding the nature and amount of various species present in normal and masked titanium sulphate solutions and also in titanium sulphate solutions of different basicities with the optimum amount of citrate in Part-III (Swamy *et al.*, 1983) of this series, further investigations to arrive at the optimum basicity, pH and concentration of titanium tanning solutions required for titanium tannage are undertaken through fixation studies on hide powder as well as microscopical studies on tanned cow hide pieces. Experiments for finding out the nature of linkages involved with the reactive groups of collagen in combination with different species of titanium during tanning are also conducted using (i) standard, (ii) deaminated, (iii) decarboxylated and (iv) deaminated as well as decarboxylated hide powders.

MATERIALS AND METHODS

1 N and 2 N Titanium sulphate solutions

500 g. of titania pulp (TiO_2 x H_20) were made into a slurry with 750 ml. of water and 780 ml. of concentrated sulphuric acid. The slurry was then digested by heating it steadily and carefully until it became a pasty mass. After cooling, the paste was treated with 500 ml. of water, cooled and then centrifuged. The clear solution thus obtained was titanium sulphate in concentrated form. The titanium and sulphate contents of the solution were estimated. From this solution, 1 N and 2 N titanium sulphate solutions were prepared by appropriate dilution with water.

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Basic Titanium sulphate solutions masked with citrate (0.167 eq. per eq. Ti) for studies on Optimum Basicity (Standard Hide Powder)

Basicity, %	10	20	30	40	50	60	75	85
1 N Titanium sulphate solution, ml.	12.5 for each							
5 N Sodium chloride solution, ml.	2.5 for each							
1 N Sodium citrate solution, ml.	2.1 for each							
1 N Sodium carbonate solution for free acid neutralisation, ml.	3.3 for each							
1 N Sodium carbonate solution for basification, ml.	1.3	2.5	3.8	5.0	6.2	7.5	9.4	10.6

The solutions were mixed individually in 250 ml. wide-mouthed bottles and aged for 24 hours.

Basic Titanium sulphate solutions masked with citrate (0.167 eq. per eq. Ti) for studies on Optimum pH (Standard Hide Powder)

% TiO_2 on hide substance	5	5	5	5
1 N Titanium sulphate solution, ml.	12.5 for each			
5 N Sodium chloride solution, ml.	2.5 for each			
1 N Sodium citrate solution, ml.	2.1 for each			
1 N Sodium carbonate solution for free acid neutralisation, ml.	3.3 for each			
1 N Sodium carbonate solution for basification, ml.	6.2 for each			
Final pH	2.0	3.0	4.0	4.5

The solutions were mixed individually in 250 ml. wide-mouthed bottles and aged for 24 hours.

50 percent Basic Titanium sulphate solutions at different concentrations of TiO_2 containing 0.167 equivalent of citrate per equivalent titanium for studies on Optimum Concentration (Standard Hide Powder)

% TiO_2 on hide substance	1.0	2.0	3.0	4.0	5.0	6.5	8.0	10.0	12.5
1 N Titanium sulphate solution, ml.	2.5	5.0	7.5	10.0	12.5	16.3	20.0	25.0	31.3
5 N Sodium chloride solution, ml.	........................2.5 for each								
1 N Sodium citrate solution, ml.	0.4	0.8	1.3	1.7	2.1	2.7	3.4	4.2	5.2
1 N Sodium carbonate solution for free acid neutralisation, ml.	0.6	1.3	2.0	2.6	3.3	4.3	5.3	6.6	8.3
1 N Sodium carbonate solution for basification, ml.	1.3	2.5	3.8	5.0	6.2	8.2	10.0	12.5	15.7

The solutions were mixed individually in 250 ml. wide-mouthed bottles and aged for 24 hours.

50 percent Basic Titanium sulphate solution containing 0.167 equivalent of citrate per equivalent titanium for Microscopical studies

500 ml. of 2 N titanium sulphate solution were taken in a litre standard flask, masked with 167 ml. of sodium citrate (1 N), free acid neutralised and basified to 50 percent by adding 250 ml. of sodium carbonate solution (2 N) and finally made upto the mark with water. The solution was aged for 24 hours.

Deaminated Hide Powder (Thomas and Foster, 1926)

250 g. of standard hide powder were soaked in 2.5 litres of distilled water for 24 hours. 250 g. of sodium nitrite were then dissolved into the mixture and then 250 g. of glacial acetic acid added gradually from a dropping funnel with constant stirring, the whole reaction system being maintained at 4°C. The reaction mixture was stirred continuously for 24 hours while a current of carbondioxide was bubbled through it to minimise oxidation. The supernatant solution was drained of and the entire process was repeated for a further period of 24 hours. The modified hide powder was then washed with 5 percent sodium chloride solution, then with running water for 12 hours and finally with distilled water. It was then dehydrated with acetone and allowed to dry at room temperature. The nitrogen content of the deaminated hide powder was then estimated. The percentage nitrogen on moisture and ash-free basis of the deaminated hide powder was found to be 17.66.

Decarboxylated (Esterified) Hide Powder (Gustavson, 1952)

20 g. of standard hide powder were shaken intermittently for 7 days with 2 litres of methanol containing 15 ml. of concentrated hydrochloric acid in a stoppered flask at

room temperature. The reaction mixture was neutralised with sodium hydroxide solution and then shaken thoroughly for 30 minutes. The methylated hide powder was filtered off and shaken twice, 10 minutes each time, with 2 litres of distilled water, dehydrated with acetone and finally allowed to dry at room temperature.

Deaminated as well as Decarboxylated Hide Powder

50 g. of the deaminated hide powder were decarboxylated following the above procedure.

Preparation of Hide Powders for Tanning studies

6.1 g. of hide powder (standard and modified) that is equivalent to 5 g. of hide substance were weighed into a 250 ml. wide-mouthed bottle and soaked with 100 ml. of water (20 times the weight of hide substance) containing 2.5 ml. of 5 N sodium chloride solution. Next day, the soaked hide powder was squeezed through a nylon cloth, washed thrice with about 50 ml. of water each time, finally squeezed thoroughly and then weighed. The moisture content of the wet hide powder was found out. For actual experiments, that quantity of hide powder required for the number of tests in a given batch of experiment was worked out, weighed, treated in the above manner and quantitatively divided for individual test.

Experiment to arrive at Optimum Basicity

The "prepared" hide powder that is equivalent to 5 g. of hide substance was added to each bottle containing the experimental solution (Eight Nos.), the contents of the bottles mixed thoroughly, the total water content was adjusted to 100 ml. in each, taking note of the moisture content of the wet hide powder and the pH values noted individually. The bottles were run in a shaker (60 rpm) for 3 hours and then allowed to stand for 18 hours (overnight). Next day, they were run again in the shaker for 30 minutes and the pH of each solution adjusted to 4.0 by adding 1 N sodium bicarbonate solution slowly, run again for a further period of 30 minutes and the pH adjusted again to 4.0 (if necessary) and maintained during a further run of one hour. The tanned hide powder in each case was then squeezed through a nylon cloth, washed thrice with 50 ml. of water each time and finally dried at room temperature.

The tanned hide powders were subjected to chemical analysis for hide substance (Soc. Leath. Tech. Chem., 1965) and titanium content as TiO_2. The microshrinkage temperature (Borasky and Nutting, 1949) of the tanned collagen fibre from each experiment was also determined. The TiO_2 content of the tanned hide powders calculated as percentage on hide substance basis along with their shrinkage temperature are given in Table I and represented by Fig. 1

Experiment to arrive at Optimum pH

Using basic titanium sulphate solution at 50 percent basicity (1 N titanium sulphate solution masked with 0.167 equivalent of citrate per equivalent titanium and basified to 50 percent) and 5 percent TiO_2 concentration, this experiment was conducted.

Tanning was carried out in four wide-mouthed bottles (250 ml.), each containing the "prepared" hide powder equivalent to 5 g. of hide substance, adopting the method given under "Experiment to arrive at Optimum Basicity" after adjusting the pH to (i) 2.0,

(ii) 3.0, (iii) 4.0 and (iv) 4.5. The bottles were run for an hour at these respective pH values after readjustment, if necessary. The hide powders were then washed, squeezed and dried at room temperature as indicated earlier. The titanium content, hide substance and microshrinkage temperature of the tanned hide powders were determined and presented in Table II and Fig. 2.

Experiment to arrive at Optimum Concentration

The "prepared" hide powder equivalent to 5 g. of hide substance was added to each bottle containing the experimental solution (Nine Nos.) and the tanning carried out as detailed under "Experiment to arrive at Optimum Basicity". The percent TiO_2 on hide substance and the microshrinkage temperature of the tanned fibres are given in Table III and represented by Fig. 3.

Experiment for Microscopical studies

Four pieces of pickled cow hide were treated individually with the solution prepared as given under "50 percent Basic Titanium sulphate solution containing 0.167 equivalent of citrate per equivalent titanium for Microscopical studies" at 2, 5, 7 and 9 percent TiO_2 on the basis of hide substance of the pieces. The float was adjusted to 50 times the weight of the piece and tanning was conducted by adopting the method as given under "Experiment to arrive at Optimum Basicity". The tanned pieces were washed, neutralised to pH 6.0 followed by washing and treated with an anionic fatliquor at 6 percent on the weight of the tanned piece and piled overnight. The leather pieces were then washed, fixed with formalin solution, washed again with running water thoroughly and the test specimens of 65 microns were cut using a freezing microtome individually. They were then progressively dehydrated with increasing strengths of ethyl alcohol at 25, 50, 75 and 90 percent followed by absolute alcohol. The dehydrated sections were cleared in xylene and mounted with euperol. They were then photographed at 42 X magnification (Figs. 4, 5, 6 & 7).

Fixation studies on (i) Standard, (ii) Deaminated, (iii) Decarboxylated and (iv) Deaminated as well as Decarboxylated Hide Powders

The hide powders were obtained as per the procedures given under "Preparation of Hide Powders for Tanning studies," "Deaminated Hide Powder," "Decarboxylated (Esterified) Hide Powder" and "Deaminated as well as Decarboxylated Hide Powder" and the experiments conducted as per details given under "Experiments to arrive at Optimum Basicity," employing four concentrations viz. 1.5, 3.0, 5.0 and 10.0 percent TiO_2 on hide substance basis and 50 percent basic titanium sulphate solution as shown in the following schedule:

% TiO_2 on hide substance	1.5	3.0	5.0	10.0
1 N Titanium sulphate solution, ml.	3.8	7.5	12.5	25.0
5 N Sodium chloride solution, ml.	......2.5 for each			
1 N Sodium citrate solution, ml.	0.63	1.26	2.10	4.20
1 N Sodium carbonate solution for free acid neutralisation, ml.	1.0	2.0	3.3	6.6
1 N Sodium carbonate for basification, ml.	1.9	3.8	6.2	12.5

The solutions were mixed individually in 250 ml. wide-mouthed bottles and aged for 24 hours.

The values of percent fixed titanium on hide substance basis are given in Table IV and represented by Fig. 8.

RESULTS AND DISCUSSION

Optimum Basicity

An increasing trend of fixation of TiO_2 is seen as the basicity of titanium tanning solution increases from 10 to 50%, beyond which the fixation gets decreased (Table I; Fig. 1).

TABLE I

FIXATION OF OPTIMUM BASICITY FOR TITANIUM TANNAGE

Sl. No. Characteristics	% Basicity 10	20	30	40	50	60	75	85
1. Hide substance, %	42.70	69.47	67.26	66.10	41.94	63.45	53.98	55.53
2. TiO_2 content, %	2.33	3.96	4.04	4.05	4.16	4.63	4.08	4.27
3. TiO_2, % fixed on hide substance basis	5.46	5.70	6.01	6.13	9.92	7.29	7.59	7.69
4. Shrinkage temperature, °C	55 to 60	56 to 62	58 to 62	78 to 82	79 to 85	80 to 85	81 to 85	81 to 85

At much higher basicities (beyond 50 percent) aggregation takes place causing reduction in the penetration of the tanning solution. Since the basicity of the tanning solution is also a function of pH which will have an effect on the extent to which various groups of collagen are charged or uncharged (Gustavson, 1926, 1937; Kuntzel and Riess, 1936), any chemical mechanism involved in mineral tanning may affect the capacity of these groups to fix the tanning agent. Based on the results obtained in this study the optimum basicity for titanium tannage is fixed at 50 percent. This is substantiated by the result obtained in hydrothermal stability of the titanium tanned hide fibres at different basicities. The tanned hide fibres show values of hydrothermal stability between 55 to 60°C at 10 percent basicity with a gradual increase to 85°C with the increase in basicities upto 50 percent and beyond. Shrinkage temperature is thus found to bear a fair degree of direct relationship with the basicity of the tanning solution and hence fixation of the tanning salt. Similar observation was made in the case of chromium fixation at different basicities (McLaughlin and Wilson, 1945).

Optimum pH

The effect of pH on the tanning salt (Schachowskoy and Froheich, 1941; Elod *et al.*, 1926, 1935) is of great importance than the conditions of protein as shown by the relationship between the pH of optimum tanning effect and the pH at which the hydroxide of the metal is precipitated. Further, the pH has an influence on the physical state of collagen. From the studies conducted with titanium tanning solutions at different pH values of the tanning bath, it is observed (Table II; Fig.2) that the fixation of titanium increases upto pH 4.0 and then decreases showing that the optimum pH for titanium is around pH 4.0. This is in accordance with the observation made with chromium sulphate solution (Bowes *et al.*, 1946). It is further noted that the shrinkage temperature of the collagen fibres is also increased on raising the pH of the tanning solution as observed by several workers (Elod *et al.*, 1935, 1939; Bowes and Morse, 1942; Theis, 1941). Based on these studies, the optimum pH for titanium tannage is fixed around 4.0.

TABLE II

FIXATION OF OPTIMUM pH FOR TITANIUM TANNAGE

Sl. NO.	Characteristics	pH 2.0	pH 3.0	pH 4.0	pH 5.0
1.	Hide Substance, %	61.50	54.85	33.27	44.13
2.	TiO_2 content, %	2.98	3.06	3.39	3.59
3.	TiO_2, % fixed on hide substance basis	4.85	5.58	10.18	8.14
4.	Shrinkage temperature, °C	75 to 79	78 to 81	82 to 85	81 to 85

Optimum Concentration

A progressive increase in the fixation of TiO_2 upto 5 percent followed by a marginal increase at concentrations beyond 5 percent is observed (Table III; Fig.3). The sluggish fixation of TiO_2 beyond 5 percent concentration may be due to the dehydration effect of the metal salt on collagen as observed with basic chrome liquors (Kuntzel *et al.*, 1934).

TABLE III

FIXATION OF OPTIMUM CONCENTRATION FOR TITANIUM TANNAGE

Sl. No.	Characteristics	% Concentration									
		1.0	2.0	3.0	4.0	5.0	6.5	·8.0	10.0	12.5	15.0
1.	Hide substance, %	73.59	76.68	61.20	70.21	52.30	52.50	70.41	65.47	54.84	60.88
2.	TiO_2 content, %	1.08	1.70	2.14	2.65	3.73	4.00	6.88	6.88	6.93	8.28
3.	TiO_2, fixed on hide substance basis	1.47	2.21	3.50	3.77	7.13	7.62	9.77	10.51	12.64	13.60
4.	Shrinkage temperature,°C	55 to 60	58 to 68	65 to 70	73 to 78	80 to 85	82 to 85	82 to 85	83 to 85	83 to 85	83 to 85

It was shown in the case of chrome liquors that increase in the concentration of the tanning solutions and lowering of pH of the tanning bath tend to reduce the ionisation of protein carboxyl groups thereby causing reduction in the fixation of cationic elements (Gustavson and Widen, 1926). The observations on chrome liquors may be applicable to titanium tan liquors as well. Regarding the hydrothermal stability of tanned hide powders as revealed by values of the shrinkage temperature, it is found that as the concentration of the tanning liquor increases, the shrinkage temperature also increases in par with the fixation of TiO_2 and a maximum of 85°C is obtained at 5 percent. This trend of direct relationship between the fixation of tanning salt and the shrinkage temperature was observed through similar studies conducted with chrome liquors (Conabere *et al.*, 1945; McLaughlin and Wilson, 1945; Merry, 1945). The optimum concentration of 50 percent basic titanium sulphate solution meant for titanium tannage could thus be fixed at 5 percent TiO_2.

Microscopical studies

Leathers made at different concentrations of titanium tanning solution as given under "Experiment for Microscopical studies" were subjected to microscopical assessment of the fibre structure and the results obtained are as follows:

(i) *2 percent TiO_2*

Fibre bundles are fairly full, well defined, moderately split up and compactly woven at high angles (Fig. 4).

(ii) *5 percent* TiO_2

Fibre bundles are full, split up to a fairly large extent and compactly woven at high angles (Fig. 5).

(iii) *7 percent* TiO_2

Fibre bundles are well defined, splitting of bundles is marginal with compact structure and the angle of weave is medium to high (Fig. 6).

(iv) *9 percent* TiO_2

Same as those of (iii) above, except that the splitting is medium (Fig. 7).

The above observations show that titanium tannage, in general, gives fairly full fibre bundles and compactly woven structure resulting in fuller and tighter leathers. Of all the concentrations used, 5 percent TiO_2 given on hide substance basis of the pickled piece may be considered as an optimum concentration for titanium tannage in view of the fullness, good degree of splitting and compactness at high angles. This finding also substantiates the optimum concentration of 5 percent TiO_2 arrived at earlier.

Studies on Modified Collagen

Having fixed the optimum basicity, pH and concentration of the basic titanium tanning solution for tanning, the role of reaction sites of collagen in their ability to fix different species of titanium is taken up as the subject for further studies. These studies are based on the extent of fixation of TiO_2 with standard, deaminated, decarboxylated and deaminated as well as decarboxylated hide powders under the optimum conditions. Table IV gives the trend of fixation of TiO_2 in standard as well as in modified hide powders and the same is represented by Fig. 8. The apparently higher figures of fixation in certain cases are due to the expression of the values on moisture-free and hide substance basis.

TABLE IV

FIXATION OF TiO_2 IN (i) NORMAL, (ii) DEAMINATED, (iii) DECARBOXYLATED AND (iv) DEAMINATED AS WELL AS DECARBOXYLATED HIDE POWDERS

Sl. No.	% TiO_2 given (on Hide substance basis)	Percent TiO_2 fixed (on Hide substance basis)			
		(i)	(ii)	(iii)	(iv)
1	1.5	2.21	1.95	1.10	0.35
2	3.0	3.50	3.25	1.59	2.79
3	5.0	7.13	4.81	3.85	4.49
4	10.0	10.51	9.96	8.97	9.65

Fixation studies on Deaminated Hide Powder

From the Table IV, it is observed that the percent fixation of TiO_2, on hide substance basis, on deaminated hide powder is 1.95, 3.25 and 4.81 for 1.5, 3.0 and 5.0 percent concentrations of TiO_2 used respectively. On comparison with the fixation of TiO_2 with standard hide powder at 1.5 and 3.0 percent concentrations used, not much variation is observed indicating the co-ordination of cationic titanium, with the activated carboxyl groups of collagen under the respective conditions of tanning. The dilution factor of the tanning solution also contributes to the complete penetration and fixation of the complex molecules. At 5 percent concentration, however, the fixation of TiO_2 in the deaminated hide powder is found to be only about 70 percent of that in the standard hide powder which may be due to lesser penetration caused by aggregation of the complex and consequent increase in size. It may be stated that at the concentration of 5 percent TiO_2, two factors i.e. coordination with the available carboxyl groups of collagen and aggregation of the titanium complex decide the fixation of titanium with the collagen. Even at much higher concentration viz. 10 percent, the fixation of TiO_2 is almost the same as that with the standard hide powder. This observation substantiates the predominant role of aggregation at higher concentration over coordination. It may therefore be inferred that at concentrations lower than 5 percent TiO_2, the fixation is very good which is possible due to coordination with the activated carboxyl groups of collagen to a substantial degree and that at higher concentrations, the combined roles of coordination with collagen and aggregation of tanning complex decide the extents of fixation.

Fixation studies on Decarboxylated Hide Powder

In contrast with the deaminated hide powder, the fixation of TiO_2 is only about 50 percent with decarboxylated hide powder at 1.5 and 3.0 percent TiO_2 concentrations, indicating very clearly the lesser role played by the amino groups of collagen as compared to the carboxyl groups. The extents of fixation observed may be due to the formation of weak, salt-like linkages due to the affinity of negatively charged titanium species towards the basic amino groups of collagen. At 5 and 10 percent TiO_2 concentrations, the observations made under "Fixation Studies on Deaminated Hide Powder" hold good except that the amino groups instead of the carboxyl groups of collagen are the deciding factor besides aggregation. Comparing the figures with deaminated and decarboxylated hide powders, the major role of carboxyl groups rather than the amino groups of collagen in the fixation of titanium is quite clear similar to chromium (Gustavson, 1931; 1937; 1939; 1940).

Fixation studies on Deaminated as well as Decarboxylated Hide Powder

The fixation of TiO_2 at 1.5 percent concentration on this type of modified hide powder is much less (only about 16 percent and 18 percent) as compared to that of standard hide powder and deaminated hide powder. This lower degree of fixation may be attributed to the role of hydrogen bonds in the absence of amino and carboxyl groups of collagen. It is also observed that concentrations from 3 to 10 percent record the fixations at the levels fairly similar to those of deaminated hide powder rather than those of decarboxylated hide powder. This fixation may be through the combined effects of aggregation and deposition besides residual activity of the available basic guanidino groups of arginine remaining after the deamination process (Bowes, 1920—45).

For titanium tannages, the optimum basicity, pH and concentration of basic titanium sulphate solution are fixed at 50 percent, 4.0 and 5 percent as TiO_2 respectively through fixation studies with standard hide powder. The fact that inactivation of carboxyl groups markedly reduces the fixation of titanium, especially at lower concentrations, substantiates the hypothesis that carboxyl groups of collagen play a major part in the fixation of titanium similar to chromium. The presence of anionic titanium in the titanium tanning liquor may induce the formation of weak, salt-like linkages with the amino groups of collagen which may not, however, contribute to hydrothermal stability of the resultant leathers.

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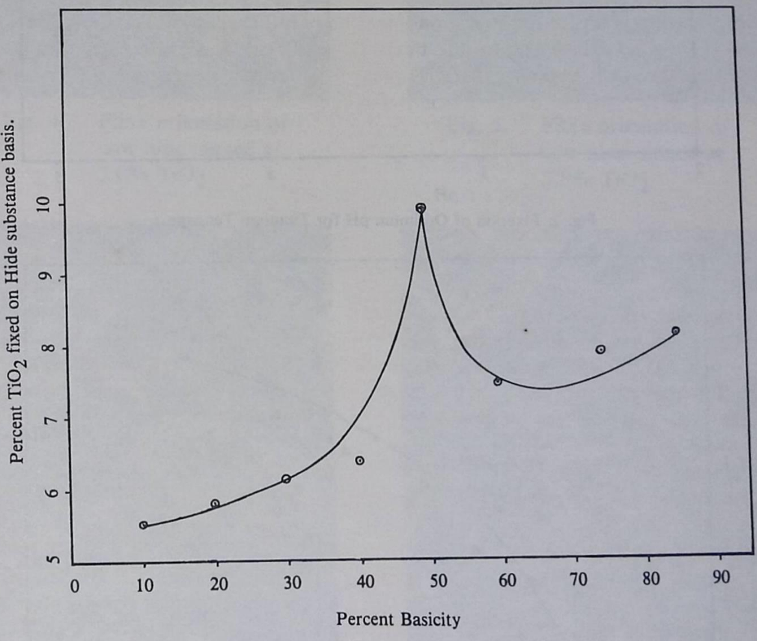

Fig. 1. Fixation of Optimum Basicity for Titanium Tannage.

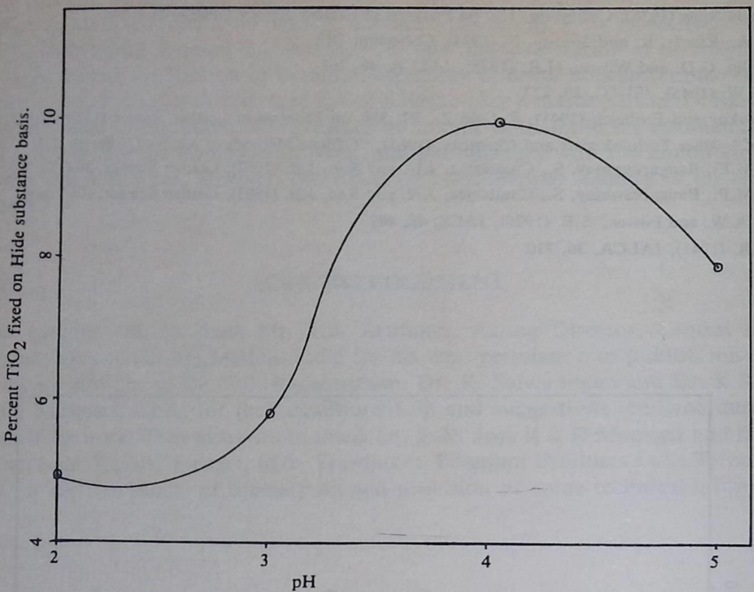

Fig. 2. Fixation of Optimum pH for Titanium Tannage.

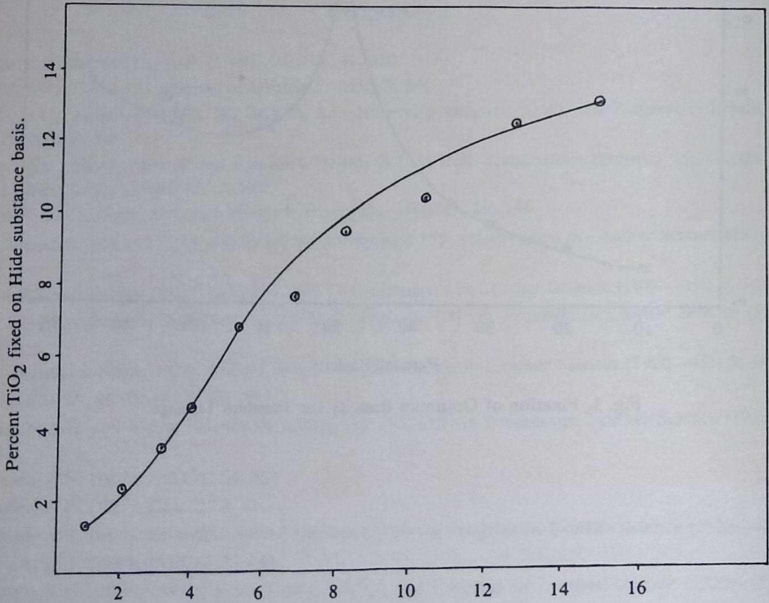

Fig. 3. Fixation of Optimum Concentration for Titanium Tannage.

Fig. 4. Fibre orientation of cow hide tanned at 2.0% TiO_2

Fig. 5. Fibre orientation of cow hide tanned at 5.0% TiO_2

Fig. 6. Fibre orientation of cow hide tanned at 7.0% TiO_2

Fig. 7. Fibre orientation of cow hide tanned at 9.0% TiO_2

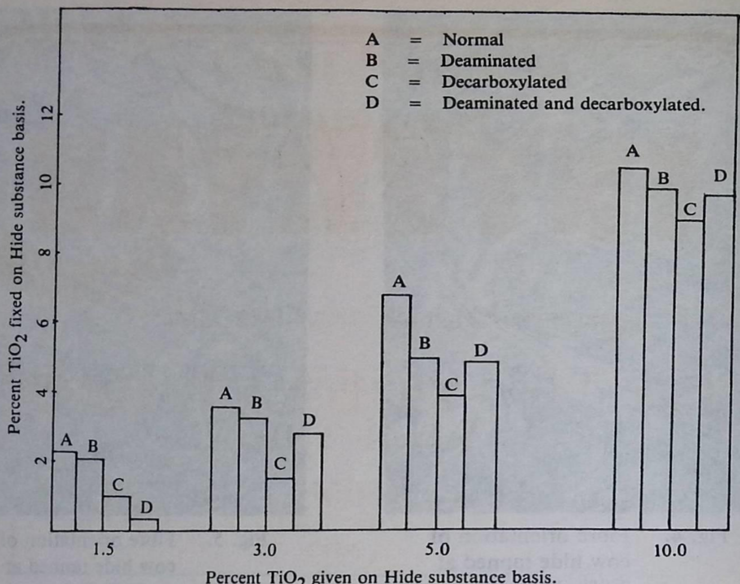

Fig. 8. Fixation of TiO_2 with Modified Hide Powders.

ABSTRACTS
(FROM OTHER PUBLICATIONS)

BIO—SCIENCES AND TECHNOLOGY

Schiefelbein, G.F., Sealock, Jr. L.J. and Ergun, S. (1980), "THERMOCHEMICAL CONVERSION ACTIVITIES FUNDED BY THE BIOMASS ENERGY SYSTEMS BRANCH, U.S. DEPARTMENT OF ENERGY," Biosources Digest, **2** (2), 74.

Current developments in renewable energy sources are discussed. The main goal of the thermochemical conversion technology activities is to develop competitive processes for the conversion of renewable biomass feedstocks to fuels and other high energy products which can substitute or supplement those produced from other conventional sources such as petrochemicals. Research and development activities in the following areas are described and evaluated: direct combustion to produce heat, steam and electricity; gasification to produce low or intermediate Btu fuel gas and synthesis gas; direct liquefaction to produce heavy oils, light fuel oils and gasoline. (6 Figs.; 1 Tab.)

(GE)

Dalal, R.K., Akedo, M., Cooney, C.L. and Sinskey, A.J. (1980), "A MICROBIAL ROUTE FOR ACRYLIC ACID PRODUCTION," Biosources Digest, **2** (2), 89.

The possibility of producing acrylic acid and other feedstock chemicals through microbial fermentation processes of cellulosic biomass has been experimented and evaluated. Bioconversion of lactate and propionate to acrylate was not observed with *Megasphaera elsdenii* and *Escherichia coli* W. The resting cell suspensions of *Clostridium propionicum* have however, been found to catalyze specific 2, 3 dehydrogenation of propionate, leading to the accumulation of up to 3g./l.(40 mM) acrylate in the presence of an electron acceptor such as oxygen or methylene blue. Similar observations were made in respect of butyrate and isobutyrate. Limited quantitative production of acrylate has been attributed to the instability of the cells in an aerobic environment. It is envisaged that this microbial approach, if properly exploited, offers a suitable alternate technology for the production of these three economically important chemical feedstocks. (4 Figs.; 1 Tab.; 9 Refs.)

(GE)

ANALYTICAL CHEMISTRY

Suzuki, M., Dokiya, Y., Yamazaki, S. and Toda, S. (1980), "A NEW TYPE OF BIOLOGICAL REFERENCE MATERIAL FOR MULTI-ELEMENT ANALYSIS — THE FUNGUS *PENICILLIUM OCHRO-CHLORON ATCC* 36741," The Analyst, **105** (1255), 944.

Penicillium ochro-chloron fungal mycelia discs found to be tolerant to heavy metals have been proposed for calibration in the analysis of metals by X-ray fluorescence spectrometry, especially for biological samples. The fungus has the important specific characteristic that the cellular contents of metals added to the media can be controlled arbitrarily over a wide range. The metallic contents of some wild edible plants determined using penicillium ochro-chloron as a reference material were in agreement with data obtained for the same samples using other known biological reference materials and by atomic absorption spectrometry. (2 Figs.; 6 Tabs.; 10 Refs.)

(AAN)

Harris, J.R., Merson, G.H.J., Hardy, M.J. and Curtis, D.J. (1980), "DETERMINATION OF CYANIDE IN ANIMAL FEEDING STUFFS," The Analyst, **105** (1255), 974.

Trace amounts of cyanide in cyano-substituted glycosides of feeding stuffs have been determined by a method involving hydrolysis in sealed tubes for 18 hours at 37°C with enzymes from sweet almond. The liberated hydrogen cyanide is aerated into sodium hydroxide solution and determined by either spectrophotometric method or gas chromatography. The method is sensitive to as little as 1mg kg^{-1} of cyanide and recoveries of cyanide added to feeding stuffs at concentrations of 10 and 20 mg kg^{-1} were approximately 98% . (4 Tabs.; 14 Refs.)

(AAN)

Malmstadt, H.V. (1980), "ANALYTICAL INSTRUMENTATION FOR THE 1980s," The Analyst, **105** (1256), 1018.

Several microcomputer-controlled analytical instruments are described that illustrate certain automation concepts, focus attention on some recent developments and help us to envisage what may be introduced during the 1980s. New types of stopped-flow analysers are shown to have considerable promise for routine and investigative kinetic and equilibrium analytical/clinical methods. Throughputs of up to 500 samples per hour with 0.1-1% precision are practical. Various types of rotating-disc analysers are also described. These include a multi-sample colorimeter, a unique multiple absorption curve spectrophotometer, and a multi-test or multi-sample analyser for clinical/analytical laboratories. Complete systems are discussed, including preparation and transport of samples and reagents, the encoding of the desired chemical information as digital electronic signals, optimisation and control of measurement conditions, data processing and final display of the chemical information. (11 Figs.; 24 Ref.)

(Author's summary)

Persson, J.A., Frech, W., Pohl, G. and Lundgren, K. (1980), "DETERMINATION OF ALUMINIUM IN WOOD PULP LIQUORS USING GRAPHITE FURNACE ATOMIC-ABSORPTION SPECTROMETRY," The Analyst, **105** (1257), 1163.

Graphite furnace atomic-absorption spectrometry has been suggested as a convenient method for the direct determination of small concentrations of aluminum added to wood pulping liquors during the production of cellulose pulp. Interferences from sodium sulphate, sodium sulphide and sodium chloride were discussed. The precision of the overall method was 4% and the results obtained through this technique were in agreement with those obtained with the flame atomic-absorption spectrometry. (4 Figs.; 6 Tabs.; 13 Refs.)

(AAN)

Klugar, J. (1980), "TWO DECADES OF LEATHER FINISHING," Leather, **182** (4458), 97.

The history of leather finishing for the past two decades are fully reviewed. While impregnation has been accepted in side leather finishing, other new methods are chosen only for special purposes since the old finishing systems still produce acceptable leathers for most purposes particularly for shoe and garment manufacturing which form the bulk of the leather business. The entry of corfam caused a renaissance in leather manufacturing; the plastics instead of displacing leather, helped to strengthen the traditional position of leather. While the corrected grain side leather flourished in the U.S.A. in the early sixties, the European tanners were slow to adopt the technique due to higher physical parameters demanded by European shoemakers especially in respect of heat and solvent resistance. The introduction of impregnation by the U.S.A. in the early sixties revolutionised the European leather finishing to adopt and improve the technique employing flow-coating method, almost not used in America. Polyurethane resin impregnation came to the scene providing a better break and pull-up but the leather could not be rebuffed; this disadvantage was later overcome by combining the two systems by applying the PU-impregnation on top of the acrylic impregnation after rebuffing. In the early sixties, aniline-look was mainly produced on corrected grain leather but the demand by European shoe factories was for purely aniline leathers. The brush-off, worn effect used by Italian and Spanish shoemakers became industrially acceptable by many finishing houses in various forms and is regarded today as 'classic' type which has not only come to stay but represent real upgrading of corrected leather.

The differences in leather finishing in the U.S., Europe and South America are discussed. The crisis of the corrected side leather came in the late sixties and the early seventies when its demand declined. Full grain leathers picked up even with grain defects as the signs of real leather. New ways of leather finishing including polyurethane water dispersions and patent leather finishing are fully described. The new finishing techniques demonstrate in a very practical way how inferior and sometimes pipey and loose leathers can be made fashionable taking advantage of those defects. The late sixties and early seventies saw tanners producing large quantities of intentionally loose leather in order to meet the demand.

(ETO)

LEATHER PRODUCTS

SATRA (1980), "USERS DEMAND MORE FROM SAFETY FOOTWEAR," Shoe and Leather News, **June 19**, 55.

In spite of set-backs in demand, safety footwear manufacturing has increased by 10% in 1979. The manufacturers' enthusiasm to meet the B.S. standards and their active role in value promotion have helped towards higher performance. The German impact testing method stipulates extra protection to the toes leading to greater comfort to the wearer. Traditionally, steel toe caps were associated with safely footwear. The present situation is different as demands by the users include protection against hazards other than falling objects. Protections against electric shock and explosions caused by static discharge from the build up of static electricity on the body are sought to be covered. Yet another important guarantee to the buyer is the ability of the footwear to withstand various environmental conditions. The positive attitude of the manufacturers is the largest single contribution to satisfy a wide segment of the market with a range of styles. The manufacturers are willing to identify industrial hazards and are prepared to produce high quality footwear to meet the challenges. (1 Fig.; 2 Tabs.)

(ETO)

SATRA (1980), "MORE INTEREST IN SYNTHETICS FOR MEN'S SHOES," Shoe and Leather News, **June 19, 56.**

The latter part of 1978 and the whole of 1979 stimulated more interest in synthetic uppers for men's shoes. The important synthetic materials are described and among which are the polyurethane coated fabrics (PUCFs) and the poromerics. Attempts to introduce transfer coated PUCFs into the men's footwear market are said to be slow and the use of PVC-coated upper materials is more or less confined to trainers and sports shoes. These PUCFs, although used for womens' shoes, they are deficient in certain strength properties and their failure could occur in a matter of three to four weeks. Women's weight PUCFs include the use of a cellular PU layer instead of a thin, solid film. The coagulated PUCFs are said to be gaining ground in Italy and Spain for men's footwear. Prospects for men's weight materials are fully discussed. The current trend for soft, flexible and leather — like appearance and competitive price could no doubt establish coagulated PUCFs as men's weight upper materials for the future. Developments in various poromerics are adequately reviewed and it has been demonstrated by SATRA that given the correct choice of footwear components, problems during wear could be minimised. The use of filmics as components of stiffeners is currently drawing considerable interest.

(ETO)

Price, N. (1980), "AN INSIGHT INTO THE WOMEN'S FASHION FOOTWEAR MARKET," Shoe and Leather News, **June 26, 14.**

Fashion as an important area of retailing activity is fully discussed. Dealing in fashionable merchandise carries with it certain element of risk since it is unpredictable. Retailers who do not rationalise fashion concept are exposed to greater insecurity and risk thereby affecting their profits. It requires care to differentiate between fashion and style. All fashion shoes are stylish but not all stylish shoes are in the latest fashion. A fashion shoe is fully defined. About 20m. pairs represent the true fashion volume in a total market size of 60m. pairs. Experience has shown that only one woman in 20 and at times as little as one in 50 is prepared to gamble on a radically new fashion. It is rather advisable for a retailer in order to minimise risk to concentrate on safe, traditional styling, including the basic comfort and stylish comfort segments of the market. This practice is highly commendable even in a market situation where stockturn is slower and mark-ups smaller. Being in minority section of the market, it is often vulnerable, as competition and other unforeseen trends can adversely affect the profit. The retailers could seek higher sales volume and faster stockturn through greater involvement in fashion/modern styling merchandise.

(ETO)

Tate, R. (1980), "TRAINING BOARD AND FURTHER EDUCATION," Shoe and Leather News, **June 26,** 16.

Two reasons are advanced on the need for further education for technicians in the footwear industry viz., (i) to prepare for the upturn in business activity so that the industry is able to take advantage of opportunities when they arise and (ii) there is a real danger of losing further education facilities if they are not used. Technician Education Council certificate and diploma programmes are suggested. The education, training and status of technicians in the footwear industry are of paramount importance towards promoting their quality, quantity and status in view of the technology advances. Education and training of young people served the dual purpose of affording them fruitful and rewarding careers ensuring the industry's future. Colleges should not be isolated from industrial reality. It was further revealed that out of 170 full-time students at Cordwainers, only 32 are from overseas and that 70 are taking footwear subjects.

(ETO)

CONTROL AND TREATMENT OF EFFLUENTS/ENVIRON. SCI. AND TECH.

Keith, L.H. (1981), "ORGANIC POLLUTANTS IN WATER: IDENTIFICATION AND ANALYSIS," Environmental Sci. & Tech. **15** (2), 156.

This is a summary of the papers presented at an ACS symposium on "Advances in the Identification and Analysis of Organic Pollutants in Water". Latest advances in the sampling, detection, analysis and analytical techniques of organic pollutants in various types of wastewaters are reported. A method of identification and quantitative analysis of a new class of man-made water pollutant called dihaloacetonitriles (DHAN) is discussed. Because of their reaction with water at high pH, dechlorinating agents and certain chromatographic columns, DHANs were not detected even by the purge-and-trap technique. The Henderson-Glaze liquid-liquid extraction technique is found suitable for the analysis of DHAN. One of the useful techniques for analysing PCBs is the negative ion chemical ionization high-resolution gas chromatography/mass spectrometry (GC/MS). New GC method of analysing chlorinated phenols in effluents from paper mills through acetylation and extraction with hexane is also reported. Various analytical techniques based especially on the use of the GC/MS for several other wastewaters are indicated. Techniques for concentration and separation of samples are described. (3 Figs.)

(JBG)

Lytle, C.R. and Perdue, E.M. (1981), "FREE, PROTEINACEOUS, AND HUMIC-BOUND AMINO ACIDS IN RIVER WATER CONTAINING HIGH CONCENTRATIONS OF AQUATIC HUMUS," Environmental Sci. & Tech., **15** (2), 224.

Amino acids were determined every month for 2 years at 12 different locations along the Williamson River, Oregon and its tributaries. The use of a new technique involving XAD-7 macroreticular resin enabled the separation of dissolved amino acids into humic and non-humic associated fractions. It was found that over 96% of the dissolved amino acids were associated with aquatic humus and that amino acid carbon constituted only about 1% of the humic carbon. The concentrations of the most abundant amino acids were found to be of the order of Gly $>$ Asp $>$ Ala $>$ Ser $\simeq$ Glu, with no significant time or seasonal changes. There was a strong correlation between the concentrations of total amino acids and discharge. Amino acids are reported to be associated with humic substances in the soil and are carried into the stream by surface run-off. (6 Figs.; 1 Tab.; 27 Refs.)

(JBG)

Gardiner, J. (1980), "MONITORING AND CONTROL OF DISCHARGES TO TIDAL WATERS," Chem. and Ind., **April 19** (8), 307.

Two pollution control strategies based on minimum discharge and maximum assimilation are discussed; the former emphasises treatment to maximally remove the pollutants and the latter aims at treating minimally to just sufficient level for the receiving environment to be able to accommodate without exceeding acceptable concentrations of pollutants. Arising from these two extreme strategies, two pollution control objectives viz., environmental quality objective (EQO) and uniform emission standard (UES) are proposed. The first objective, EQO is extensively discussed. The EQO establishes the pollution control objectives expressed in terms of the protection of resources of the receiving water and the maintenance of environmental quality in accordance with its intended uses such as protection of fisheries, suitability for swimming or industrial use, avoidance of offensive odours etc. From EQO, the environmental quality standard (EQS) is set. This defines the maximum concentrations of pollutants which could still permit the realisation of the quality objectives. Monitoring environmental quality through chemical analysis and biological assay is very important to the achievement of EQO and EQS. (2 Tabs.; 39 Refs.)

(JBG)

McLoughlin, J. (1980), "METHODS OF CONTROL USED IN DIFFERENT COUNTRIES," Chem. and Ind., **April 19** (8), 328.

Legislative methods of pollution control in the U.K., France, Sweden and West Germany are examined. Licensing is reported to be a commonly used means of pollution control as it offers opportunity for flexibility such that a balance is easily achieved between protection of the environment and safeguarding a viable industry. In the financial method of pollution control, the dischargers of pollutants are made to pay fees commensurate with the type and quantity of their discharges. Tribunals are also used to settle pollution issues. At least a member of the tribunal is a pollution expert. The deficiencies of each of the control methods are pointed out. (1 Tab.)

(JBG)

Fox, K.F.A. and Kotler, P. (1980), "THE MARKETING OF SOCIAL CAUSES: THE FIRST 10 YEARS," J. Marketing, 44 (4), 24.

The extent of work in the application of marketing to social causes is evaluated. An extensive review of literature as a background to an assessment of the nature of technology of social marketing, its successes, limitations and prospects is made. Key people in leading social marketing firms and government agencies concerned with public health and nutrition are interviewed. Findings of the study are presented in a form in which they attempt to shed light on what social marketing means, the situations that call for social marketing, the accomplishments, criticisms, obstacles and future of social marketing. Social marketing can be best appreciated by relating it to the legal, technological, economic and information approaches which make for social change. Situations that call for social marketing include those which require the dissemination of new information and practices, countermarketing and activation. Social marketing has achieved tremendous results in the areas of family planning and heart disease prevention. However, social marketing has been criticised as not being real marketing for being manipulative, self-serving and capable of damaging the reputation of marketing. Some hurdles to social marketing include the difficulty of target market choice, market analysis and product strategy formulation. Others are the difficulty in utilisation and control of distribution channels, difficulty in implementing communication strategies and in the evaluation of social marketing efforts. It is foreseen that social marketing specialists combining business marketing skills with supplementary training in the social sciences will be working on a more extensive range of social causes with increasing sophistication. (32 Refs.)

(AAI)

Savitt, R. (1980), "HISTORICAL RESEARCH IN MARKETING," J. Marketing, 44 (4), 52.

A rationale for historical research in marketing and a methodology for such a research are presented. Historical research in marketing enables scholars of the discipline to understand the origins and the past and possibly forecast the future of marketing. Marketing history has two distinct but related strands, namely, the history of marketing thought and the history of marketing content. Although experimentation (as in the case of biological and physical sciences) is not applicable in the field of history, historical research nonthe-less retains the objectivity of the scientific method following its structure as much as possible. Essentially, historical research in marketing conforms the following frame-work viz., perceptual experience, images of real world, hypotheses, research design, data collection, verification, theory construction and explanation. (1 Fig.; 35 Refs.)

(AAI)

Westbrook, R.A. (1980), "A RATING SCALE FOR MEASURING PRODUCT/SERVICE SATISFACTION," J. Marketing, **44** (4), 68.

This study examines the suitability of the Delighted Terrible (D-T) scale for measuring consumer satisfaction. Success in the application of this measure would be of immense benefit not only to applied studies in industry and government but also to basic research on the process through which consumers arrive at judgements about their purchases. The advantages of the D-T scale are (i) improved representation of the construct of satisfaction through more explicit reference to and gradation of the affective component, (ii) improved differentiation of responses of the upper end of the satisfaction continuum and (iii) allowance for respondents who may never have evaluated their satisfaction with the product or service, which reduces potential response bias due to obtrusiveness and demand effects. Results of three separate empirical studies with durable goods and banking services indicate that the D-T scale is a good measure for consumer satisfaction. (2 Figs.; 3 Tabs.; 11 Refs.)

(AAI)

DISSEMINATION

D'elia, G. (1980), "THE DEVELOPMENT AND TESTING OF A CONCEPTUAL MODEL OF PUBLIC LIBRARY USER BEHAVIOUR," The Library Quarterly, **50** (4), 410.

The objective of this study was to test the following hierarchical model: Public library use is a function of (1) individual characteristics, (2) awareness of library services, (3) perceived accessibility of the library, (4) perceived ease of use of the library, and (5) use of other nonpublic libraries. The model was tested with four different measures of library use — a dichotomized measure of nonuse and use and, among library users, frequency of use and two-factor analytically derived indexes descriptive of two distinctly different types of library use. Type 1 use appeared to measure intensity of use, and type 2 use appeared to measure in-house use. Data were collected from 202 residents of the Syracuse metropolitan area by means of a telephone interview survey. Results indicated that, among individuals with the characteristics associated with library use, users of the public library tended to perceive the library as more accessible than did nonusers; and, among users of the library, (1) frequency of use was related to awareness of special library programs, (2) intensity of use was also related to awareness of special library programs, and (3) in-house use was related to use of other libraries. (1 Fig.; 10 Tabs.; 20 Refs.)

(Author's summary)

Hicks, D.A. (1980), "DIVERSIFYING FISCAL SUPPORT BY PRICING PUBLIC LIBRARY SERVICES: A POLICY IMPACT ANALYSIS," The Library Quarterly, **50** (4), 453.

This paper addresses the possibility of diversifying the resource base of local library systems which currently are critically dependent on property taxes for their funding. A case is offered for pricing library services, and an empirical analysis of such a policy which was adopted by the Dallas Public Library System is reported. Employing a deliberate sequence of significance tests within the context of an interrupted time-series, quasi-experimental design to study the impact of the program on service demand, the results are evaluated with respect to several economic and evaluative performance criteria. While such a user-charge policy may not be wholly adequate or efficient, it is effective, promotes equity, and is deemed appropriate to supplement current funding arrangements. (2 Figs.; 2 Tabs.; 27 Refs.)

(Author's summary)

GENERAL

Roberts, E.B. (1980), "WHAT DO WE REALLY KNOW ABOUT MANAGING R & D," Chemtech, **Mar.**, 156.

The contributions of management research for running the R & D organisations are discussed under three major areas, viz., staffing, structure and strategy. In order to stimulate ideas, the staff could be given diversified tasks to work on. For example, scientific staff may be given development work as well as research and the engineers, some work linked with manufacturing as well as some tasks in association with a design group. Apart from diversification, the nature of supervision is very important. The supervisor, besides having very good human relationship and sufficient skill to motivate and stimulate, must be technically competent. For effective commercial innovation to succeed, the entrepreneur should be sufficiently forceful to take creative ideas and drive them to adoption. It was shown that the role of manager-planner-coordinator affects directly the progress of a technical project. A structure that allows effective communication within and outside the organisation is suggested. It was shown that the sponsor differs from the entrepreneur. For effective management of R & D, any element of communication gap must be completely removed between the technical contributors within the organisation. A structure that defines clearly the type of information that comes into the organisation and the type that goes out is considered ideal, that is, both the research innovation information and the market research information should be properly utilised to bring out a product. The organisation should be properly structured in R & D, in marketing and in sales. The strategy, the third area under discussion, is considered a weak point of academic work. There is thus no clearly defined strategy to adopt but for an industry that is associated with a primary technological area, technological change and its impact are dependent on the level of technology. (1 Fig.; 9 Refs.)

(BBD)

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CONTENTS

HISTOLOGY OF THE CAMEL *(CAMELUS DROMEDARIUS)* HIDE IN RELATION TO LEATHER MANUFACTURE

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ABSTRACT

Microanatomical studies of the camel hide including measurements of its appendages from the neck, midside, back, breech and ventral abdomen revealed a basic difference in the arrangement of the hair follicles from what obtains in other domestic animals. The relatively thicker dermis at the midside and breech should produce more splits for processing into leathers. The comparatively numerous sweat glands in the back may be responsible for most spongy leather. The hide of the camel can be classified into the Type-III category, similar to the South American cattle hide, because of its highly coiled sweat glands and shallow hair follicle depths.

INTRODUCTION

In Nigeria, apart from the occasional use of reptile skins for leather manufacture, the animals whose skins and hides are very frequently used are cattle, sheep and goats which are among the common domestic animals around. But the camel, ship of the desert, has moved into semidesert areas and it is finding its place in the northern parts of Nigeria, especially Sokoto, Kano, Maiduguri and parts of Kaduna State, where it is subserving the livestock, the farm transport and the leather industry.

Despite the improper flaying methods adopted at the various slaughter houses in the country, it has been observed that the size of the integument from the neck region of the animal, which is better flayed, is comparable to a goat skin.

Amakiri (1975a), while studying the hide structure of some cattle breeds (White Fulani, Muturu, N'Dama and some imported Freisian) in Nigeria, explained that structural variations in the hide influence the quality of leather produced from different species of animals or from different breeds of the same species. Burns (1965) found that the greater and thicker tissue fibres in the reticular layer of the goat skin, make the leather made out of it superior in quality to that from sheep skin. Also, the shallow depth of the secondary hair follicles, the low follicle and sweat gland density and the relative smallness of the sebaceous and sudoriferous sweat glands of the Nigerian Sokoto Red goat skins provide leathers superior to those of other breeds of goat in Nigeria. It is the natural structure of the animal skin that makes leather what it is, the merits of which are derived from the interweaving dermal fibres in three dimensions. These merits are manifest in the attractive appearance of the grain and other physical properties of the interwoven dermal fibres (Dempsey, 1961).

Among the few facts known about the hide structure of the camel are those from the studies on the hide, sweat glands and hair follicles of the animal (Dowling and Nay, 1962; Lee and Schmidt-Nielsen, 1962a). The measurements of the hair follicles and sweat gland densities were made from only the midside region of the animal and were found to be

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between 63 to 65 hair follicle groups, each group containing approximately 28 hair follicles (Dowling and Nay, 1962).

This study is intended to show the histological structure of the integument of the camel from the neck, back (sacral), breech (buttocks) and ventral abdomen regions, in addition to the midside, with microscopical measurements of the hair follicle depth and density as well as sweat gland density and shape from all these sites. Also intended for study are the epidermal and dermal thicknesses as they too, relate to the suitability of the integument of this animal for leather manufacture.

MATERIALS AND METHODS

Hides were obtained from a total of ten adult (over two years old) camels (five males and five females) from Kano abattoir immediately after slaughter and samples were taken from five body sites viz, neck, back (sacral), midside (bend), breech (buttocks) and ventral abdomen. Samples were spread out on corks and impaled (Burns, 1949) in order to retain as far as possible their original size and shape.

All the samples were fixed in 10% buffered formol-saline immediately. They were divided into three groups. One of the groups were fixed for 24 hours, dehydrated in 70% alcohol, wax impregnated and sectioned vertically at 25µ with a rotary microtome serially, taking every fourth section for uniformity, and then stained with 0.5% polychromic methylene blue; the length and diameter of the sweat glands were measured on such sections with a calibrated 10x micrometer eyepiece graticule (Jenkinson and Nay, 1968b; Chowdhury and Sadhu, 1963).

The remaining two groups stayed in formol-saline for 72 hours and were later transferred to a 4% aqueous solution of phenol for three days to soften; they were then dehydrated in various grades of alcohol, cleared in benzene, and wax impregnated in Histokinnette tissue processor. The tissues were embedded in paraffin. Vertical and horizontal sections were cut serially at 8µ with a rotary microtome. Half of the sections were stained using a simple triple stain — Mayer's haemalum, eosin and picric acid (Carter and Clarke, 1957). The other half of the sections were routinely stained using haematoxylin and eosin (H & E).

Hair follicle depth was measured in vertical sections of hide, and hair follicle and sweat gland densities in horizontal sections, using calibrated 10x micrometer eyepiece (Amakiri and Hill, 1975).

Additional sections were processed and cut serially at 8µ. Special staining for specific structures were carried out. Masson's Trichrome stain was used for staining dermal fibres blue. Phosphotungstic acid haematoxylin (PTAH) stain was used for staining elastic fibres purple.

MEASUREMENTS

Hair Follicle Depth (FD): It is defined as the shortest distance between the base of an active hair follicle and the skin surface (Jenkinson and Nay, 1968b). For the present studies on camel, the distance of the base of the deepest follicle within the group in the cluster was measured in ten random clusters. This measurement included either primary or secondary follicle. Hair follicle clusters seated deep in the reticular layer were ignored, because of lack of connection with the hide surface.

Sweat Gland Length (L): The lengths of the secretory portions (fundus) of the glands were obtained by measuring the stretch of the fundus from the point of contact with the duct to its base, and adding the measurements of the individual loop described for the measurement of coiled glands (Chowdhury and Sadhu, 1963). The mean measurements of five glands from each site of the camel hide were calculated.

Diameter (D): The diameters of the same number of glands were measured in five places per gland. The mean of these readings was taken as the sweat gland diameter.

Shape (L/D): The ratio of the length of the sweat gland to its diameter was calculated for hide typing and for determining the shape of the sweat glands.

Sweat Gland and Hair Follicle Density: The number of sweat glands and hair follicles per square centimetre of the hide at the various sites were determined from sections cut horizontally (or parallel) to the hide surface. This measurement included all sweat glands and hair follicles (primary and secondary) in the microscopic fields scanned. Six fields of one square millimetre each were measured and the mean value was calculated which was then converted to give the number per square centimetre of the hide at that site. Since each primary hair follicle has a sweat gland duct associated with it (Dowling and Nay, 1962). the primary follicles were differentiated from the secondary follicles, by the formers' association with sweat gland ducts.

Epidermal and Dermal Thickness: The thickness of the epidermis was obtained by measuring the thickest and thinnest zones of the sections in ten places and the average was obtained for each site. The dermal thickness was obtained in sections, from the derm-epidermal junction to the subcutaneous layer.

RESULTS

GENERAL STRUCTURE

Epidermis: The layers evident in all the areas studied from the base to the surface were stratum germinativum, stratum spinosum, stratum granulosum and stratum corneum. The layer of stratum lucidum was not seen. In some regions, the epidermis was so thin that all the zones were not always distinguishable. The average thickness was 0.10mm. (Table I).

Dermis: An overall average thickness of 3.85mm. was obtained for the dermis (Table I). A thin superficial zone of delicate, closely woven fibres was clearly evident in the stratum papillare of all the regions studied.

Hair Follicles: In all the body areas examined, the hair follicles were grouped into distinct clusters. These clusters were embedded in delicate collagenic fibres in groups so that the hairs grew in tufts (Fig. 1). The groups were roughly oval in shape and varied in size. The study of sections revealed that the groups of small hairs emerged from a common hair follicle neck. The papillary layers of the regions studied showed that the hair follicles in clusters associated with sebaceous glands and sweat gland ducts were securely arranged. There seemed a patterned trio groups of primary and secondary hair follicles, each unit of the trio being covered and separated by invading septa from a larger, defined covering of connective tissue capsule (Fig. 2). At the deeper reticular layer the unit covering of connective tissue around the individual secondary follicles was gradually lost. The trio group arrangement (the fundamental unit of the coat), also seemed to have been lost, revealing an almost singular existence of the secondary follicles, even though still within the common cluster (Fig. 3).

TABLE I

AVERAGE THICKNESS OF THE EPIDERMIS AND DERMIS OF THE CAMEL HIDE AT VARIOUS BODY SITES. IN MILLIMETRES

Body Site	Epidermis	Dermis
Neck	0.05	3.59
Midside	0.28	5.28
Back (sacral)	0.05	3.73
Breech	0.02	4.17
Ventral Abdomen	0.11	2.50
Overall Average ($\bar{x}$)	0.10	3.85

Sebaceous Glands: Simple or branched saccular glands of the holocrine type surrounded each primary hair follicle, and each branch of the compound follicles of the secondary hairs had its own ring of such glands.

Sweat Glands: Simple coiled tubular apocrine (epitrichial) sweat glands were observed in sections from all the regions studied. These tubular sweat glands were seen in association with the larger primary (cover) hair follicles only and none were seen related to the follicles of small secondary hairs. Fig. 2 shows three sweat gland ducts associated with the follicles of primary hairs in the cluster.

Blood Vascular System: The dermis and the hypodermis were pervaded by continuous arteriovenous network with meshes of different sizes and with various spatial relationships. Arteriovenous anastomoses (AVA) or shunts were seen between one hair follicle group and another, usually at the junction of the papillary layer and reticular layer (Fig. 4). Even though discrete networks were seen around hair follicles and sweat glands, the general distribution was really one unit of vertically interconnecting vessels of separate plexuses (from the deep reticular layer upwards to below the epidermis).

Connective Tissue Fibres: At all the sites of the camel hide studied, fine architectural distribution of elastic fibres were seen best in the papillaris dermis and around the cutaneous appendages and blood vessels. The strands ran parallel to the epidermis (Fig. 5). The reticular layer of the hide in all the regions, showed a dense network of irregularly arranged thick bundles of collagen fibres. They were most prominently cross-linked and sometimes wavy at the breech, midside, neck and ventral abdomen. Very deeply within the dermis, they were found to agglomerate around blood vessels, hair follicles and sweat gland secretory portions (Fig. 6).

Fig. 1 *Camel hide, midside (vertical section):*

Tuft of hairs (1) emerging from a common hair follicle neck. Below, are larger primary hair follicles (2) with their associated sweat gland ducts (3); H & E x 300

Fig. 2 *Camel hide, back (horizontal section):*

Hair follicle cluster showing the patterned trio arrangement of the primary and secondary hair follicles (the fundamental unit of the coat). Secondary follicles (1), the primary follicles (2) and their associated sweat gland ducts (3) are all embedded in delicate collagenic fibres (4) separated by invading septa of connective tissue (5); H & E x 120

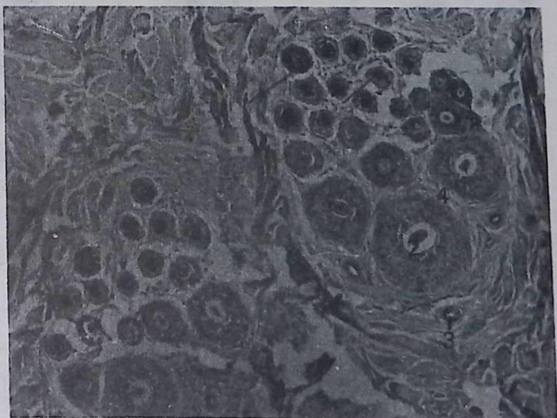

Fig. 3 *Camel hide, midside (horizontal section):*

Cluster of hair follicles in the reticular layer of dermis with secondary hair follicles (1) without distinct separation by connective tissue septa. Primary hair follicles (2) with sweat gland ducts (3) having more distinct connective tissue envelopes (4); H & E x 120

Fig. 4 *Camel hide, midside (vertical section):*
Two spirally cut arteries (1) and an arteriole (2) in the arteriovenous anastomoses (AVA) unit between two adjacent hair follicle groups (3). The sweat gland secretory portion (4) is below the hair follicle group; H & E x 366

Fig. 5 *Camel hide, ventral abdomen (vertical section):*
Fine architectural network of elastic fibres (1) in the papillaris dermis. Note the primary follicle (2) with its spirally cut sweat gland duct (3) and the secretory portion of the sweat gland (4). The secondary hair follicles (5) and arrector pili muscle (6) are at the ectal and ental sides of the hair follicle group respectively; PTAH x 132

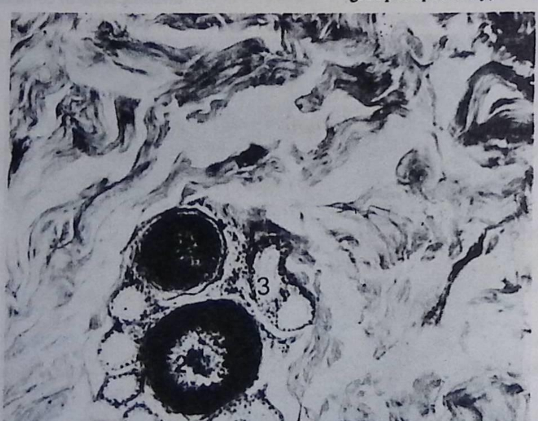

Fig. 6 *Camel hide, breech (horizontal section):*
The thick wavy collagen fibre bundles (1) agglomerate around their follicles (2) and secretory portions of sweat glands (3); Masson's Trichrome x 450

MEASUREMENTS

Hair Follicle Depth (FD): The average hair follicle depth for all positions studied was 0.96mm. (Table II). The breech had the deepest follicles of 1.13mm., followed by the ventral abdomen, with 1.00mm.

Sweat Gland Length (L): The sweat gland of the camel was observed to be highly coiled, with an average length of 1598.8µm. (Table III). It was longest at the ventral abdomen with 2048.0 µm., followed by the neck with 1766.2µm.

Diameter (D): Average sweat gland diameter was found to be 62.0µm. (Table III). It was also widest at the ventral abdomen with 65.1 µm., followed by the breech with 62.9µm.

Shape — L/D: As seen from the Table III, average ratio of length to diameter was 25.8, which indicates a highly coiled serpentine nature. It was most highly coiled at the ventral abdomen with the ratio of 31.5, followed by the neck with 29.1.

TABLE II

AVERAGE MEASUREMENTS OF THE CAMEL'S HAIR FOLLICLE DEPTH (FD), IN MILLIMETRES, AND DENSITY PER SQUARE CENTIMETRE AT VARIOUS BODY SITES

Body Site	**Depth**	**Density**	
		Primary	**Secondary**
Neck	0.95	350	1400
Midside	0.73	317	2550
Back (sacral)	0.99	550	1717
Breech (Buttocks)	1.13	233	1983
Ventral Abdomen	1.00	466	1200
Overall Average ($\bar{x}$)	0.96	383	1770

TABLE III

AVERAGE MEASUREMENTS OF THE CAMEL'S SWEAT GLAND LENGTH (L), DIAMETER (D), AND SHAPE (L/D RATIO) AT VARIOUS BODY SITES IN MICROMETRES (µm)

Body Site	**Length**	**Diameter**	**Shape**
Neck	1766.2	60.7	29.1
Midside	1418.4	58.9	24.1
Back (sacral)	1683.2	62.3	27.0
Breech (Buttocks)	1078.0	62.9	17.1
Ventral Abdomen	2048.0	65.1	31.5
Overall Average ($\bar{x}$)	1598.8	62.0	25.8

Hair Follicle and Sweat Gland Density: According to Table II, the average primary hair follicle density was 383 per square centimetre of the hide, and average secondary follicle density 1770 per square centimetre. The number of primary hair follicles is the same as sweat glands because of the association of their ducts with the primary hair follicles. The back had the densest primary hair follicles with 550/cm.^{2} followed by ventral abdomen, 466/cm.^{2} As regards the secondary hair follicles, the midside had the densest, with 2550/cm.^{2} followed by the breech with 1983/cm.^{2}

DISCUSSION

The epidermis of the camel hide did not vary from the general pattern that had been described for domestic animals (Jenkinson, 1965). The degree of thickness of this layer is important because camel hides are often extensively damaged by parasitic disease and mechanical defects such as brands, wounds and abrasions (Mann, 1956).

Domestic animals have been divided into two classes on the basis of the arrangement of the hair follicles (Jenkinson, 1965), viz., those which do not exhibit hair follicle grouping, like the cow, horse and buffalo, in which individual follicles are arranged at random in the hide, and those which exhibit hair follicle grouping such as the camel, cat, dog, goat and sheep in which hair follicles are associated in clusters, each cluster consisting of two to five large guard hairs surrounded by smaller lanugo hairs.

In this study, the camel's cover (primary) hairs have separate follicles and each has multiple sebaceous glands and a single sweat gland. This arrangement of the hairs and their follicles is quite different from the arrangement in other animals and agrees with the findings of Lee and Schmidt-Nielsen (1962b). The wool hairs of a guard hair unit, in the camel, emerge from the common orifice of a compound follicle which branches above the level of the sebaceous glands. It is unlike the dog, for example, in which the wool hairs are in a compound follicle, all emerging from a common orifice together with the primary hairs (Lovell and Getty, 1957).

There is a very thick dermis, with an overall average thickness in the regions studied, of 3.85mm. The papillary layer here was not separately measured from the reticular layer. But, a thicker papillary layer contributes to the softer feel of the grain surface and more splits can be obtained from the thicker and heavier hides (Amakiri, 1975b). These characteristics can thus be expected more at the midside and breech regions of the camel hide because of their greater dermal thickness relative to the other sites.

A hide containing many sweat glands may produce a spongy leather because of empty spaces left after their removal in the processes preparatory to tanning (Amakiri, 1975b); hence, the back, ventral abdomen, neck, midside and breech regions of the camel are expected to exhibit this characteristic in descending order.

Sweat gland shape, defined as the ratio of sweat gland length to its diameter, L/D (Jenkinson and Nay, 1968a), was found to be a reliable indicator of hide type in cattle when measured on samples from either the neck or midside of adult animals. Other hide measurements such as hair follicle depth (FD) may also prove useful under restricted conditions and in the sub-classification of hide type based on sweat gland shape.

Three hide types were classified in European, African, Asian and South American cattle (Jenkinson and Nay, 1972 and 1973a). Type I hide with L/D less than 8.0 and FD less than 1.5mm. had sac-like glands. These were predominant among African and Asian cattle. The type II hide, with L/D greater than 12.0 and FD greater than 2.0mm. had coiled serpentine sweat-glands. They were predominant in European cattle. Type III hide, predominantly found in South American cattle had L/D greater than 12.0 and FD less than 1.5mm. The glands of these cattle were also highly coiled and serpentine, but their hair follicle level was similar to type I. Type I and III cattle, mostly found in the tropics, and known to be tolerant to hot environments (Jenkinson and Nay, 1973b), have shallow hair follicle depths in common — both less than 1.5mm.

In this study, the camel, showed a hair follicle depth less than 1.5mm. at all the body regions examined. With its highly coiled sweat glands, the camel hide can thus be classified under the type III category, like the South American cattle hide.

It can therefore be summarized that the structure of the integument of the camel is not generally different from other domestic animals, but that basically, the arrangement of the hair follicles is the major difference. The thickness of the dermis especially at midside and breech should provide the advantage of obtaining more splits for processing into leathers. The back may give the most spongy leather because of its comparatively numerous sweat glands.

ACKNOWLEDGEMENT

The authors acknowledge the procedural guidance and valuable suggestions given by Prof. C.O. Njoku, Department of Veterinary Pathology and Microbiology and Associate Prof. S.A. Ojo, Department of Veterinary Anatomy, both of Ahmadu Bello University, Zaria. The co-operation of Dr. A.S. Mshelbwala, Director, Leather Research Institute of Nigeria, Zaria at the time of this study, is also gratefully acknowledged.

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SOME CHEMICAL FEATURES OF RED ONION SKIN *(ALLIUM CEPA)* EXTRACT: A TANNING MATERIAL

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ABSTRACT

The chemical features of red onion skin *(Allium cepa)* aqueous extract were investigated by colour spot tests, thin layer chromatography and spectroscopic examinations. Results obtained show that the major components of the red onion skin extract are condensed tannins of flavonol type. It is thus clear that red onion skin, a waste material, has some promise of technical significance which should stimulate applied research in many fields, notably the leather industry.

INTRODUCTION

Tannin molecules of vegetable origin have been employed since antiquity for the conversion of hides and skins into leather. This traditional "cottage industry" type process was dramatically changed during industrialization over the latter half of the last century resulting in the substitution of most of the hydrolysable tannins such as algarobilla, dividivi, tara, oaks etc. with condensed tannins, namely mimosa, quebracho and mangrove extracts. The drift to condensed tannins might be due to their local availability, abundance as well the richness of the sources.

Thus, this shift to condensed tannins coupled with decreased availability of synthetic phenolic materials, as a result of benzene being diverted to outlets with a better capital returns, has stimulated a search for more local and renewable sources of condensed tannins. Among the renewable sources, the most convenient source to consider is agricultural wastes. Apart from the fact that the use of agricultural wastes improves the quality of the environment, it also opens up new reservoirs of natural resources for various requirements of the country's chemical industries. Some of the agricultural wastes whose utilization technology has been made known include: baggase (Saad *et al.*, 1978), peanut hulls (Chen, 1981) etc. However, there are others such as red onion skin — a by-product of red onions that is supposed to possess some tannins (Harborne, 1967) which might have high potential for economic use but at present unused owing to lack of knowledge of its chemical features.

Although the chemical features of most condensed tannins from mimosa and quebracho barks are well documented in the open literature (Pizzi, 1980), little or no published information is available for red onion skin tannins. Of particular note is the fact that previous investigations carried out on red onion skin (Kuroda and Umeda, 1951; Okajima, 1960) were merely contended with the isolation and quantification of the quercetin content. Accordingly, the purpose of this study is to determine the chemical characteristics of the onion skin tannin in order to render the skin waste to economic exploitation.

MATERIALS AND METHODS

Materials

The red onion skin materials used for this experiment were collected from the Port Harcourt main market on the 24th February, 1982. The onion skin is the dry scale and the inedible portion of the red onion bulb which is usually used as soup condiment (spice).

Extraction Procedure

A series of single contact batch solvent leaching was used to obtain the crude tannin extract. This involves the addition of 50 ml. of warm water to 1g. of sun-dried onion skin in a flask and agitating with Flask shaker for 3 hours. Thereafter the extract solution and raffinate solid phases were separated by filtering, using a Buchner's funnel with Whatman filter paper No. 4. The aqueous extract was used for the initial spot tests as soon as it was prepared to avoid oxidation on storage.

For TLC and UV measurements, pure alcohol was used as the extracting solvent.

Estimation of the Tannin Content of the Extract

The tannin content of the onion skin extract was determined by IR Spectroscopy (Chow and Steiner, 1975). The spectrum was recorded in a NaCl cell of 0.05mm. thickness.

Characterisation of Red Onion Skin Extracts

Spot Test Reactions: Colour reaction tests were carried out on the crude extract and separated fractions using conventional organic identification reagents (Feigl, 1966).

UV and Chromatographic Analysis (TLC): The chromatographic analysis of the red onion skin extract was made on silica gel plate with a developing solvent system of toluene-ethyl acetate - formic acid (5:4:1). About 2μ l. of the methanol extract of the red onion skin was spotted on 250μm. thick layer of silica gel plate (previously activated in an oven at 120°C.) and the spots allowed to dry. The plates were then developed in a chromatographic tank using the above-stated solvent system and dried. Detection was affected by spraying with concentrated ammonium hydroxide solution and examined visually under UV light using MinUVis Desaga (Heidesberg) at 366nm. The zone of the separated fraction was then scrapped out and extracted with methanol, filtered and the resulting filtrate subjected to both colour reaction tests and UV measurements using Hitachi 100-20 spectrophotometer.

UV Spectra: UV Spectra of tannin extract in ethanol and sodium hydroxide solution (10%) were taken with Carry 219 spectrophotometer.

RESULTS AND DISCUSSION

Colour Reactions

Tannins are found in plant extract as mixtures of different classes. Various classes of tannin give characteristic colour reactions; it is thus possible to assign each tannin type present in a given extract. In the present study, for example, spot tests on the separated fractions (Table I) exhibited positive reactions. The results are typical of colours shown by flavonols (Koukol and Corn, 1961). To ascertain the pattern of flavonol hydroxylation of the onion skin, the extract was reacted with ferric chloride solution and it gave a colour reaction with the formation of a brick-red precipitate, indicating similar oxygenation pattern, as found with wattle bark tannins (Pizzi, 1980) and Morin (Feigl, 1966).

The presence of ketonic character in the tannin extract was made evident by the formation of a pink precipitate when reacted with hydrazine, indicating a positive reaction. Similarly, spot test reactions carried out on the TLC fractions gave positive ketonic and erythocyclic oxygen (ether) features. Previous investigators (Kallay *et al.*, 1968 and Ollis *et al.*, 1952) have reported similar observations with flavonoids.

UV-Chromatographic Studies

The relative migration rates (R_f) of the onion skin extract components are shown in Table I. It is seen that five compounds were separated and all gave bright yellow colouration when exposed to ammonia vapour, under UV lamp radiation, which is typical of flavonols (Koukol and Corn, 1961).

The UV examination of the TLC fractions was accomplished by scanning over the wave length range of 300—400nm. Tannins of flavonol type normally exhibit two major absorption peaks: band I (350—385nm) and band II (240—280nm) while flavonones absorb between 304—350nm (band I). Thus, the position of band I absorption provides a guide to the type of flavonoid present in a given vegetable extract. As seen in Table II, the onion skin extract comprises of a mixture of flavonoids, with flavonols being the major constituents as evident in their wave lengths of maximum absorption and absorbance values. The absorption maxima of the onion extracts compare well with values reported (Robert, 1962) for quercetin (λ max. 374nm), kaempferol (λ max. 368nm), galangin (λ max. 359nm) and apigenin (λ max. 344nm). From the absorbance values, quercetin appears to be the major flavonol type in the onion extract. Similar observations have been reported (Harborne, 1967).

One can also note in Tables I and II that highly oxygenated flavonols (tannins) tend not only to absorb at longer wave lengths, but also of less R_f values than those with fewer oxygenation substituents.

UV Spectral Studies

An inspection of the absorption spectra (Fig. 1) of the onion skin tannin extract and sodium tannate of the extract reveals their nature. As stated earlier, flavonols exhibit two major absorption peaks, band I and band II, and it may be seen in Fig. 1a that the onion skin extract showed in ethanol characteristic strong absorptions in three regions: 250—300nm, 250—380nm, and 400—460nm. The UV spectra (Fig. 1) have maxima at 250 and 280nm with a shoulder at 290, 360 and 380nm.

This finding is supportive of the chromatographic result, as well as in good agreement with the findings of previous investigators (Godwin, 1965 and Harborne, 1962) that oxygenation of ring B of the flavonol influences the shape of band II. For example, it is reported that 3' 4' dihydroxyl flavonol and 3' 4' 5' trihydroxyl flavonol exhibit a maximum with a shoulder at the longer wave length side (Mabry *et al.*, 1970). The broad band centred at 470nm is attributed to the conjugated double bonds formed between benzene nucleus and the heterocyclic rings.

The UV spectrum of extract in sodium hydroxide solution (Fig. 1b) is somewhat different to that in ethanol, in that absorption maximum of band II shifted to 260nm and band I to 365nm, indicative of the formation of phenolate anions. The UV spectral features of the extract in sodium hydroxide were nearly identical with those of trihydroxyl-benzyl-methane-4-glucoside isolated from malus leaves (Williams, 1967), which somewhat confirms our earlier result implicating flavonols as the major type of tannins present in aqueous red onion skin extract.

IR Spectroscopic Studies

The IR Spectrum (Fig. 2) of the onion skin extract showed the presence of a chelated carbonyl group conjugated with an aromatic ring at 1660 $cm.^{-1}$ A detailed interpretation of the IR bands is given in Table III, which is similar to that reported for isoflavonol (Sheinman, 1980).

Estimation of Tannin Content: Various methods of analysis are available for the determination of tannin content. The method used in this study is based on the one developed using the absorbance ratio of the IR region (Chow and Steiner, 1975). The analysis was based on the linear relationship between the variation of 1490/1450 $cm.^{-1}$ absorbance ratio and the amount of A rings (phloroglucinolic group) in a tannin extract, using the regression expression shown below:

$$Y = 0.2375\ x - 0.00275$$

where x = % A rings and Y = absorbance ratio.
The 1490$cm.^{-1}$ peak is characteristic of A rings of the tannin molecule only, while the 1450$cm.^{-1}$ accounts for the rest extract component. Y value was obtained from IR Spectrum in which the baseline is drawn as tangent to the adjacent minima and the squares so enclosed in the absorption peak computed. Percent tannin content of the onion skin extract is about 30. The computed IR tannin value is in good agreement with the result obtained using the method published elsewhere (Odozi and Agiri, In Press).

On the basis of IR Spectrometry, colour reaction, the relative quantities of the compounds in the chromatographic bands and UV examination, the likely structure of tannins contained in the onion skin extracts may be of the flavonol and flavonone types.

ACKNOWLEDGEMENT

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TABLE I

R_f VALUES AND COLOUR REACTIONS OF ONION SKIN EXTRACT (TLC FRACTIONS)

Fraction	Colour UV lamp (366nm)	Experimental R_f	Colour Reactions: Hydrazine	Colour Reactions: $Cu(OAC)_2$-benzidine Solution*	Colour Reactions: O-dinitro-benzene
1	Yellow	0.80	+	+	+
2	Yellow	0.76	+	+	+
3	Yellow	0.69	+	+	+
4	Yellow	0.65	+	+	+
5	Yellow	0.61	+	+	+

*Specific for heterocyclic oxygen (ether).

TABLE II

UV PROPERTIES OF THE TLC FRACTIONS

Fraction	Experimental λ max.	Calculated λ max.	Absorbance	Assignment of Tannin Type
1	340	344	0.836	Apigenin
2	350	356	0.921	Fisetin
3	360	364	0.980	Galangin
4	370	370	0.989	Kaempferol
5	380	370	0.993	Quercetin

TABLE III

IR ABSORPTION BANDS OF ONION SKIN EXTRACT

Frequencies ($Cm.^{-1}$)	Band Assignment
3500 — 2500	OH stretching and hydrogen bonded
2980 — 2850	C — H stretching
1720	Stretching of aliphatic ketonic group
1660, 1600	Ring C — C stretching
1490, 1430	Phloroglucinol or resorcinolic group (A-ring)
1215	C — O stretching of vinyl ethers
830 — 750	Multiple benzene ring substitution

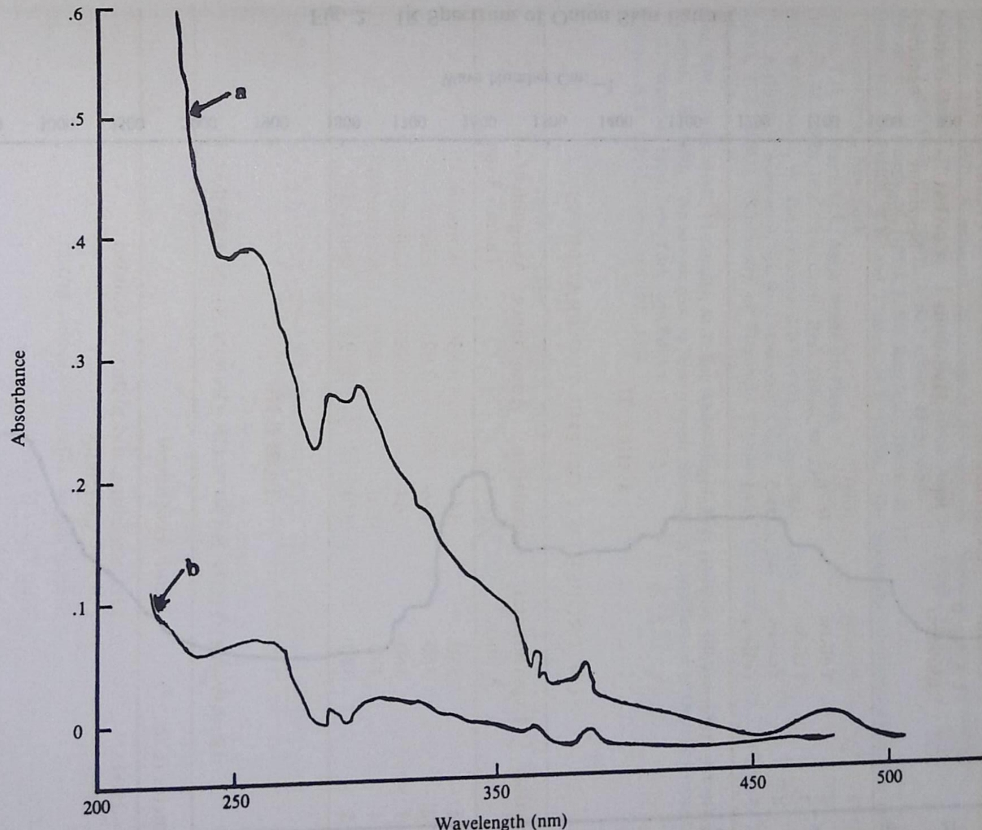

Fig. 1. UV absorption Spectra of Onion Skin Extract in (a) Ethyl alcohol and
(b) Sodium hydroxide solution at a scan rate of 20min./S.

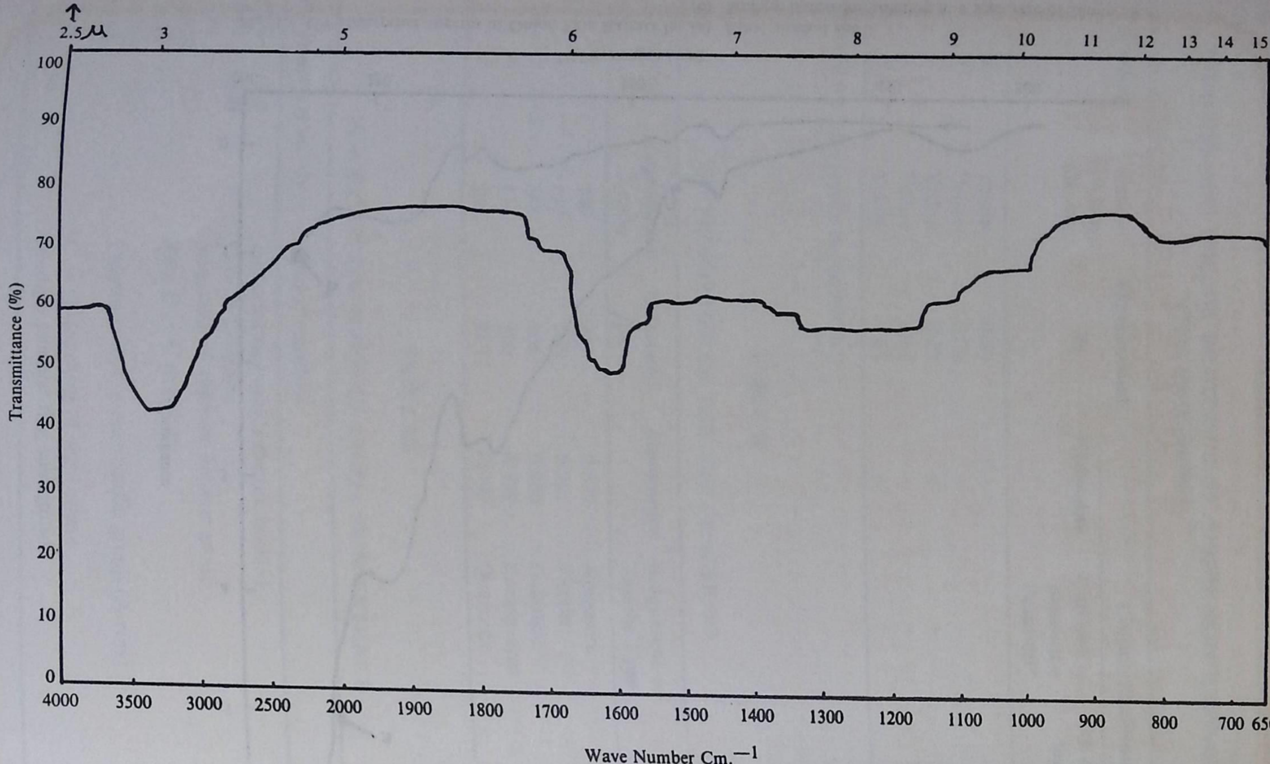

Fig. 2. IR Spectrum of Onion Skin Extract

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JOURNAL OF LEATHER RESEARCH
(A QUARTERLY PUBLICATION OF LERIN)

ABSTRACTS
(FROM OTHER PUBLICATIONS)

BIO-SCIENCES AND TECHNOLOGY

Macleod, A.J. (1980), "BIOTECHNOLOGY AND THE PRODUCTION OF PROTEINS," Nature, **285** (5761), 136.

The advantages and disadvantages of large scale production of proteins by different techniques, especially for therapeutic use, are reviewed. The possible use of recombinant DNA techniques to produce bacterial strains capable of synthesizing these proteins, although appears attractive, has serious constraints. Major problems encountered include recovery of significant quantities of the products, determination of their precise nature and purity, antigenic and pyrogenic effects of bacterial proteins and cell debris respectively in mammals. Manipulation of human cell cultures to produce human proteins is considered a better alternative to bacterial systems because of correct modification, reduced antigenicity and pyrogenicity. Currently, technology based on plasma fractionation and human cell culture techniques appear the most acceptable means of large-scale production of human proteins.

(GE)

Bassham, J.A. (1980), "BIOCHEMICAL TRANSFORMATIONS," Biosources Digest, 2 (3), 180.

Maximum solar energy conversion efficiency for plant growth is about 5 to 6%, but the highest annual yields of biomass when translated into conversion efficiency generally are less than 3% for C_4 plants and 2% for C_3 plants. C_3 plant efficiency falls off drastically due to photorespiration under otherwise optimal conditions. C_4 metabolism is less efficient than C_3 under limiting light, but avoidance of photorespiration allows C_4 plants to have a higher efficiency under optimal growing conditions. Annual growth is severely limited by growing season length, water availability and other agronomic factors. Ideal energy conversion efficiencies might be approached under controlled environment conditions. Despite many advantages for the future, this is not presently economic in most cases. Plants will have to be developed to gain maximum advantage of such systems. Conversion of storage and structural carbohydrates to more valuable, energy-rich chemicals and fuels can be accomplished outside the plant or by biosynthesis in the plant. Use of plants such as *Euphorbia* species for production of "hydrocarbons" may be economically attractive in areas such as those with high solar energy and limited, but sufficient rainfall. Economics depends on yield of desired products per unit of biomass. Examination of biosynthetic pathways from carbohydrates to "hydrocarbons" suggests possibilities for improving yield of desired products through plant breeding and plant cell tissue culture. (8 Figs.; 2 Tabs.)

(Author's summary)

TANNING AGENTS AND MECHANISM OF TANNING AGENTS

Gudel, H.U. and Hauser, U. (1980), "EXCHANGE INTERACTIONS IN TRIS [CIS-DI-μ-HYDROXO-BIS (ETHYLENEDIAMINE)CHROMIUM(III)] CHROMIUM(III) TRIS (DITHIONATE) OCTAHYDRATE," Inorg. Chem., **19** (5), 1325.

The preparation of polynuclear complex $[Cr \{(OH)_2\ Cr(en)_2\}\ 3]^{6+}$ which is the chromium(III) analogue of Werner's salt is discussed. The complex formed is investigated by magnetic susceptibility studies using the moving sample technique. The complex is iso-structural with the corresponding cobalt(III) compound. An overall antiferro-magnetic exchange coupling in $[Cr \{(OH)_2\ Cr(en)_2\}\ 3]\ (S_2\ O_6)_3\ .8H_2O$ is observed. (4 Figs.; 17 Refs.).

(AAN)

ANALYTICAL CHEMISTRY

Korenaga, T. (1981), "ATOMIC-ABSORPTION SPECTROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF ARSENIC IN ACRYLIC FIBRES CONTAINING ANTIMONY OXIDE WITH SOLVENT EXTRACTION AND ARSINE GENERATION," The Analyst, **106** (1258), 40.

A solvent extraction and arsine generation atomic-absorption spectrophotometric method is described for the determination of arsenic in acrylic fibres containing antimony oxide. Wet ashing procedure with a mixture of concentrated nitric acid, perchloric acid and sulphuric acid was used in preparing the sample solution of the acrylic fibre. The As(V) obtained after acid digestion was reduced to As(III) with titanium(III) chloride. As(III) was extracted into benzene from a sulphuric acid — hydrochloric acid mixture after reduction of arsenic and antimony leaving antimony(III) unextracted. As(III) in the benzene layer was further back-extracted into water. AsH_3 is then generated in the aqueous mixture with potassium iodide, tin(II) chloride and zinc powder from 2.4N hydrochloric acid solution and introduced to a nitrogen — hydrogen flame of atomic absorption spectrophotometer. Interferences caused by co-existing elements (eg., antimony) was eliminated by solvent extraction with benzene. The method, which is capable of determination of 0.04 — 400ppm. arsenic has been tested with various acrylic fibre samples containing antimony oxide. For 1g. sample, the detection limit is 0.04ppm. and standard deviation is 7%. The method may be applicable to determination of trace amounts of arsenic in other organic materials. (5 Figs.; 3 Tabs.; 14 Refs.).

(FAL)

Howard, A.G. and Arbab-Zavar, M.H. (1981), "DETERMINATION OF 'INORGANIC' ARSENIC(III) AND ARSENIC(V), 'METHYLARSENIC' AND 'DIMETHYLARSENIC' SPECIES BY SELECTIVE HYDRIDE EVOLUTION ATOMIC-ABSORPTION SPECTROSCOPY," The Analyst, **106** (1259), 213.

A technique for the determination of "inorganic" arsenic(III) and arsenic(V), "methylarsenic" and "dimethylarsenic" species is described which is based on the trapping of arsines and selective volatilisation into a heated quartz atomiser tube situated in the optical path of an atomic-absorption spectrometer. Improved reproducibility is obtained by the use of a continuous flow reduction stage and detection limits are approximately 0.25ng. (based on twice the standard deviation of 10 blank measurements). For a typical sample volume of 10ml. this corresponds to a detection limit of 0.02ng. ml.$^{-1}$ of arsenic. Interferences were investigated and depression of results was observed in the presence of silver(I), gold(III), chromium(VI), iron(II), iron(III), germanium(IV), molybdenum(VI), antimony(III), antimony(V), tin(II), manganese(VII) and nitrite. Various approaches to overcoming such interferences were investigated, and for general use, masking with EDTA is advocated. The choice of extraction procedures for speciation analysis is discussed. (5 Figs.; 5 Tabs.; 19 Refs.)

(Authors' summary)

Harris, M.R. and Lepp, N.W. (1981), "COMPUTER-LINKED ATOMIC-ABSORPTION SPECTROSCOPY: A STREAMLINED APPROACH TO ENVIRONMENTAL ANALYSIS," The Analyst, **106** (1260), 283.

An analytical system using two single-beam atomic-absorption spectrophotometers linked to a microcomputer has been developed for efficient processing of large numbers of plant and soil samples for various metal analyses. The rationale underlying the development of the system and the details of the interfacing and data handling techniques are given. The advantages of this system include efficiency of operation for detection of large numbers of soil extracts and plant digests, flexibility in pairing of elements to be analysed and in number of pairs that may be included, real savings in analytical and datahandling times with concurrent savings in cost and general applicability to personnel without specialised experience. (1 Fig.; 3 Tabs.; 3 Refs.).

(FAL)

Sandhu, S.S. (1981), "DIRECT SPECTROPHOTOMETRIC METHOD FOR THE DETERMINATION OF HYDROCHLORIC ACID-RELEASABLE ARSENIC IN SEDIMENTS AND SOILS," The Analyst, **106** (1260), 311.

A spectrophotometric method using silver diethyldithiocarbamate (SDDC) in pyridine for direct determination of hydrochloric acid — releasable inorganic arsenic in sediments and soils is described. The method provides reliable data on quantitative recovery of 2.0μg. of As(V) added to 5.0g. (0.4mg. kg.$^{-1}$) of soil, clay, sand and sediment samples. The method is reliable and relatively rapid, requiring the use of simple equipment. It can be routinely applied to the quantitative determination of arsenic in soil and soil — like material. The detection limit has been established as 0.5μg. of As. The extent of interference of certain metal ions such as Cr(VI), Cu(II), Ni(II), Sb(III) and Hg(II) in the use of this method for arsenic determination in soil has been quantitatively evaluated. (2 Tabs.; 30 Refs.)

(FAL)

LEATHER TECHNOLOGY/CHEMISTRY

Covington, A.D. and Sykes, R.L. (1981), "TANNAGE WITH ALUMINIUM SALTS. PART III. PRELIMINARY INVESTIGATIONS OF THE INTERACTIONS WITH POLYCARBOXYLIC COMPOUNDS," JSLTC, **65** (2), 21.

The system acrylic resin + aluminium (III) + chromium (III) has been investigated, as the basis of a novel tanning system. In particular, tannages containing very low or zero chromium (III) offers were investigated with a view to finding an alternative to full chrome tannage. High shrinkage temperature was the main aim of these experiments but other parameters were not ignored. The colour of the leathers were essentially white, even when $\ngtr$ 1% chromium (III) was present. There was no loss in thermal stability on soaking for 42 h. in water at 30-35°C. Tear strength of fellmongered sheepskin leather was in excess of the 1976 GERIC guidelines for garment leather. Light fastness was better than 6 on the Blue Wool Scale. (2 Figs.; 14 Tabs.; 13 Refs.)

(Authors' summary)

Hopkins, T.A. (1981), "THE EFFECT OF SOME VARIABLES IN THE TOGGLING OF SOFTY GARMENT SIDES," JSLTC, **65** (2), 29.

In this work, based on an MSc project, it was found that various conditions of temperature, time of toggling and extra subsequent Slocomb staking caused significant differences in area changes and some subjectively assessed properties of softy garment cow sides. Increasing time and temperature of toggling gave area gains up to 0.8 ft^2/side. Extra Slocomb staking after toggling increased area gain by approximately 0.75 ft^2/side, compared with unstaked sides. (6 Tabs.; 10 Refs.)

(Author's summary)

Wiener, F. (1980), "PRODUCTION OF GLOSSY AND MATT SUEDE BY PROCESS ADJUSTMENT," Leather, **182** (4459), 71.

To obtain gloss, the incident light must be reflected regularly from the surface which is dependent on the characteristics of the resultant fibre structure. The influence of various processes on the resultant fibre structure is discussed. It is found that a fibre splitting mild liming, that is, liming with little sodium sulphide but more of sodium hydrosulphide, is best. Studies on deliming, bating and pickling showed that the softest fibre is also the glossiest. The best tannage for gloss is probably an unmasked cationic chrome tannage, as the smallest chrome complexes are deposited in the skin. More filling chrome tannage could be more suitable for a fine matt nap. Splitting after liming gave better results for bovine suedes. For matt suede it is probably more advantageous merely to split and not to shave. Wet buffing but more often wet wheeling is practised as this combed the fibres rather than tearing them. For glossier suede it is more advantageous to damp-buff and for matt suede to dry-buff. Retannage with the usual anionic materials like vegetable tan, resin tans etc. give short "fixed" fibres which is deterimental. An aluminium-chrome or chrome-syntan retanning system is most suitable. The best neutralisation treatment is by sodium bicarbonate with a little addition of sodium formate in a short float followed by good rinsing as the salt reduces gloss. The best fatliquor for a matt suede is a penetrating fatliquor such as the one based on sulphited esters, in conjunction with a non-hardening filler. It is reported that for softest, glossiest suedes hang drying is best while for matt suedes pasting is advantageous. For a good wetting back, a suitable stable fatliquor should be used. Since deep dye penetration and brilliance are desirable for suedes, drumming two-thirds of the total dyestuff quantity as powder in a low float, floating up and adding the remaining one-third is recommended. Fatliquoring using suitable fatliquors with the addition of gloss-giving agent is recommended. The finishing processes suggested include damp buffing, spraying of antistatic agent along with a gloss-giving agent. Finally the goods are dry drummed. A water-resistant agent may be incorporated into the fatliquor in right proportion without affecting the re-dyeing, conditioning etc. characteristics.

(BBD)

LEATHER PRODUCTS

Holgate, J. (1980), "COURTS AND SANDALS — SPRING-TIME FANCIES," Shoe and Leather News, **Oct.23**, 10.

Various shoe designs at the British International Footwear Fair are presented. For the feminine at heart the pretty little pastel bootees with flower motifs were considered favourites while for those who are out for fun, the flat toe-post with multi-coloured hanging beads by Tarantino were considered to be ideal. The Red Skin Saga was considered the leading fashion, coming through as decoration in the form of weaving and fringing particularly on courts. The duo-coloured stripped uppers, often in two pearlised pastels or stark contrasts, took the woven look one step further. Pretty courts in soft leather variations as well as unstructured bootees featuring pastel embroidery, halter-back sandals and low-heeled courts were displayed at the fair. A stacked wood-effect heel topped with leather uppers in court form or with the new sling back was also introduced. All the designs produced took cognisance of the price squeeze.

(BBD)

CONTROL AND TREATMENT OF EFFLUENTS/ENVIRON. SC. AND TECH.

Grutsch, J.F. (1980), "THE α-β-γ'S OF WASTEWATER TREATMENT," Environ. Sci. & Tech., **14** (3), 276.

The removal of organic matter from wastewaters by Activated Sludge Process (ASP) was found to be well improved by increase in sludge age (SA) and addition of powdered activated carbon (PAC). A biomass balance around the ASP gave an equation which showed a relationship between SA, α (the maximum possible cell yield) and β (cell yield decrease due to substrate diverted to energy metabolism). α was found to be constant with a value of 0.3 on COD basis. β was found to be linearly dependent upon temperature. Gamma (γ), defined as the substrate captured by bio-cells but not yet utilized, was indicated to have contributed to concealing the nature of α and β. (5 Figs.; 1 Tab.).

(JBG)

Martin, R.J. (1980), "ACTIVATED CARBON PRODUCT SELECTION FOR WATER AND WASTEWATER TREATMENT," Ind. Eng. Chem. Prod. Res. Dev., **19** (3), 435.

There is a wide variety of commercially available activated carbons and it is readily apparent that the judicious selection of a particular carbon for a particular water or wastewater treatment problem may have a significant effect on the capital and operating costs for the adsorption treatment process. An experimental programme was carried out to evaluate the suitability of several different activated carbons for the adsorption of municipal wastewater organics and also of selected organics of varying size, structure and molecular weight. It was ascertained that if pore distribution data were to be made readily available by activated carbon manufacturers, the carbon user could choose a carbon appropriate to his organics which are to be removed from the aqueous phase; the nearer the pore size is to the diameter of the adsorbate molecules, the greater is the attraction between adsorbent and adsorbate. An example of carbon selection for a particular real life treatment problem is appended. (11 Figs.; 6 Tabs.; 15 Refs.).

(Author's summary)

ECONOMICS AND MARKETING

Day, G.S. (1981), "THE PRODUCT LIFE CYCLE: ANALYSIS AND APPLICATIONS ISSUES," J. Marketing, **45** (4), 60.

The usefulness of the product life cycle concept as a marketing tool is discussed. The definition of the product market for the purpose of life cycle analysis, the difficulties of identifying the present life cycle position, the potential for forecasting the key parameters of the life cycle and the role of the product life cycle in the formulation of competitive strategy are dealt with. While most of the underlying factors determining the parameters of life cycle operate during several stages, the relative importance of such factors changes during the transition from one stage to another. Some of the problems associated with the identification of a product's position in its life cycle include the adjustments that should be made to eliminate the effects of economic conditions and the difficulty of choosing a unit measurement for sales. The life cycle analysis serves as an enabling condition and a moderating variable to strategy formulation. (45 Refs.)

(AAI)

Thorelli, H.B. and Burnett, S.C. (1981), "THE NATURE OF PRODUCT LIFE CYCLES FOR INDUSTRIAL GOODS BUSINESSES," J. Marketing, **45** (4), 97.

The appeal of the Product Life Cycle Concept (PLCC) lies first, on its simplicity and intuitive logic and secondly, on its high normative value. Specific issues discussed are (i) whether the growth rates of industrial markets tend to increase and then decrease over time and (ii) to what extent do changes in market concentration, market innovation, profitability and international trade exhibit PLCC behaviour for industrial businesses. These issues were investigated on the basis of the strategy and performance experiences of 1148 PIMS businesses which manufacture and market industrial products. Cross-sectional analytical design was used. Results of the study show low correlations between product age and each of the variables such as market growth, market concentration, market innovation, profitability, cash flow and international trade. The results do not, however, suggest that the PLCC should be ignored for industrial businesses. On the contrary, while the PLCC forces are at work, they do not seem to be the only independent variables for important decision making in industrial businesses.(3 Figs.; 1 Tab.; 29 Refs.)

(AAI)

Tellis, G.J. and Crawford, C.M. (1981), "AN EVOLUTIONARY APPROACH TO PRODUCT GROWTH THEORY," J. Marketing, **45** (4), 125.

The Product Life Cycle (PLC) is extensively used by business firms and academics. The PLC model has generated controversy based on the theoretical and practical specifications and empirical problems associated with it. As an attempt to resolve the controversy and to provide a comprehensive analytical framework, an evolutionary approach to product growth is proposed. This approach assumes that products are constantly evolving and are propelled by market forces, managerial innovations and government intervention. Evolutionary growth assumes five distinctive patterns viz., divergence, development, differentiation, stabilisation and demise. In resolving the controversy between the PLC and the Product Evolutionary Cycle (PEC), the former is seen as a special case of the latter on the aggregation level. As a theoretical model, the PLC is viewed as an over-simplification of the product growth process. The controversy hinging on validity and applicability is resolved by shifting emphasis from proper curves identification to the analysis of underlying forces such as market dynamics, managerial creativity and government intervention. (3 Figs.; 46 Refs.)

(AAI)

DISSEMINATION

Goudy, F.W. (1982), "GENERAL REVENUE SHARING AND PUBLIC LIBRARIES: AN ESTIMATE OF FISCAL IMPACT," The Library Quarterly, **52** (1), 1.

This paper has two objectives: to determine the allocation of general revenue sharing funds to public libraries during the fiscal years from 1973 through 1977; and to estimate the net fiscal impact of these funds on the collective library budgets of the country. Actual Use Data tapes were obtained from the Office of Revenue Sharing and the Bureau of the Census, and COBOL programming was used to derive the needed data. This led to the accomplishment of the first objective. To achieve the second, a linear regression prediction model was used. The application of this model yielded certain conclusions regarding the extent to which general revenue sharing funds supplanted traditional local, state and federal revenues and the degree to which the legislation provided additional funds for library programmes, services and capital projects. (6 Tabs.; 24 Refs.)

(Author's summary)

Serpil de Costa (1982), "FOUNDATION AND DEVELOPMENT OF IFLA, 1926 — 1939," The Library Quarterly, **52** (1), 41.

Attempts at international bibliographic organization in the late nineteenth century, notably those of Otlet and La Fontaine, are examined in respect to their relation to later institutional developments. The origins of IFLA as an international library organization are linked to the early internationalist concerns of the American and British library associations. Efforts by the League of Nations in the 1920s coinciding with those of internationally oriented librarians such as Bishop of the United States, Krüss of Germany, and Collijn of Sweden, were instrumental in the founding of IFLA. The questions of how and why IFLA was found in 1927 are explored, and the later formalization of the structure of the new federation, as well as its relations with other international organizations such as IIIC and IID (FID), is treated in detail. (23 Refs.)

(Author's summary)

IULTCS Regional Conference

4—6 October, 1985

The Conference of North European Regional International Union of Leather Technologists and Chemists Societies is scheduled to be held at the Cairn Hotel, Horrogate, Yorkshire during 4—6 October, 1985. The conference hosted by the Society of Leather Technologists and Chemists will consist of presentation of papers on various aspects of leather science and technology, woolskins etc. followed by the Annual General Meeting of the SLTC. All bookings must be made by 31st August 1985; the contact address for obtaining more particulars and for participation at the conference is as follows:

Mr. J. Reek
Conference Booking Officer
49 Broomfield Road
Heaton Moor
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NOTES TO CONTRIBUTORS OF PAPERS

The scope for the papers intended for publication in the JLR could project the research and development work conducted on science and technology of leather and leather-products such as footwear and all types of leathergoods, chemistry, biochemistry, physics, biophysics, biology, microbiology, environmental engineering, by-product utilisation, quality control and standardisation, machinery and equipment, industrial chemicals, management, technical education and training, economics, marketing and dissemination as applicable to leather and leather-products industries.

As regards the methodology of publication of articles, please go through the papers appearing in JLR. The format and arrangement of various Sections of the article shall be:- Abstract, Introduction, Materials and Methods, Results along with Figure(s)/ Table(s) if any, Discussion, Acknowledgement(s) if any and Reference(s). The names of Sections of the paper ''Abstract'' etc., shall be at the middle of the line and in block letters. Sub-sections (sub-headings) can start at the margin and normal-typed and underlined or italicised. References shall be given within brackets in the running line eg., (Author's name, year); in case, there are only two authors, the names of both the authors be given eg., (—and—, year); references to articles contributed by more than two authors be indicated as follows: (Name of the first author et al., year); references to more than one article by the same author/s in the same year are to be indicated as follows: (first reference, year a); (second reference, year b) and so on. Reference to books shall indicate the name(s) of the author(s), (year of edition/publication), ''title of the book'', (name of the editor), name of the Press and page number (p.--). The ''References'' shall contain the names of all the authors who have contributed the article, arranged in alphabetical order, (year), name of the journal, **Vol. No.** (Issue No.) or **Month**, Page Number.

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CONTENTS

AN ESTIMATION OF THE PHYSIOLOGICAL ROBUSTNESS OF THE SKIN OF THE NIGERIAN GOAT, *CAPRA HIRCUS*

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ABSTRACT

The physiological robustness of the skin of the Nigerian goat was estimated from the known physical parameters of the skin. For 0.8 to 3 year-old goats, the fresh skin constitutes between 5 and 8.5 percent of the live weight of the animal and by making use of the mean Dermal-Somatic Ratio (D.S.R.) of 6.6 for Nigerian goatskins, the weight of the skin could be estimated from the live weight of the animal. The width of the skin is about 75 percent of the skin length; the length and width of the skin could be estimated from either of their measurements. The Condition Factor (K), which is an index of the physiological robustness of the skin was found to be 2.1. These observations provide simple and fair means of estimating the size and robustness of the skin of the Nigerian goat, *Capra hircus.*

INTRODUCTION

In the world over, goat is a multipurpose animal which supplies meat, milk, skin and hair (Devendra and Burns, 1970) and the relative commercial values of various goat pro ducts are milk, 58.39%; meat, 35.61%; skin, 4.27% and fibre, 1.73% (McDowell and Bove, 1977). In countries where there are large populations of goats, the skin is a valuable by-product. In view of the economic importance of goat skin, it is important for the raw material suppliers and the leather industry to be able to estimate the quantity of skin obtainable from a given goat before it is slaughtered.

While several studies have been carried out on the relationships between the weight and linear measurements of the goat, most of the findings have been interpreted in terms of meat production (Devendra and Burns, 1970; Bonsma, 1966; Turner *et al.*, 1966; Bhatnagar *et al.*, 1966; Tallis *et al.*, 1964; Rae, 1966; Khandekar *et al.*, 1965; and Devendra, 1966). Information on a quick and reliable method of estimating the weight and dimensions of goat skin from the known dimensions of live goats is not available. This paper deals with a simple method of quantifying such parameters of the skin. The present study also provides a method of determining the physiological robustness of the skin of the goat.

MATERIALS AND METHODS

Eleven goats *(Capra hircus)* of age ranging from 0.8 to 3 years from Zaria (7°20′E and 11°20′N) were selected and the weight of the animals, their length along the backbone (crown to the root of the tail) and chest girth were determined. They were then slaughtered and the fresh skins were weighed; the length of the skins along the backbone (apex of the neck to the root of the tail) was measured. The distance from one side of the skin to the other, midway between the fore and hind-limbs was taken as the width of the skin.

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The Dermal — Somatic Ratio of the skin was calculated as follows:-

$$\text{Dermal — Somatic Ratio} = \frac{\text{Weight of skin}}{\text{Weight of animal}} \times 100$$

The Condition Factor of the skin was estimated as follows:-

$$\text{Condition Factor (K)} = \frac{\text{Weight of skin, g.}}{(\text{Length of skin, cm.})^3} \times 1000$$

The cube of the length is a factor that is widely used in the estimation of the physiological robustness of organisms (Adegboye, 1982; Oni *et al.*, 1982).

RESULTS

Table I shows the physical parameters of the goats whose skins were taken up for this study. The live weight of the goats ranged between 14 and 28kg. with a mean of 22.4kg. The minimum weight of the skin was 0.96kg., while the maximum was 2.12kg. with a mean of 1.5kg. (Table II); the skin thus constituted on an average, about 6.6 percent of the live-weight of the goat which is the figure for the Dermal-Somatic Ratio of Nigerian goat skin. By making use of this Dermal-Somatic Ratio, it is possible to estimate the weight of the skin from a given weight of a live goat.

TABLE I

PHYSICAL PARAMETERS OF NIGERIAN GOAT,
CAPRA HIRCUS

Sl. No. of the animal	Length cm.	Chest Girth cm.	Live Weight kg.
1	126	26	28.0
2	112	22	20.5
3	118	24	21.0
4	110	20	21.5
5	97	18	14.0
6	122	23	26.5
7	119	24	28.0
8	131	26	24.0
9	123	26	25.0
10	133	24	24.0
11	122	20	14.0
MEAN	119.4	23.0	22.4

Table III shows the physical parameters of the skin of the Nigerian goat. The mea length of the skin was 89.6cm. while the width was 68.6cm. The calculated Condition Fac tor (K) for the skins examined is shown in Table IV. For skins with an average weight c 1473.6g. and an average length of 89.6cm., the Condition Factor was about 2.1g./cm The minimum Condition Factor was found to be 1.27 while the maximum was 2.88g./cr

TABLE II

DERMAL-SOMATIC RATIO (D.S.R.) OF NIGERIAN GOAT, *CAPRA HIRCUS*

Sl. No. of the animal	Live Weight kg.	Skin Weight kg.	D.S.R.
1	28.0	1.75	6.25
2	20.5	1.41	6.88
3	21.0	1.59	7.57
4	21.5	1.83	8.51
5	14.0	0.98	7.00
6	26.5	1.35	5.09
7	28.0	2.12	7.57
8	24.0	1.21	5.04
9	25.0	1.47	5.88
10	24.0	1.54	6.42
11	14.0	0.96	6.86
MEAN	22.4	1.5	6.6

TABLE III

PHYSICAL DIMENSIONS OF THE SKIN OF *CAPRA HIRCUS*

	Weight kg.	Length cm.	Width cm.
	1.75	93	76
	1.41	87	71
	1.59	87	62
	1.83	86	64
	0.98	70	54
	1.35	95	76
	2.12	92	74
	1.21	93	64
	1.47	89	76
	1.54	102	72
	0.96	91	66
MEAN	1.5	89.6	68.6

TABLE IV

THE CONDITION FACTOR (PHYSIOLOGICAL ROBUSTNESS) OF THE SKIN OF *CAPRA HIRCUS*

	Weight g.	Length cm.	Condition Factor
	1750	93	2.18
	1410	87	2.11
	1590	87	2.41
	1830	86	2.88
	980	70	2.86
	1350	95	1.58
	2120	92	2.72
	1210	93	1.50
	1470	89	2.09
	1540	102	1.45
	960	91	1.27
MEAN	1473.6	89.6	2.1

DISCUSSION

While several relationships have been worked out for determining the quantity of meat obtainable from livestock (Devendra and Burns, 1970), little has been done on the estimation of skin quality on the basis of the parameters of the live goat. Devendra (1966) has shown that the skin of the Malaysian goat constituted 9 percent of the live-weight of the animal. In the leather industry, the skin is generally evaluated on the basis of its green-salted or brined-weight (O' Flaherty *et al.,* 1965). The results obtained in this study have shown that certain parameters of the skin are related to certain other parameters of the live-goat. Secondly, a method of quantifying the quality of fresh skin has been developed for the skin of the Nigerian goat, *Capra hircus.*

Physical Parameters of the Skin and Dermal Somatic Ratio

The skin of *Capra hircus,* the Nigerian goat, constitutes about 6.6 percent of live-weight of the goat. This ratio is much less than the 9 percent obtained from the skin-body weight ratio of the Malaysian goats. Apart from variations of species, differences in the nutritional aspects of the diets of the Malaysian and Nigerian goats might also contribute to the higher skin-body weight ratio of the Malaysian goats. The weight of the skin of the Nigerian goat does not appear to increase appreciably with length and chest girth of the goat. However, the weight of the skin is found to increase with the weight of the goat. This is in agreement with the well-known function of the skin which is to cover the biomass of the animal. Thus, the bigger the biomass of the goat, the heavier is the skin.

Within limits, it is possible to estimate the weight of the skin from the weight of a live-goat before it is slaughtered and skinned. The width of the skin constitutes only about 75 percent of the length of the skin and thus the width of the skin could be estimated from the length, and *vice versa*.

Condition Factor

The Condition Factor of 2.1 arrived at for the skin of *Capra hircus* in this study, is an index of the physiological robustness of the skin. While the weight is indicative of the biomass of the skin, and the length and width are indices of the surface area, the Condition Factor gives an idea of the spread of the biomass over the entire surface of the skin. The Condition Factor is also a good index of the specific gravity of the skin, and this factor could be used to compare the qualities of skins within and between species.

ACKNOWLEDGEMENT

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THE EFFECT OF AFTER-TREATMENT OF DYED COTTON WITH NATURAL TANNING AGENT AND METALLIC SALTS

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ABSTRACT

Direct dyes when applied to cotton fabrics do not possess good fastness properties to washing. The wet fastness properties of these dyes can be improved by treatment with a natural tanning agent such as tannic acid. Much improvement is obtained when tannic acid is complexed with fixing agents such as potassium antimonyl tartrate, zinc chloride and zinc acetate. This is attributable mainly to modification of the substrate by the complex which lowers the rates of diffusion of the dye out of the dyed fibre.

INTRODUCTION

Cotton fibres are undoubtedly the most important of the natural cellulosic fibres in textile and allied fields. They have a strong affinity for direct dyes with a wide range of shades but poor to moderate fastness to wet treatments.

Natural tannins (poly-phenolic compounds, usually polygalloylated glucoses) which are plant products of phenolic nature (Haslam *et al.,* 1961a, 1961b; White, 1956) and employed in the tanning of leathers, when applied to cotton that had been dyed with anionic dyestuffs, are believed to reduce the rate of diffusion of the dye out of the dyed fibre. The effectiveness of this treatment can be further improved by an additional treatment with potassium antimonyl tartrate (tartar emetic) otherwise known as "full back-tanning", zinc chloride or zinc acetate and any of these metallic salts will give a less soluble complex of tannic acid.

Some new methods of improving the washing fastness of dyed cotton fibres with the aid of a vegetable tanning agent and metallic salts are discussed in this paper.

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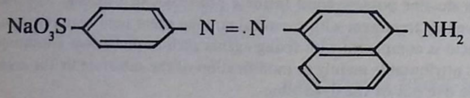
MATERIALS AND METHODS

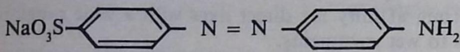
The scoured and bleached cotton fabrics used for this work were obtained from Kaduna Textiles Limited, Kaduna. The tannic acid and all other chemicals used were of analytical grade.

Dyes

Two direct cotton dyes (C.I. Direct Red III and C.I. Direct Orange 34) were supplied by M/s. Chemical Allied Products Limited, Lagos (formerly ICI). The structural formulae of the dyes are as follows:-



C.I. DIRECT RED III (DURAZOL BROWN 2RS) (MOLECULAR WEIGHT 349)



C.I. DIRECT ORANGE 34 (DURAZOL ORANGE 2G) (MOLECULAR WEIGHT 299)

Dyeing Procedure

The dyeings of the cotton fabrics (1g.) with the direct dyes (2% on the weight of the fabric) were carried out individually using Dyemaster Dyeing Machine and maintaining dyeing temperature at 95°C. for 1 hr. and a liquor to material ratio of 75:1. Sodium chloride (20% on the weight of the fabric) was added to each dyeing at the start of the dyeing process so as to promote maximum dyebath exhaustion. The dyed fabrics were removed from the dye liquor, rinsed with cold water and dried.

Determination of Dye on Fibre

The amount of dye adsorbed by the 1g. samples was determined by carrying out cold extractions with 20% aqueous pyridine for 24 hrs. using the above liquor to material ratio of 75:1. Concentrations of the dye extracts (Df) were calculated from the previously constructed calibration graphs of the dye in 20% aqueous pyridine.

After-treatment of Dyed Samples

The dyed samples were subjected to the following after-treatments: (i) tannic acid alone; (ii) tannic acid-potassium antimonyl tartrate (full back-tan); (iii) tannic acid-zinc chloride; and (iv) tannic acid-zinc acetate.

The dyed cotton fabric was worked in a conical flask containing 10% on the weight of fabric of tannic acid in 0.05M borax at 60°C. in a liquor to material ratio of 50:1 for 1 hr.

The treated fabric was removed, rinsed, squeezed and divided into four pieces; one of them was dried and taken up for the wash fastness test. The other three were transferred to individual conical flasks containing 10% on the weight of fabric of each of the following fixing agents: potassium antimonyl tartrate, zinc chloride and zinc acetate in distilled water and worked for 1 hr. using the same temperature and liquor to material ratio; they were then removed, rinsed, squeezed, dried and subjected to wash fastness test.

Preparation of the Detergent Solution

The detergent solution was prepared by dissolving 4g. of *Omo* detergent (Dawson, 1981) in a litre of distilled water. The solution was stirred for 30 mins. and allowed to stand for 1 hr. It was then filtered using a clean cotton fabric to obtain a clear solution of *Omo* detergent (pH 9.4).

Fastness to Washing

The treated samples were individually submerged in *Omo* solution maintained at a constant temperature of 80°C. for 2 hrs. in a flask fitted with a mechanical stirrer and reflux condenser. A liquor to material ratio of 100:1 was employed. The absorbance of dye loss was taken at regular intervals and used to calculate the amount of dye loss from the previously constructed calibration graphs of each dye in the detergent solution.

RESULTS AND DISCUSSION

The amounts of dye adsorbed by the cotton fabrics and that left in solution are shown in Table I.

TABLE I

ADSORPTION OF DYES BY THE COTTON FABRIC

Dyes	Dye on fibre (g.) $\times 10^{-3}$	Dye left in bath (g.) $\times 10^{-3}$
DURAZOL BROWN 2RS	13.50	6.45
DURAZOL ORANGE 2G	10.50	8.75

An examination of the figures of Table I clearly demonstrates the effect of an additional benzene ring in the dyestuff molecule; the effect of an increase in the molecular weight in promoting dye uptake on the fibre is illustrated in Fig. 1.

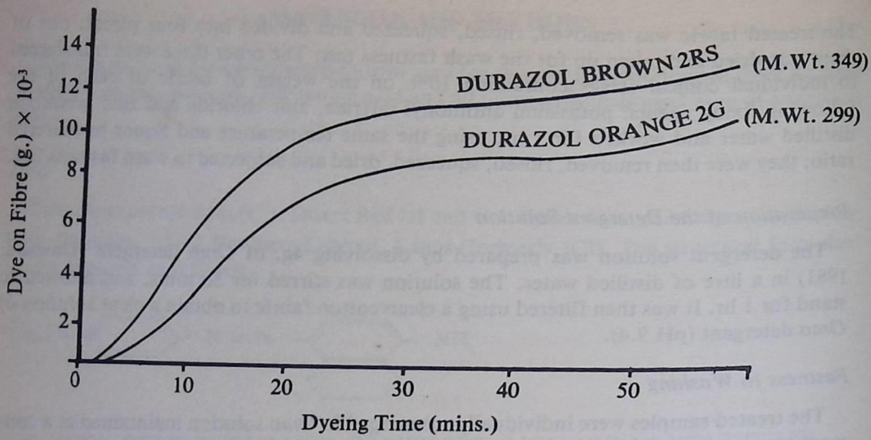


Fig. 1. Effect of Molecular Weight on Dye Uptake

Prior to the after-treatment of dyed cotton samples, it was necessary to investigate a suitable application condition for the uptake of tannic acid by undyed cotton. The following media were investigated: distilled water, 0.05M sodium chloride and 0.05M zinc chloride; it was observed that the pretreated cotton fabrics were greatly discoloured when treated at 60°C. for 1 hr. in each of these solutions. The discolouration may be due to the sensitivity of the pretreated cotton to atmospheric oxygen. Traces of oxygen cause intensive oxidation and consequently degradation of cellulose. As this discolouration will be objectionable to any subsequent process, it was necessary to search for a non-discolouring application condition.

Since tannic acid contains hydroxyl groups, it will be safe to apply it to cotton under alkaline conditions. A buffered solution of 0.05M borax (pH 9.2) was therefore used to apply the tannic acid but the fixing agents were applied with distilled water.

As the wet fastness properties of direct dyes on cotton often do not fall in line with requirements, they must be improved by other methods. With a view to examining the effect of new types of after-treatment for cotton, the following compounds were investigated: tannic acid alone; tannic acid-potassium antimonyl tartrate (P.A.T. or tartar emetic); tannic acid-zinc chloride and tannic acid-zinc acetate. It was observed that tannic acid improved to some extent the wet fastness properties of the dyes used. This may be due to the modification of the substrate by tannic acid through hydrogen bond formation which lowers the rates of diffusion of the dye out of the dyed cotton fabrics.

Additional treatments with potassium antimonyl tartrate, zinc chloride and zinc acetate enabled better results to be obtained. The mechanism of fixation of tannic acid with these metallic salts is still unknown but it is believed to be due to the interaction between tannic acid and metallic salts to give less soluble, colourless complex (Shore, 1971) of potassium antimonyl tannate or zinc tannate, possibly present as a ‘skin’ formed at the outer surface of the fabrics.

The various amounts of dye loss from untreated and after-treated dyed cotton fabrics are shown in Table II and illustrated in Figs. 2 & 3. The amounts of dye loss from the full back-tanned cotton fabrics indicated that this process gave the best improvement in wet fastness properties of the direct dyes used. It was thought necessary to find an efficient substitute for tartar emetic. Two of the inexpensive metallic salts, zinc acetate and zinc chloride were substituted for tartar emetic and zinc acetate in particular did give a certain amount of success.

Table II

WASH FASTNESS OF UNTREATED & AFTER-TREATED DYED COTTON FABRICS

Dye/shade/treatment	**Initial amount of dye in the fabric (g.) × 10^{-3}**	**Time (mins.)**	**Amount of dye loss (g.) × 10^{-3}**	**% Dye loss**
DURAZOL BROWN 2RS	13.50	0	—	—
2% shade untreated	,,	5	3.69	27.33
	,,	10	4.63	34.30
	,,	20	5.70	42.22
	,,	30	6.37	47.19
	,,	40	6.96	51.56
	,,	60	7.58	56.15
	,,	80	8.17	60.52
	,,	100	8.55	63.34
	,,	120	8.79	65.12
	13.50	0	—	—
DURAZOL BROWN 2RS	,,	5	2.59	19.19
2% shade treated with	,,	10	3.58	26.52
10% tannic acid	,,	20	4.35	32.23
	,,	30	5.28	39.12
	,,	40	5.83	43.19
	,,	60	6.57	48.67
	,,	80	6.85	50.74
	,,	100	6.92	51.26
	,,	120	7.13	52.82

DURAZOL BROWN 2RS 2% shade treated with 10% tannic acid — 10% tartar emetic	13.50	0	—	—
	,,	5	1.18	8.74
	,,	10	1.82	13.48
	,,	20	3.00	22.23
	,,	30	3.62	26.82
	,,	40	4.13	30.60
	,,	60	4.66	34.52
	,,	80	5.23	38.74
	,,	100	5.32	39.40
	,,	120	5.42	40.15
DURAZOL BROWN 2RS 2% shade treated with 10% tannic acid — 10% zinc acetate	13.50	0	—	—
	,,	5	1.56	11.55
	,,	10	2.29	16.97
	,,	20	3.47	25.71
	,,	30	4.09	30.30
	,,	40	4.66	34.52
	,,	60	5.32	39.41
	,,	80	5.62	41.63
	,,	100	5.84	43.26
	,,	120	5.96	44.15
DURAZOL BROWN 2RS 2% shade treated with 10% tannic acid — 10% zinc chloride	13.50	0	—	—
	,,	5	2.21	16.37
	,,	10	2.84	21.04
	,,	20	3.87	28.67
	,,	30	4.57	33.86
	,,	40	5.04	37.34
	,,	60	5.75	42.60
	,,	80	5.96	44.15
	,,	100	6.29	46.60
	,,	120	6.45	47.78
DURAZOL ORANGE 2G 2% shade untreated	10.50	0	—	—
	,,	5	2.77	26.39
	,,	10	4.01	38.19
	,,	20	5.44	51.80
	,,	30	6.16	58.67
	,,	40	6.89	65.62
	,,	60	7.34	69.91
	,,	80	7.62	72.58
	,,	100	7.79	74.19
	,,	120	7.95	75.72

DURAZOL ORANGE 2G 2% shade treated with 10% tannic acid —	10.50	0	—	—
	,,	5	2.43	23.15
	,,	10	3.61	34.33
	,,	20	4.96	47.24
	,,	30	5.70	54.29
	,,	40	6.30	60.00
	,,	60	6.97	66.38
	,,	80	7.24	68.96
	,,	100	7.35	70.00
	,,	120	7.58	72.19
DURAZOL ORANGE 2G 2% shade treated with 10% tannic acid — 10% tartar emetic	10.50	0	—	—
	,,	5	1.27	12.10
	,,	10	1.96	18.67
	,,	20	3.08	29.33
	,,	30	3.77	35.91
	,,	40	4.60	43.81
	,,	60	5.11	48.67
	,,	80	5.53	52.67
	,,	100	5.81	55.34
	,,	120	5.92	56.38
DURAZOL ORANGE 2G 2% shade treated with 10% tannic acid — 10% zinc acetate	10.50	0	—	—
	,,	5	2.03	19.34
	,,	10	3.29	31.33
	,,	20	4.48	42.67
	,,	30	5.14	48.96
	,,	40	5.86	55.81
	,,	60	6.44	61.33
	,,	80	6.70	63.81
	,,	100	6.89	65.62
	,,	120	6.97	66.38
DURAZOL ORANGE 2G 2% shade treated with 10% tannic acid — 10% zinc chloride	10.50	0	—	—
	,,	5	2.14	20.38
	,,	10	3.43	32.67
	,,	20	4.58	43.62
	,,	30	5.42	51.62
	,,	40	6.02	57.34
	,,	60	6.68	63.62
	,,	80	6.97	66.38
	,,	100	7.18	68.38
	,,	120	7.31	69.62

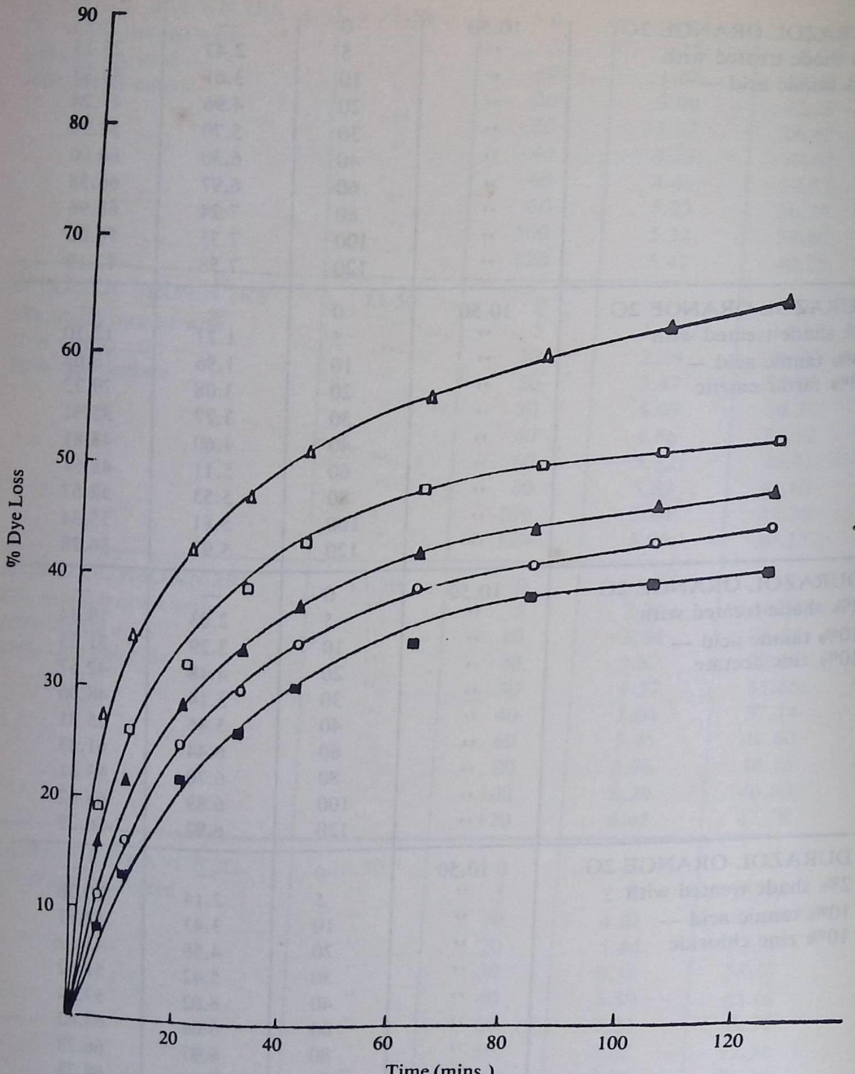


Fig. 2. Dye Loss Curves of Durazol Brown 2RS (2% shade) in *Omo* solution at 80°C.
△ Untreated
□ Treated with 10% tannic acid
▲ Treated with 10% tannic acid and 10% zinc chloride
○ Treated with 10% tannic acid and 10% zinc acetate
■ Treated with 10% tannic acid and 10% potassium antimonyl tartrate.

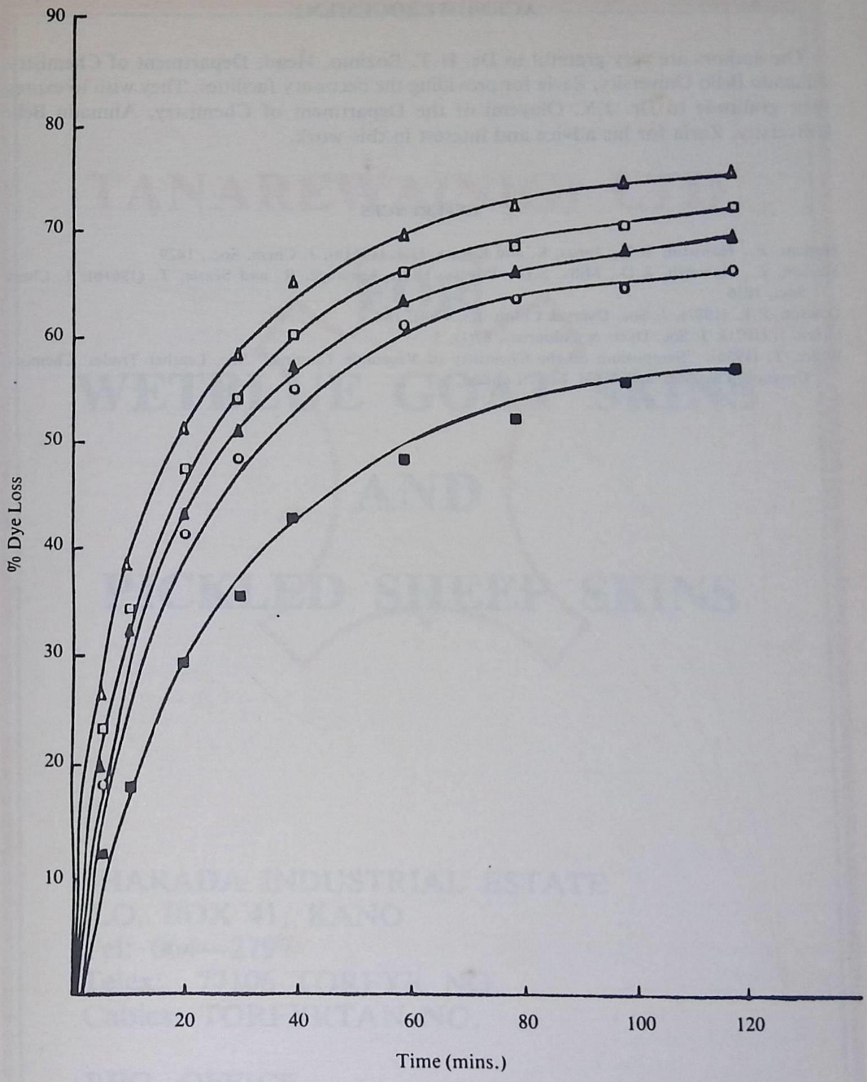


Fig. 3. Dye Loss Curves of Durazol Orange 2G (2% shade) in *Omo* solution at 80°C.

- △ Untreated
- □ Treated with 10% tannic acid
- ▲ Treated with 10% tannic acid and 10% zinc chloride
- ○ Treated with 10% tannic acid and 10% zinc acetate
- ■ Treated with 10% tannic acid and 10% potassium antimonyl tartrate.

ACKNOWLEDGEMENT

The authors are very grateful to Dr. H.T. Bozimo, Head, Department of Chemistry, Ahmadu Bello University, Zaria for providing the necessary facilities. They wish to express their gratitude to Dr. J.Y. Olayemi of the Department of Chemistry, Ahmadu Bello University, Zaria for his advice and interest in this work.

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ABSTRACTS
(FROM OTHER PUBLICATIONS)

HIDES AND SKINS

Haines, B.M. (1981), "CONSERVATION OF CATTLE HIDES BY FREEZING," J. Soc. Leath. Tech. Chem., **65** (3), 41.

Because of the large quantity of salt required in curing hides and the high cost it might incur, an alternative—the use of deep freezing techniques is investigated. The work is carried out in three separate parts, that is, the freezing and storage of hides at a temperature of — 30°C., whose leathers were assessed for quality and chemical stability; the freezing at — 10°C., a more commercially economical temperature, the leather quality and yields compared with those from salted hides similarly processed; and the freezing to — 10°C. and then thawing by the pallet load, rather than individually. Leathers from the small number of hides which were frozen for one month at — 30°C. compared favourably with those from salted hides. No adverse features were found. The grain layer showed no damage and was resistant to abrasion and flexing; the microscopical observations of the fibre structure revealed no marked differences. The physical and chemical properties were similar and on the whole, satisfactory leathers could be produced. In those hides frozen to — 10°C., no bacteria penetrated despite thawing at 10°C. over 48h. and a further delay of 48h. before processing. No statistically significant differences were observed between the final leathers of both the frozen and salted hides with regard to area yield, fibre structure of leather, grain surface appearance and physical properties of leather. Processing variations within the tannery caused the observed differences between the leathers of the two processed packs than between the leather from the salted and frozen hides. On the whole, freezing at — 10°C. and storage at this temperature has resulted in no adverse features in the final leather and the area yield remained unchanged. The handling costs involved in interleaving the frozen hides with polythene or other spacing materials could be the disadvantage of these two trials. Pallet freezing at — 10°C. and thawing by paddling in water produced satisfactory leathers and is considered to be economical. (8 Figs.; 14 Tabs.; 9 Refs.)

(GDG)

BIO-SCIENCES AND TECHNOLOGY

Robertson, M. (1980), "BIOLOGY IN THE 1980s, PLUS OR MINUS A DECADE," Nature, **285** (5764), 358.

Most speakers at a symposium on 'Biology in the 1980s' at the Friedrich Miescher-Institute agreed that new discoveries and revolutionary concepts in science are mostly unpredictable. Discussions are therefore limited to work carried out in the past one or two decades and a few outstanding questions. Some of the significant disclosures include technique to investigate hitherto inaccessible processes in mammalian development, production of a mutant barley which lacks proanthocyanidins, cloning of two interferon genes by genetic engineering and a new technique for studying the relationship between genotype and neoplastic phenotype. The control of embryonic development and the mechanism of plasticity in the nervous system are two important questions to which solutions should be found. The answer to the first depends on techniques for identifying morphogenetic substances while that to the second depends on techniques for measuring small changes in synaptic resistance. (5 Refs.)

(GE)

Dickson, D. (1980), "BIOTECHNOLOGY: CANADA STIRS," Nature, **285** (5765), 431.

An independent working group is set up to advise the government whether and how to promote the growth of biotechnology within the country. One major objective of the group is the assessment of the potential of the country to compete directly with other countries in certain areas such as the biological production of industrial chemicals and health care products. It is also envisaged that adequate attention will be given to the country's characteristic resources and needs in the areas of energy, mining, food, agriculture and forestry. Among the issues to be resolved by the working group is whether the predominantly foreign-based companies operating in the country would be ready to support research and utilise the research findings within the country. Other factors to be considered include the gulf between university research and its potential applications and the nature and extent of government's involvement in research.

(GE)

TANNING AGENTS AND MECHANISM OF TANNAGES

Holwerda, R.A. and Petersen, J.S. (1980), "CHROMIUM (III) PRODUCTS FROM THE REDUCTION OF 1,4—BENZOQUINONE BY CHROMOUS ION. SYNTHESIS OF THE μ—OXO —BIS [PENTAAQUOCHROMIUM(III)] ION," Inorg. Chem., **19**(6), 1775.

The reduction of 1,4 benzoquinone by chromous ions in both weakly and strongly acidic solutions yielded chromium (III) products which were isolated through cation-exchange chromatography on SP-Sephadex C—25 resin. The mechanism proposed by Ardon and Plane for the formation of di-μ-hydroxo-bis [tetraaquochromium(III)] ion is: Cr^{II} + two-electron oxidizing agent $\rightarrow Cr^{IV}$; $Cr^{II} + Cr^{IV} \rightarrow$ binuclear product. The product distribution results obtained through experiments implied that Cr(IV) was not produced as an intermediate. (1 Fig.; 1 Tab.; 20 Refs.)

(AAN)

Pahlavanpour, B., Thompson, M. and Thorne, L. (1981), "SIMULTANEOUS DETERMINATION OF TRACE AMOUNTS OF ARSENIC, ANTIMONY AND BISMUTH IN HERBAGE BY HYDRIDE GENERATION AND INDUCTIVELY COUPLED PLASMA ATOMIC-EMISSION SPECTROMETRY," The Analyst, **106** (1261), 467.

A method using hydride generation technique and inductively coupled plasma for simultaneous determination of arsenic, antimony and bismuth in herbage is described. The samples were dry ashed in the presence of magnesium nitrate to prevent loss of analyte by volatilisation and incorporation into the walls of the crucible, and leaving the analyte residue in a readily soluble form. Spiking experiments showed excess of analyte compared with concentrations added. The mean recovery for all the three analytes was 98.7% with a standard error of 1.2%. The results of analysis of standard reference materials are in close agreement with the Bowen's kale standard and the U.S. National Bureau of Standards. Blank determinations with reagents and cellulose floc were low, equivalent to less than 0.01μg. g.$^{-1}$ of any of the analytes. Also, the effect of trace amounts of analytes in the reagent is negligible, unless at very high levels. (1 Fig.; 2 Tabs.; 7 Refs.)

(FAL)

Brooke, P.J. and Evans, W.H. (1981), "DETERMINATION OF TOTAL INORGANIC ARSENIC IN FISH, SHELLFISH AND FISH PRODUCTS," The Analyst, **106** (1262), 514.

Two methods are described for the determination of total inorganic arsenic in fish and fish products. The first method involves separation of the inorganic arsenic by distilling it from 6.6 N hydrochloric acid. The second method involves chelation and extraction of inorganic arsenic after sample dissolution in sodium hydroxide solution, with subsequent back-extraction and oxidation. In both methods the arsenic concentration is measured, after hydride generation by atomic-absorption spectrophotometry with atomisation in a flame-heated silica tube: with the first method the solution contains arsenic (III), and in the second the solution contains arsenic (V). Results obtained by both methods are in agreement over a range of samples. The distillation method is favoured for reasons of efficiency and economy in time. The derived limit of detection and confidence intervals are given. (5 Tabs.; 10 Refs.)

(Authors' summary)

Eusebius, L.C.T., Ghose, A.K. and Dey, A.K. (1981), "THIOSULPHATE AS A COMPLEXING AGENT IN THE SEPARATION OF CATIONS BY CATION—EXCHANGE CHROMATOGRAPHY," The Analyst, **106** (1262), 529.

A batch equilibration technique has been employed using an aqueous and aqueous — alkaline thiosulphate — Dowex 50W—X8 system to separate metal ions. The formation of strong anionic complexes by Cu(II), Cd(II), Ag(I) and Pb(II) lowers their distribution coefficients (K) appreciably and they therefore remain in solution while other cations are taken up by the cation exchanger. A critical analysis of the K values indicated the conditions under which a number of binary and ternary mixtures could be resolved by column chromatography. In 0.06—0.10M sodium thiosulphate solutions, the following binary separations have been achieved: Cu(II), Cd(II), Ag(I) or Pb(II) from Mn(II), Fe(II), Co(II), Ni(II), Zn(II), Mg(II), Ca(II), Sr(II), Ba(II), La(III) or Ce(III); and in 0.28M sodium thiosulphate solution Sr(II), Ba(II), La(III) or Ce(III) were separated from other metal ions studied. The following ternary mixtures have also been resolved: Cu(II), Cd(II), Ag(I) or Pb(II) from Mn(II), Fe(II), Co(II), Ni(II), Zn(II), Mg(II) or Ca(II) from Sr(II), Ba(II), La(III) or Ce(III). In all of the separations favourable column kinetics have been observed. The distribution coefficients, elution characteristics of metal ions, elution curves and statistical analyses of the results of the resolution of artificial binary and ternary mixtures are reported.

(Authors' summary)

LEATHER PRODUCTS

(1980), "NEW IDEAS FOR SHOEMEN AT CFI EXIBITION," Shoe and Leath. News, **Nov. 13**, 20.

The Apparel Industries Exhibition at Harrogate organised by the Clothing and Footwear Institute (CFI) offered much to the Clothing and Footwear manufacturers. The displays of technical literatures and instruments included rechargeable battery-operated Coats Digital Tension — Pressure Meter (Mk 2) used for checking and setting thread tension and presser foot load of industrial sewing machines; the Memory Stitching Unit Model 2800 T4 with its own programming centre; Barudan, an electronically-controlled multi-head embroidery machine; new profile sewing machine Models BAS.301M and BAS.330 Profile S; a new colour matching service which enables customers to have fabric swatches matched to the correct thread colour from the ESL range; and I.C.S. Colour Match Prediction Computer.

(ETO)

McKay, G. (1980), "PEAT — AN ADSORBENT/FILTRATION MEDIUM FOR WASTEWATER TREATMENT," Water Services, **84** (1012), 357.

Peat has a chemical composition and particulate nature which makes it an effective adsorbent and filter for wastewater treatment. The types of wastewater for which peat has been found suitable for their treatment are reviewed. Among these are (i) oil spills wastewater, from which peat can selectively absorb as much as eight times its weight of oil, while releasing the associated water; (ii) textile dyes wastewater, with peat adsorbing as much as its own weight of the dyestuff; (iii) phosphate wastewater, where peat has been used to achieve removals of 82% phosphorus, 90% nitrogen, 95% BOD and 99+% pathogens; and (iv) polluted streams, from which metal ions such as Cu^{2+} and Pb^{2+} are successfully removed by its use. (4 Figs.; 2 Tabs.; 19 Refs.).

(JBG)

(1980), "PLASTIC FILTER MODULES FOR EFFICIENT FILTRATION," Water Services, **84** (1012), 372.

An arrangement of biofilters with pvc-sheets called 'Plasdek' is designed by AB Carl Munters to achieve high efficiency in wastewater treatment. Compared with the conventional ASP and stone biofilters, it accommodates a much higher organic and hydraulic loading and adapts much better to shock loadings. It requires relatively smaller land area and is easy to instal and operate. A plant handling 7200 $m.^3$ of wastewater has been successfully installed and operated in Sweden. (1 Fig.; 1 Tab.)

(JBG)

Borman, S. (1980), "PROCESS MEASUREMENTS FOR ENVIRONMENTAL ASSESSMENT," Environ. Sc. and Tech., **14** (4), 385.

A three-phased approach has been advocated for complete chemical and biological characterization of industrial effluents. Phase 1 is a survey which establishes whether or not a potential environmental problem exists in connection with any of the process streams. Phase 2 identifies specific chemical species responsible for the environmental hazard in streams ranked most hazardous in the Phase 1 survey. The third phase involves continuous monitoring of key indicator materials to evaluate long-term process variability. At each phase, appropriate analytical and bioassay techniques are applied.

(AAN)

Madeley, J. (1980), "TARGET 2000: ALL AFRICAN COMMON MARKET," West African Technical Review. **July, 29.**

The need for an All-African Common Market is examined. In April 1980, African Heads of State held an extra-ordinary meeting in Lagos during which they mapped out a plan of action for the economic development of the African continent by the year 2000. The plan envisaged increased co-operation between African countries in the areas of trade, industry, transport and communications, food and agriculture, monetary affairs, science and technology and natural resources. It was intended that the existing and strengthened regional and economic sector organisations should form the basis for such continental-wide co-operation. Such co-operation will give boost to the development of continental industries, proper financial support to regional technology centre, promotion of inter-continental trade besides improving the intra-African transport and telecommunications network. (1 Tab.)

(AAI)

Kodjo, S.O. (1981), "THE PROBLEM OF THE ENVIRONMENTAL NEUTRALITY OF TECHNOLOGY AND ITS POLICY IMPLICATIONS," The Nigerian Journal of Development Studies, **1** (1), 1.

The application of imported technology to the LDC conditions is critically examined. The development of technologies in the advanced countries was determined by the socio-economic conditions in those countries. The technology, therefore, was not environmentally neutral. Various aspects in which the advanced-country technologies can be inappropriate to the socio-economic conditions of under-developed countries were discussed. Any meaningful and lasting solutions to the technological problems of the underdeveloped countries must take cognisance of the peculiar circumstances prevailing in such countries. (15 Refs.)

(AAI)

Tayler, M. (1980), "DESK — TOP COMPUTERS AND MANAGEMENT INFORMATION," Chem. and Ind., **June 21 (12)**, 482.

Computers are capable of removing the drudgery of routine work and of enabling man to be creative — a job that 'he is best at'. They also help the user to know more about his job. The advantages and disadvantages of both the micro-computer and a large installation are explained with a note that micro-computer has widened the potential use of computers. Computers can be divided into three sizes: Large, office and desk-top. All computers do the same things, viz., Input, Store, Process and Output. The basic structures of computers are mentioned. There are 16 computer languages in regular use and that the most commonly used is the COBOL (Common Business Oriented Language). For micro-computers, the language in use is Basic (Beginners All-purpose Symbolic Instruction Code) because of its simplicity and wide application. The calculation routines of micro-computers to prepare market forecasts are analysed. (1 Fig.; 1 Ref.)

(EOAF)

Kronick, D.A. (1982), "SCIENTIFIC JOURNALS: A REVIEW ARTICLE," The Library Quarterly, **52** (3), 265.

For over three centuries, the journals have played a significant role of transmitting and storing scientific and technical information. The concern over the effective continuity of this role had resulted in a series of studies and reports, the findings of which are contained in the volume being reviewed. Emphasis is laid on the U.S. scientific and technical journals. The volume provides a description of a conceptual model, summary of the journal system, factors covering the authors' relationships to the system, the flow of information, the economics of publishing, the effects of interlibrary loan, networking and copyright and finally a futuristic view of the newly evolving electronic journal system. (6 Refs.)

(EOAF)

Walgate, R. (1980), "FRENCH RESEARCH: BETTER BUDGETS," Nature, **285** (5766), 527.

As part of its plan to boost research and development expenditure from 1.8 percent of the gross domestic product (GDP) to 2.3 percent, by 1985, the French government had proposed a 20% increase in the R & D expenditure in 1981. This expenditure proposal compared favourably with the figure of 2.2% of the GDP spent on research and development in other large Western countries. The report of a group on industrial research and development had recommended to the Secretary of State for Science, a 65% increase in industrial research and development spending, over the next five years. This level of expenditure compared favourably with the 40% target set by the Council of Ministers to be achieved 'in a few years'. The principal beneficiaries of the new proposal would include the Centre National de la Recherche Scientifique (CNRS) which accounted for a large part of basic research in France.

(AAI)

Valluri, S.R. and Rohatgi, P.K. (1980), "MANAGEMENT OF SCIENCE AND TECHNOLOGY IN DEVELOPING COUNTRIES: THE INDIAN EXPERIENCE," J. Scient. Ind. Res., **39** (7), 349.

The pervasive influence exercised by science and technology in almost all aspects of human endeavour has become the major concern of governments whatever be their political philosophies. Governments therefore spend a sizeable portion of their income to set up infrastructure for academic training and R & D in institutions of higher learning and laboratories covering every field of interest. The 1974—1979 and 1978—1983 Development plans for science and technology in India were outlined. The Green Revolution and the increased power supply were used as examples of the influence of science and technology development. People have become aware of the impact of R & D on the growth and development of the nation. The need to develop purposeful R & D laboratories for a developing country like India is very high but it must be noted that this cannot satisfy the totality of the needs without the utilisation of some imported know-how, the choice of which must be very deliberate. This imported technology can then be absorbed ultimately and subsequently becomes the base for growth. The proper personnel management in R & D institutions has been recognised as one of the most essential ingredients for obtaining high quality results. The importance of technology and information transfer and extension services is stressed. Institutional collaboration ensures utilisation of inter-disciplinary inputs, avoidance of unnecessary duplication of research efforts, collective wisdom from different groups, opportunity to conduct large scale replicates of trials and savings in total investment of infrastructure.

(BBD)

Rich, V. (1980), "RESEARCH APPLICATION: HUNGARY EXPECTS," Nature, 285 (5764), 351.

Science in Hungary has a top-heavy structure with too many research institutes for the economy to conveniently support. Plans are under way to re-orientate the roles of these institutes from the present state of conducting 'insignificant and middle-level' basic research to that which serves the socio-economic needs of the country. In this pragmatic streamlining of research institutes, emphasis is to be placed on directing researches to the needs of export since more than half of the country's GNP comes from exports. Integration of the staff of the institutes into the teaching structure of the universities is being envisaged. It is hoped that at the end of the exercise, the government would have succeeded in reshaping the balance between academic and applied research while still maintaining the total number of research job opportunities. (1 Fig.)

(GE)

IULTCS Regional Conference

4—6 October, 1985

The Conference of North European Regional International Union of Leather Technologists and Chemists Societies is scheduled to be held at the Cairn Hotel, Horrogate, Yorkshire during 4—6 October, 1985. The conference hosted by the Society of Leather Technologists and Chemists will consist of presentation of papers on various aspects of leather science and technology, woolskins etc. followed by the Annual General Meeting of the SLTC. All bookings must be made by 31st August 1985; the contact address for obtaining more particulars and for participation at the conference is as follows:

Mr. J. Reek
Conference Booking Officer
49 Broomfield Road
Heaton Moor
Stockport
Cheshire SK4 4LZ.

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The scope for the papers intended for publication in the JLR could project the research and development work conducted on science and technology of leather and leather-products such as footwear and all types of leathergoods, chemistry, biochemistry, physics, biophysics, biology, microbiology, environmental engineering, by-product utilisation, quality control and standardisation, machinery and equipment, industrial chemicals, management, technical education and training, economics, marketing and dissemination as applicable to leather and leather-products industries.

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LEATHER RESEARCH INSTITUTE OF NIGERIA
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CONTENTS

STUDIES ON PICKLED SKINS — CASE FOR QUALITY CONTROL AND STANDARDISATION

S. Bangaruswamy, E.T. Obonukut and F.O. Ohiani
Leather Research Institute of Nigeria, P.M.B. 1052
Zaria, Nigeria

ABSTRACT

Pickled skins constitute one of the items of export by the Nigerian leather industry. Quite a good degree of variations in the characteristics of pickled skins are observed. A need is recognised to implement quality control measures in the pickling plants and tanneries engaged in the exports of such skins. Requirements in respect of certain important characteristics are suggested as the basis for the formulation of Nigerian standard specifications for pickled skins with a view to help both the Nigerian exporters and the importers abroad.

INTRODUCTION

Pickled skins continue to remain one of the export-items of many of the third world countries, although efforts towards further processing them within the respective countries are being stepped up. Quite a substantial proportion of Nigerian goat and sheep skins are exported in the pickled state. The skins in the raw condition undergo the normal sequence of beamhouse operations from soaking to pickling and those meant for export receive additional treatment with fungicides in the pickle bath; sodium trichlorophenate, sodium pentachlorophenate, sodium silicofluoride, p-nitrophenol, o-, m- and p-cresols, p-chloro-m-cresol and β -naphthol are the commonly used fungicides. The pickled stock, after assortment, is then packed in bundles in such a way that the skins are protected from over-drying, contact with water etc.

The consignments containing the material, as they arrive at the importer's point, are highly heterogenous in their characteristics and need appropriate adjustments during further processing. It would be advantageous for both the supplier and buyer, if the material under transaction is fairly uniform with respect to its inherent characteristics. Ensuring uniformity will enable the tanner to use just the required quantities of chemicals over the stipulated time and thus leads to savings in the cost of inputs such as chemicals including water, labour and power and often savings in time. For the buyer, the uniformity in the starting material will greatly help him to devise his processing methods easily and orient the production with confidence.

Pickling practices vary amongst tanneries. The process of pickling must take into account the differences in possible process adjustments made prior to pickling. Quality of water supplies, extent of float, amounts and purity of chemicals employed, duration of pickling etc., factors influence the uptake of input chemicals. Insufficient amounts of salt and acid in the pickled skins cannot preserve the stock effectively. The material with extremely low pH will cause deterioration of the hide substance and consequent fall in strength properties. Undue amounts of moisture in the export-stock may hasten degradation. The variations in the practices of pickling reflect in the differences in physical and chemical characteristics of the skins posing problems to importers thereby leading to complaints over the transactions. A case for quality control for the pickled skins of Nigerian origin was felt and studies on their physical and chemical characteristics were taken up to throw more light on the whole problem. The studies may also help to evolve appropriate national standard specifications for pickled skins.

MATERIALS AND METHODS

Six representative samples of export quality pickled goatskins were collected from different commercial tanneries of Nigeria. They were subjected to physical testing and chemical analyses (Landmann, 1980; Soc. Leath. Tech. Chem., 1965).

RESULTS

The data on physical testing and chemical analyses are presented in Table — I. Based on the data, the requirements for pickled skins of Nigerian origin in respect of some important characteristics are suggested as provided in Table — II.

TABLE — I

PHYSICAL AND CHEMICAL CHARACTERISTICS OF PICKLED SKINS

	Sample I	Sample II	Sample III	Sample IV	Sample V	Sample VI
Physical:						
1.1 Tensile strength, N/mm.^{2}	27.4	26.2	21.8	19.3	27.0	25.1
2. Tongue tear strength, N/mm. thickness	34.8	73.5	51.0	69.6	36.2	28.6
3. Stitch tear strength, N/mm. thickness	161.3	339.7	123.3	185.7	171.4	182.1
4. Shrinkage temperature, °C.	59	60	60	60	60	58
Chemical:						
1. Moisture-content, % by wt.	55.50	57.50	55.80	55.80	54.90	56.90
2. Acidity, as H_2SO_4, % by wt.						
(a) Bromophenol Blue	0.28	0.29	0.29	0.30	0.28	0.29
(b) Phenolphthalein	0.35	0.34	0.39	0.36	0.39	0.39
3. Salt, as NaCl, % by wt.	5.91	5.67	3.40	3.58	7.58	7.94
4. pH of aqueous extract	2.50	2.50	2.60	2.70	2.50	2.50
5. Free fatty matter, % by wt.	2.12	1.74	4.01	3.52	1.22	0.90
6. Hide substance, % by wt.	27.30	28.30	30.44	30.60	28.60	27.90
7. Calcium sulphate, $CaSO_4$, % by wt.	0.09	0.09	0.07	0.07	0.07	0.07

TABLE — II

SUGGESTED REQUIREMENTS FOR PICKLED SKINS

Sl. No.	Characteristic	Requirement
1.	Moisture, % by wt.	As agreed
2.	Acid-content, as H_2SO_4, % by wt., *Min.*	0.30
3.	Salt-content, as NaCl, % by wt., *Min.*	12.00
4.	Hide substance, % by wt., *Min.*	65.00
5.	p^H of aqueous extract, *Max.*	3.00
6.	Shrinkage temperature, °C., *Min.*	50.00

(Characteristics 2, 3 and 4 are expressed on moisture — free basis).

DISCUSSION

The physical characteristics of the skins are determined with a view to have some idea on the same. The reproducibility of the results on strength properties of pickled skins, as expected, was not found to be quite good. The results however indicate that the skins possessed sufficient strength. The hydrothermal stability of the pickled skins as shown by the figures for shrinkage temperature is found to be satisfactory for such skins.

As regards the chemical characteristics, moisture-content varies from 54.90 to 57.50% which could be considered normal. While the acid-content and pH of the stock are fairly uniform, the amounts of salt present high variation ranging from 3.40 to 7.94. This reveals indiscriminate use of salt during the process of pickling. Free fatty matter of the skins also records variations between 0.90 and 4.01 reflecting non-uniformity in the pre-pickling beam house operations. The figures for hide substance reveal a fair degree of uniformity. There was not significant difference in the values of calcium sulphate amongst the samples taken up for analysis indicating comparable extents of deliming and washing processes.

Based on the above observations that the pickled skins of Nigerian origin display variations in certain characteristics, a case for implementation of quality control measures in the processing of pickled skins is well-recognised. Apart from the point of view of export, uniformity of the pickled stock for a particular production in a given tannery is advantageous for the industry within the country as well. The need to prescribe national standard specification for pickled skins is also being increasingly felt and the tentative values for some of the important characteristics are provided in Table — II.

It is suggested that the Nigerian exporters and tanners may do well to adopt quality control measures in their production. It is also hoped that the industry will be greatly benefited by the adoption of standard specification for pickled skins being formulated by the Leather Research Institute of Nigeria under the auspices of the Standards Organisation of Nigeria.

ACKNOWLEDGEMENT

The authors wish to thank Dr. A.S. Mshelbwala, Director, Leather Research Institute of Nigeria for his keen interest during the course of the work.

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PREVALENCE OF SKIN DISEASES OF CATTLE AND ITS IMPACT ON LEATHER PRODUCTION IN NIGERIA

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ABSTRACT

An analysis of skin diseases of cattle revealed that there is a high prevalence of injuries due to tic fly bites infestation in the Kainji Lake area. There are also lapses in reporting and proper investigation of these hides and skins problems by Ministries nation-wide. This may be due to insufficient ante-mortem skin inspection, poor record keeping and low priority consideration of skin diseases. The implication of these skin conditions in the productivity of quality leather and the need to institute proper surveillance are briefly discussed.

INTRODUCTION

In order to achieve an integrated approach and maximum leather production in Nigeria, it is proper that the hides of cattle be adequately protected. This is because good quality hides, as the basic raw material, provide high quality leathers that would compete favourably in international markets.

While emphasis on leather quality has been on processing methods it is worthy to remember that the quality of leather depends on how the animal is managed. This is because the unhealthy condition of the skin of an animal would eventually affect the property of leather in terms of the latter's wear and tear, tensile strength, extensibility and amenability to various end-uses (Russel *et al.*, 1980).

Cattle hides available to the leather industry in Nigeria are about 1.3 million (Mshelbwala *et al.*, 1983) and the level of production is bound to fall except the hide of cattle is disease free. This paper discusses the prevalence of skin diseases of cattle of the Kainji Lake basin area, with emphasis on their effect on the production of leather in Nigeria.

MATERIALS AND METHODS

The survey was conducted between November 1979 and April 1981 in cattle markets that sprang up as cattle migrate south-wards during the dry season. Animals were examined for various skin lesions and diagnosis was based on gross pathological lesions, clinical signs, skin scrapings and light microscopy.

Green hides were also examined at Yashikera and New Bussa in Kwara State for dermatophilosis. Other data were obtained from scattered records of the Ministry of Agriculture, Annual Veterinary reports of Northwestern State (now Sokoto State) and Kwara State for the period 1975 — 1983 and from discussions with Veterinarians and Livestock Officers with responsibility for hides inspection, working in Kainji Lake area and other areas of Nigeria.

RESULTS AND DISCUSSION

The high number of food animals slaughtered annually, the expansion in construction of drying sheds and frame facilities for hides and skins at the Kainji Lake basin are indications of the resource potential of leather industry development in Nigeria.

An average of 95,524 cattle, 192,980 sheep and 15,259 goats are slaughtered annually in the local government areas in the Lake basin (Table I). Yelwa Local Government area has the largest share of the production of hides and skins as reflected by 81.91 — 98.37% slaughter figures and 96.97% hide buying licence issued per annum. The drying sheds in the Local Government areas are located in big market towns and slaughter slabs in villages.

While the survey revealed the potential for leather industrial development there were obvious lapses in the proper inspection of hides. This is because the slaughter slabs do not have trained personnel to inspect skin of cattle ante-mortem and the hides post-mortem. Eight major skin lesions were detected in animals examined in cattle markets. These include dermatophilosis, ringworm, wart, demodetic mange, cutaneous ulcer due to filariasis-related infections, tick and fly spots due to injuries from tick and fly bites, branding and lacerations on skin (Table II).

TABLE I

DISTRIBUTION OF LEATHER DRYING FACILITIES AND SLAUGHTER FIGURES IN LOCAL GOVERNMENT AREAS BORDERING THE KAINJI BASIN, BASED ON LOCAL VETERINARY ANNUAL REPORTS (1975 — 1983) (% TOTAL IN PARENTHESIS)

Local Government Area	No. of Districts	No. of Towns	No. of Sheds	No. of Frames	Average Licenced Buyers/Annum	Average slaughter/annum		
						Cattle	Sheep	Goat
Borgu	6 (50)	12(27.91)	6(30.00)	78(36.45)	46(3.03)	15084(15.79)	3146(1.63)	2760(18.09)
Yelwa	6 (50)	31(72.09)	14(70.00)	136(63.55)	1472(96.97)	80440(84.21)	189834(98.37)	12499(81.91)
Total	12	43	20	214	1518	95524	192980	15259

TABLE II

DISTRIBUTION OF SKIN LESIONS IN CATTLE EXAMINED IN SOME CATTLE MARKETS IN THE KAINJI LAKE BASIN AREA

Location	No. of Animals Examined	Skin Conditions							
		Dermato- philosis	Ringworm	Wart	Demodetic mange	Cutaneous Ulcer	Tick and Fly bites	Branding	Laceration
Sabon Pegi	13	1	—	2	1	1	3	—	—
Awuru	28	3	1	—	—	—	4	—	—
Yelwa	230	40	8	6	5	3	195	5	8
Malendo	22	2	1	8	3	—	5	2	1
Malale	8	—	—	1	—	1	3	—	—
Afani	6	3	—	—	2	—	1	—	—
New Bussa	75	14	4	11	—	5	21	1	10
Guffanti	20	5	—	1	—	—	3	—	2
Zugurma	18	6	1	3	1	—	7	4	—
Sabon Patiko	13	2	—	2	—	1	3	—	—
Koko	19	8	12	1	2	—	12	—	1
Total	452	84	27	35	14	11	257	12	22

Dermatophilosis and injuries due to tick and biting flies infestation constitute the majority of skin injuries in respect of all cattle examined. Cattle with dermatophilosis were in three clinical forms namely, *active,* in which the skin is characterised by open sores and matting of the skin that attract flies; *dormant,* characterised by crusted wounds and fresh scaring of skin; and *recovered* or *cured,* characterised by old healed blemishes and patches of dry alopecia.

However, the results of the survey were not correlated to those reflected in annual reports on skin disease problems of the Kainji Lake area which in most cases were unreported (Table III). For example the prevalence of dermatophilosis was 0.25 — 17.00% for ante-mortem and 1.46 — 38.60% for post-mortem examinations (Tables III & IV).

Infection by external parasites was generally high. This was reflected in Yelwa Local Government area with incidence of 2.26 — 47.34% but dermatophilosis was not reported. A similar observation on the lack of reporting of the prevalence of skin problems was made when a study on prevalence of dermatophilosis in cattle was initiated by the University of Ibadan in 1971. Their comment was: "Is it possible that livestock inspectors do not recognise the disease dermatophilosis?" The reasons for the low reporting incidence could be the lack of sufficiently trained livestock inspectors to monitor hides and skins conditions, lack of any preventive measures to curtail skin diseases and incorrect flaying practices, poor record keeping and low priority consideration of skin diseases often treated under the sub-heading of external parasites in the appropriate records.

TABLE III

RELATIVE PERCENTAGE INCIDENCE OF SKIN DISEASE OF CATTLE IN THE KAINJI LAKE AREA BASED ON LOCAL VETERINARY ANNUAL REPORTS (1975 — 1980)

Diseases	**Years**					
	1975	**1976**	**1977**	**1978**	**1979**	**1980**
Borgu Local Government Area						
Dermatophilosis	0.33	0.25	nr	17.00	5.40	10.30
External parasites (Ticks and others)	nr	nr	nr	0.32	nr	0.10
Yelwa Local Government Area						
Dermatophilosis	nr	nr	nr	nr	nr	nr
Lumpy skin diseases	0.69	nr	nr	nr	nr	nr
External parasites (Ticks and others)	nr	36.94	2.26	19.16	47.34	20.32

Key: nr = not recorded

TABLE IV

DERMATOPHILOSIS SURVEYS INITIATED BY MINISTRIES AND KAINJI LAKE RESEARCH INSTITUTE

Location	Investigator	Year	No. of Cattle Slaughtered	No. of Lesions (% on Cattle) Heavy	Medium	Light	Total
Katsina	M.A.N.R.	1970	228	17	13	15	45
				(7.46)	(5.70)	(6.58)	(19.74)
New Bussa	M.A.N.R.	1971	1025	—	3	12	15
				(—)	(0.29)	(1.17)	(1.46)
Yashikera	K.L.R.I.	1983/84	82	1	13	2	16
				(1.22)	(15.85)	(2.44)	(19.51)
New Bussa	K.L.R.I.	1983/84	645	3	15	231	249
				(0.46)	(2.33)	(35.81)	(38.60)

M.A.N.R. = Ministry of Agriculture and Natural Resources
K.L.R.I. = Kainji Lake Research Institute

Skin lesions have been recognised as a problem in cattle (Bida, 1969; Oduye, 1974a and 1974b; Lloyd, 1976; Bamidele and Amakiri, 1978) but they have not received the desired attention as a major problem, because they do not directly affect meat production nor do they drastically affect the live animals. However, studies show that dermatophilosis accounts for 27.0% and demodicosis 22.5% of skin lesions (Bamidele and Amakiri, 1978). Other epidemiological studies revealed that dermatophilosis accounted for 50 — 78% of bovine dermatosis (Bida, 1969; Oduye, 1974a and Lloyd, 1971). There is therefore a gross under-estimation of damage to hides and skins due to insufficient reporting.

Moreover, over a quarter of the hides obtained immediately after slaughter is bought for human consumption without really being examined. There is therefore the need to re-assess the value of damage being done in terms of non-availability of hides for leather production.

Hides and skins were one of Nigeria's main export commodities but since 1975 this sector of the economy has dwindled from 3 million tonnes in 1975 to 1 million tonnes in 1980, the value being from ₦6.8 million to ₦3. 7 million respectively (Fed. Min. of National Planning, 1981), showing a fall in revenue by about 50%.

Some of the reasons for this decline in production is skin disease problems, poor reporting, human consumption of hides and skins, production of poor quality hides and the lack of seriousness on dwindling revenue from hides not yet being considered a national loss. While the subject of this article is on Kainji Lake basin area, discussion with veterinarians elsewhere have shown similar trends nation-wide. The situation of skin disease reporting is therefore not peculiar to Kainji Lake basin area. In Katsina area, while the Ministry has reported 19.74% (Table IV) prevalence of dermatophilosis, Bida (1969) has recorded the same to be over 78% in the same area. There is therefore the need to continue investigations into skin lesions and their prevention, proper handling of hides and skins, provision of standard slaughtering facilities (so as to minimize damage of hides and skins) and adequate training of more livestock officers to handle hides and skins inspection. These measures are necessary for ensuring better quality and increased production of leather in Nigeria.

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BIO-SCIENCES AND TECHNOLOGY

(1980), "BIOTECHNOLOGY — FRANCE NOW," Nature, **286** (5769), 99.

A commercial organisation, TRANSGENE, has been set up by a group of French scientists for the exploitation of genetic manipulation. This enterprise is jointly sponsored by a consortium of industrial companies and certain research institutes. The nature of work as well as the scientific objectives will be defined by the scientific board.

(GE)

Mary, B., Gowri, C. and Krishnan, G. (1980), "OBSERVATIONS ON THE DIFFERENCES IN COMPOSITION OF COLLAGEN IN SUCKERS AND TENTACLES OF *SEPIA OFFICINALIS,*" Leath. Sc., **27** (1), 14.

Significant differences are observed in the physico-chemical properties of the collagens of the suckers and tentacles of *Sepia officinalis,* although they have similar moleculer organisation. The higher values of hydroxylysine, carbohydrate-content and non-collagenous protein obtained for sucker collagen are responsible for the more pronounced cross-linking and hence greater stability as reflected in higher denaturation and shrinkage temperatures as against the tentacle collagen. These differences are attributed to the different biological functions of these organs. (1 Fig.; 6 Tabs.; 18 Refs.)

(GE)

Natesan, R., Ramanathan, N. and Nayudamma, Y. (1980), "PHASE EQUILIBRIUM STUDIES ON THE CROSS-LINKING OF COLLAGEN FIBRES BY IODINE," Leath. Sc., **27** (1), 30.

The thermodynamic parameters of iodinated collagen subjected to thermal contraction under stress are determined. The heat of fusion ($\triangle$ H) introduced by iodine at pH 3 in collagen is found to be 2.2. Cross links in the collagen are probably mediated by the iodination of histidine and/or tyronine residues. An increase in hydrothermal stability of the iodinated collagen is observed. (12 Refs.)

(GE)

Rajaram, A. and Ramanathan, N. (1980), "THE HYDROTHERMAL DENATURATION TEMPERATURE OF CROSSLINKED COLLAGEN," Leath. Sc., **27** (2), 47.

The hydrothermal denaturation temperature Tg of crosslinked collagen fibres is measured by using a thermomechanical relaxation method. The Tg of crosslinked collagen fibres and skin treated with formaldehyde, acetaldehyde, glutaraldehyde, wattle and myrob was increased whereas chrome tannage did not alter the denaturation temperature even though the shrinkage temperature is raised very much in the latter case. The isometric tension was found to be very high for the crosslinked collagen, and continued to increase even at the boiling point of water. (1 Fig.; 1 Tab.; 21 Refs.)

(Authors' summary)

Mallika, M., Dhar, S.C. and Madhavakrishna, W. (1980), "STANDARDISATION OF DIFFERENT CULTURAL CONDITIONS FOR THE OXIDATION OF CATECHOL BY CERTAIN MOLDS," Leath. Sc., **27** (2), 53.

Survey shows *A. flavus, A. terreus and A. fumigatus* as the three strains of mold that have ability to significantly oxidise catechol. The various cultural conditions viz., pH, temperature and different constituents of the medium, incubation period and concentration of catechol, that are necessary for these strains are investigated to find out the extent of oxidation. Oxidation of catechol is highest for *A. flavus* in nearly all the cultural conditions studied. (2 Figs.; 7 Tabs.; 19 Refs.)

(GE)

Takenouchi, K. (1981), "DENATURATION AND BREAKDOWN OF HIDE COLLAGEN BY HEATING IN AIR," J. Soc. Leath. Tech. Chem., **65** (4), 65.

The denaturation and breakdown of hide collagen by heating in air were investigated by means of chemical and spectral analyses. From weight loss, solubility, infrared spectra, and hydrogen-deuterium exchange, it is suggested that collagen denatures gradually on heating at 130 — 160°C; that it denatures markedly during the initial period of heating at around 180°C, and then breaks down gradually; and that it starts to break down immediately on heating at 200°C or more. (10 Figs.; 14 Refs.)

(Author's summary)

Farag, A.B., El-Wakil, A.M. and El-Shahawi, M.S. (1981), "QUALITATIVE AND SEMI-QUANTITATIVE DETERMINATION OF CHROMIUM (VI) IN AQUEOUS SOLUTION USING 1,5 —DIPHENYLCARBAZIDE—LOADED FOAM," The Analyst, **106** (1264), 809.

Polyurethane foam previously treated with 1,5 -diphenylcarbazide reagent has been found to be sensitive and satisfactory in the detection and semi-quantitative determination of chromium (VI) in aqueous solutions in both batch and column experiments. The chromate ion collects on the foam matrix and is detected by a violet colour in the presence of the reagent. Determination of as little as 0.1ppm. was recorded. The reagent is also selective for chromium (VI) in low concentrations even in the presence of relatively high concentrations of various other elements. When 1,5—diphenylcarbazide-treated polyurethane foam was used as packing material for column experiments, lower chromium (VI) contents of up to 10ppb. was detected. A suitable colour scale was developed for chromium (VI) determination. (2 Tabs; 11 Refs.)

(AAN)

Peacock, C.J. and Singh, S.C. (1981), "INEXPENSIVE, SIMPLE HYDRIDE GENERATION SYSTEM WITH MINIMUM INTERFERENCES FOR THE ATOMIC—ABSORPTION SPECTROPHOTOMETRY OF ARSENIC," The Analyst, **106** (1266), 931.

A system for the hydride generation atomic-absorption spectrophotometry of arsenic is described that uses ordinary boiling-tubes to hold the acidified samples into which sodium tetrahydroborate (III) solution is injected and the evolved hydrogen carries the generated arsine directly through the spectro-photometer nebuliser to a nitrogen-supported hydrogen flame. The total arsenic evolved is measured by integrating the absorbance for 16s. Apart from transition metals of the cobalt, nickel and copper groups, the arsenic response appears to be insensitive to interferences, and the effects of these metals may be overcome by adding 0.5g of thiourea to each sample. The limit of detection (95% confidence) is about 6ng of arsenic and the reproducibility is about 1% for 0.5μg of arsenic. (2 Figs.; 8 Tabs.; 3 Refs.)

(Authors' summary)

Puvanakrishnan, R., Bose, S.M. and Dhar, S.C. (1980), "COMPARATIVE STUDIES ON BATING USING IMMOBILIZED PANCREATIC ENZYME PRODUCT AND PANCREATIN BATE IN THE MANUFACTURE OF GLACE KID," Leath. Sc., **27** (3), 81.

A novel technique for the manufacture of glace kid using immobilised pancreatic enzyme product is demonstrated. Considering the microscopical features and the physical and chemical properties of the finished leathers, this new technique compares favourably with pancreatin bate-treated leathers. The ability of the immobilised enzyme to be reused two or three times with minor loss in potency constitutes one of its advantages over soluble enzyme products. (1 Fig.; 3 Tabs.; 10 Refs.)

(GE)

Panneerselvam, M. and Dhar, S.C. (1980), "A NEW PROCEDURE OF BATING WITH FUNGAL ACID BATE AND A COMPARATIVE STUDY OF ITS EFFECTS ON FINISHED LEATHERS," Leath. Sc., **27** (7), 207.

A process for bating of blue chrome leather using fungal acid bate in acidic condition has been described. The use of the same bate for bating delimed pelts in acidic condition for the manufacture of glace kid has also been standardised. Microscopical features of the bated pelts and leathers, physical and chemical analyses of the finished leathers produced by using fungal enzyme bate have been compared with those of standard acid bate-treated leathers. The results obtained are critically discussed for the evaluation of the quality of leathers produced. (2 Figs.; 4 Tabs.; 7 Refs.)

(Authors' summary)

Hodder, J.J., Prentiss, W.C. and Ward, G.J. (1984), "PRACTICAL LEATHER PROCESSING USING THE NOVEL PRETAN CONCEPT II. RESULTS OF TANNERY TRIALS ON SIDE UPPER LEATHER," J. Amer. Leath. Chem. Assn., **79** (1), 6.

A patented pretanning procedure enabling splitting and shaving prior to tanning and retanning has been covered in previous papers. A number of production trials have been run in tanneries on several raw stocks to fine tune the process and make material adjustments in order to optimize shrinkage temperature and subsequent splitting and shaving of the pretanned stock. Process variables such as chrome charge in the primary tannage and auxiliary utilization are discussed in this paper together with the results of physical tests and chemical analyses. (4 Figs.; 3 Tabs.; 4 Refs.)

(Authors' summary)

Wilson, E. (1980), "BAD UK DESIGN IS NOT THE FAULT OF DESIGNERS," Shoe and Leath. News, **Dec. 18, 14**.

Bad U.K. design is not the fault of only the designers but a lot more contribute to it. British design does not compete; there are conflicting opinions as to what is wrong with design. Not enough potentially brilliant people in the factories are sent to design training schools, although such schools in U.K. are known to be the best in the world. Factors which create the right conditions in which design can grow are stressed. The habit of exactly copying the past designs should be discouraged and new approaches in designs be emphasised.

(ETO)

QUALITY CONTROL AND STANDARDISATION

Bailey, M., Audet, N.F., Demorais, M.F., Bernstein, S., Kupferman, Z. and Spindola, K. (1984), "EVALUATION OF FLAMMABILITY OF FOOTWEAR UPPER MATERIALS: PATENT AND REGULAR SHOE UPPER LEATHER Vs. PORVAIR AND CLARINO POROMERICS," J. Amer. Leath. Chem. Assn., **79** (1), 16.

The Chief of Naval Operations requested that the Navy Clothing and Textile Research Facility investigate the flammability and burn hazard potential of poromeric materials (Porvair and Clarino), after poromeric shoes worn by a sailor caught fire and severely burned his feet. As a result, poromeric materials were compared with regular and patent leather under several heat and flammability conditions. The findings showed poromerics burn when exposed to open flames and are indeed potentially hazardous; while the leathers, including patent leather, which has an easy-care finish like the poromerics, are fire retardant. (6 Tabs.; 2 Refs.)

(Authors' summary)

(1980), "QUALITY MARKING OF FOOTWEAR," Leather, **182** (4465), 39.

Papers on the quality marking of footwear which are relevant to the leather industry were presented at a Study Session held at the CTC (Centre Technique du Cuir), Lyon, France. Consumers need comprehensible, factual, not overwordy and strictly impartial information on the goods; an opinion poll revealed that 39% of them are willing to pay extra 1% for such information, 33% not fully convinced and 27% unwilling. About 60% of male customers wanted information at shopwindows before purchasing. Information on the production and wearing properties of upper and bottom materials was generally good. Details of work on footwear durability and wear behaviour, repairability, comfort and waterproofness as approved by AFPAC, the French Association for the Maintenance of Footwear Quality, are provided. The attitudes of independent retailers, the chain stores, departmental stores and the footwear industry for quality marking of footwear are expressed.

(ETO)

CONTROL AND TREATMENT OF EFFLUENTS/ENVIRON. SC. AND TECH.

Lollar, R.M. (1980), "TCA PROGRAM—ENVIRONMENTAL REGULATIONS," Leath. Manufacturer, **98** (1), 18.

The TCA's approach to the proposed Environmental Protection Agency (EPA) effluent disposal regulations is indicated as follows: to challenge the EPA's stringent regulations, by way of proving that EPA based its proposals on inadequate data; to improve awareness and information base within the leather industry and to encourage members of TCA to react to the regulations individually; to encourage suppliers of chemicals to react to the issue by assisting in showing, for example, that Cr^{3+} used in the leather industry is not environmentally hazardous; and to demonstrate that EPA had seriously underestimated the investment and annual costs of effluents treatment. The volume of wastewater per unit weight of hide or skin processed was erroneously calculated because EPA got confused between raw material weight bases, such as sides or hides; conventional versus fleshed hide weight; dozens or pieces of sheepskin; split/shaved weight versus cured stock weight on chrome in the blue grains; and untrimmed versus trimmed and shaved splits.

(JBG)

Budiansky, S. and Josephson, J. (1980), "WASTE DISPOSAL CHEMISTRY," Environmental Sc., & Tech., **14** (5), 508.

So far, there is no firm scientific basis for the treatment and disposal of hazardous wastes. For proper management of hazardous waste, adequate knowledge of its composition is very essential. Certain procedures for general analysis and classification of the wastes are being studied towards developing best treatment or disposal strategy as well as preventing dangerous reactions which would result from the mixing of incompatible materials. Hatayama has produced a compatibility chart which classifies the wastes into categories, such as oxidizing mineral acids, organophosphates and nitriles and lists possible interactions. Though little is known of the chemistry of hazardous wastes treatment, progress is being made in the treatment of polychlorinated biphenyls, halogenated organics and inorganic wastes, especially metals. The chemistry of incineration is also less understood. But some work done showed that certain breakdown products of incineration are sitll hazardous and more stable and resistant to further decomposition even at high temperatures of up to 800°C. (2 Figs.)

(JBG)

ECONOMICS AND MARKETING

Webster, Jr., F.E. (1981), "TOP MANAGEMENT'S CONCERNS ABOUT MARKETING: ISSUES FOR THE 1980's," J. Marketing, **45** (3), 9.

A study of top managers' views of the marketing function is discussed. The study was conducted by means of interviews and highlights the major problems which top managers consider inhibitive to the marketing function. These problems include insufficiency of innovative and entrepreneurial thinking among marketing managers, declining productivity of marketing expenditures in the face of rising marketing costs particularly in the areas of media advertising and field selling; the inability of marketing managers to comprehend basic concepts of financial management and the implications of their decisions on the financial performance of the enterprise. Other problems are the ineffectiveness of the product management system, the aversion of MBA graduate employees of the firms to risk-taking, coupled with the desire of these graduates to move too quickly into general management as against pursuing careers in sales and sales management, and the incomplete acceptance by some firms of the marketing concept as a management philosophy. As a result of these findings therefore, it is suggested that marketing managers should become more willing to take risks and more innovative and entrepreneurial in their thinking. They also need to devote more time to financial analysis relevant to their decisions. The MBA-trained managers also need to review their career plans and priorities. The need also arises for thorough investigations into the relevance of the product management system. (9 Refs.)

(AAI)

Tybout, A.M. and Hauser, J.R. (1981), "A MARKETING AUDIT USING A CONCEPTUAL MODEL OF CONSUMER BEHAVIOUR: APPLICATION AND EVALUATION," J. Marketing, **45** (3), 82.

This paper examines the role that conceptual models of consumer behaviour can play in a marketing audit. Research employing a model of consumer decision making (an expanded version of a normative model developed by Hauser and Urban), to assess the market position of a public transportation system, is reported. Use of this model to design and select strategy and to reassess market position after strategy implementation also is illustrated. The advantages and limitations of this approach to decision making are discussed. (3 Figs.; 10 Tabs.; 43 Refs.)

(Authors' summary)

DISSEMINATION

Wiberley, Jr., S.E. (1982), "JOURNAL RANKINGS FROM CITATION STUDIES: A COMPARISON OF NATIONAL AND LOCAL DATA FROM SOCIAL WORK," The Library Quarterly, **52** (4), 348.

Journal rankings from citation studies have been an important criterion for selection of journals for academic libraries. Recent research by Line, however, argues that rankings from one study do not indicate what rankings will result from any other study. Line, therefore questions use of citation studies in journal selection. This paper tests Line's argument by comparing journal rankings derived from national databases with rankings based on local data. National databases are sources representative of an entire field. Local data derive from publications from a particular school. Comparison of journal rankings from three national databases with rankings from citations from a subsequent period from one school of social work suggests that easily executed citation studies are a useful, if limited and imperfect, guide to the selection of the journals most important for a given collection. (5 Tabs.; 22 Refs.)

(Author's summary)

(1980), "APPROPRIATE TECHNOLOGY INTERNATIONAL," West African Technical Review, **Aug.**, 23.

The role of Appropriate Technology International (ATI), Washington is discussed. The aims of ATI are to seek out people with ideas and give them the support needed to get their projects off the ground. Examples of such ATI involvements include the service centre for a rural pottery industry in India and bio-gas plant in Papua — New Guinea to transform vegetable and animal wastes into fuel for vehicles and to generate compost and fertilizer as by-products. The projects are for the local people or institutions and the ATI is interested in those projects that employ technologies suited to local conditions and customs. ATI has no projects of its own and is concerned with management, with credit programmes, with setting in motion a process that will enable people to gain experience in organised business and production. The centre in Kenya is to serve the business needs of the people located in the outskirts of Nairobi. ATI, a non-profit making institution is established by U.S. congressional mandate; though funded by the government, it is controlled by an executive director and a board of directors selected mostly from the private sector and from various countries.

(BBD)

21ST TANNERS GET-TOGETHER, 1986
1—3 February 1986
Central Leather Research Institute
Madras India

The Tanners Get-Together (TGT), 21st in series, is scheduled to be held at the Central Leather Research Institute (CLRI), Madras, during 1—3 February, 1986. The theme will be "Recent Advances in Collagen and Leather Finishing." Papers on collagen and leather finishing will be presented; Tanners Open Forum and Poster Session will follow. Participants willing to contribute paper(s) are to send abstract(s) of about 200 words. Necessary facilities in the institute's tannery will be provided to commercial firms to demonstrate the application of their finishing auxiliaries.

Delegate Fee: Rs.100/= (A/c. Payee Draft in favour of CLRI)

Pre-registration with the delegate fee: 15 October, 1985

Abstracts and requests for demonstration: 15 November, 1985

Correspondence: The Conveners
21st Tanners Get-together, 1986
Central Leather Research Institute
Adyar, Madras 600 020
India.

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NOTES TO CONTRIBUTORS OF PAPERS

The scope for the papers intended for publication in the JLR could project the research and development work conducted on science and technology of leather and leather-products such as footwear and all types of leathergoods, chemistry, biochemistry, physics, biophysics, biology, microbiology, environmental engineering, by-product utilisation, quality control and standardisation, machinery and equipment, industrial chemicals, management, technical education and training, economics, marketing and dissemination as applicable to leather and leather-products industries.

As regards the methodology of publication of articles, please go through the papers appearing in JLR. The format and arrangement of various Sections of the article shall be:- Abstract, Introduction, Materials and Methods, Results along with Figure(s)/ Table(s) if any, Discussion, Acknowledgement(s) if any and Reference(s). The names of Sections of the paper ''Abstract'' etc., shall be at the middle of the line and in block letters. Sub-sections (sub-headings) can start at the margin and normal-typed and underlined or italicised. References shall be given within brackets in the running line eg., (Author's name, year); in case, there are only two authors, the names of both the authors be given eg., (—and—, year); references to articles contributed by more than two authors be indicated as follows: (Name of the first author et al., year); references to more than one article by the same author/s in the same year are to be indicated as follows: (first reference, year a); (second reference, year b) and so on. Reference to books shall indicate the name(s) of the author(s), (year of edition/publication), ''title of the book'', (name of the editor), name of the Press and page number (p.--). The ''References'' shall contain the names of all the authors who have contributed the article, arranged in alphabetical order, (year), name of the journal, **Vol. No.** (Issue No.) or **Month**, Page Number.

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CONTENTS

GROWTH PERFORMANCE AND IMPORT CONSTRAINTS OF THE NIGERIAN LEATHER INDUSTRY

A.A. Ihuoma
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ABSTRACT

The modern leather industry in Nigeria was one of those manufacturing industries which developed out of the need to process raw materials to some stage before export. The industry has since been gradually incorporated into the nation's framework of import substitution industrialisation which was very rigorously pursued in the 1960's. This has entailed enormous and increasing foreign exchange expenditure. The implication of the foreign exchange — dependent type of development for the leather industry is that foreign exchange shortage can act as an effective constraint to the industry's pace of development. This paper examines the growth performance of this industry and investigates the nature of the industry's import constraints. The findings of this paper clearly show that the output level in the Nigerian leather industry is dependent on the import levels of machinery, spare parts and tanning chemicals. The findings also support the contention that the acquisition of leather working machinery, spare parts of tanning machines and tanning chemicals depends on the capacity of the Nigerian economy to import. The policy implications of the observed import constraints are discussed.

INTRODUCTION

The Nigerian industrialisation process is largely based on the import substitution industrialisation (ISI) strategy and the modern leather manufacturing industry is part and parcel of this process. The ISI strategy in the less developed countries (LDCs) has meant the use of foreign exchange to import machines, equipment (capital goods) and the intermediate inputs with which to replicate consumer goods which were hitherto imported. The implication of this strategy is that a country wishing to industrialise must export goods and services to earn the necessary foreign exchange, or in the event of lack or shortage of exportable commodities, such a country has to attract foreign capital. The inherent factor in this strategy therefore is the foreign exchange constraint.

The foreign exchange constraint has been very acute in Nigeria since 1982. The National Economic Council Expert Committee Report on the State of the Nigerian Economy, issued in February 1983, which was intended to explain and resolve the current economic crisis in Nigeria contends that the most serious manifestation of the current economic crisis has been acute foreign exchange shortage. The report further states that the problem of acute foreign exchange shortage has arisen from the fact that the growth of demand for foreign exchange has persistently been faster than the growth of supply of foreign exchange in the Nigerian economy. The effects of foreign exchange constraint on the Nigerian economy has sharpened the need for the economic planners to evolve a self-reliant development strategy for the country with emphasis on the greater utilisation of domestic resources. In this paper, the import orientation of the Nigerian leather industry is examined by testing two hypotheses: (a) that the output level in the Nigerian leather industry is dependent on the import levels of leather-working machinery, spare parts (for the machines) and tanning chemicals, and (b) that the acquisition of leather working machinery, spare parts of tanning machines and tanning chemicals depends on the capacity of the Nigerian economy to import. The rest of the paper is divided into three Sections, viz., the growth performance of the Nigerian leather industry; estimating the nature of import constraints in the Nigerian leather industry; conclusions and implications for policy.

THE GROWTH PERFORMANCE OF THE NIGERIAN LEATHER INDUSTRY

Using such indicators as number of persons employed, gross output, and value added, the growth performance of the Nigerian leather industry over time can be examined. As can be seen in Table I-a (Federal Office of Statistics, 1962 — 1978), the Nigerian leather industry has recorded a rapid and impressive growth since 1962.

A notable trend in the growth performance of the industry in Nigeria is a more rapid absolute average annual growth in the 1970s than in the 1960s. For example, whilst the average annual value added by the tanning industry was ₦982,000 for the 1960s, it was ₦3,962.2 million for the 1970s. The other indices can be similarly interpreted. In terms of growth rate however, it can be observed that for all indices, the average annual rate of growth was faster in the 1960s than in the 1970s. This trend is explained by the fact that the overall mean annual manufacturing growth rate was higher (11.3%) in the 1960s than in the 1970s (10.6%) as shown in Table I-b (Ekuerhare, 1980).

Another notable feature in the growth performance of the Nigerian leather industry is that for the entire period 1962 — 1978, the average annual growth rate of the net output (value added) out-stripped that of employment. For example in the 1962 — 78 period, whilst the net output in the tanning industry grew at an annual average rate of 42.5%, employment grew at a slower rate of 28.6% indicating that the net output increased one and half times faster than employment. Indeed, for the entire 1962 — 78 period, except for the years 1969, 1971 and 1977 when the employment growth rate exceeded that of net output, the growth rate of net output outstripped that of employment for all the years. The failure of the growth rate in employment to keep pace with that of net output may be attributed to an increasing use of highly capital intensive technology most of which is imported.

An inspection of the import figures of machinery, spare parts and tanning chemicals will reveal an ever increasing reliance on these items. For example, Table II (Federal Office of Statistics, 1962 — 1983) shows that the imports of leather working machinery rose from ₦20,272 in 1962 to all-time-high of ₦3.85 million in 1980 and descended from its 1980 level to ₦2.26 million in 1983. Similarly, the imports of spare parts of machines for working leather rose from a meagre ₦3,920 in 1963 to a peak of over ₦2.05 million in 1978 and descended to ₦662,525 in 1983. If the period of 1962 — 1983 is divided into five, that is 1962 — 1966 corresponding to the period of industrialisation upsurge in Nigeria; 1967 to 1970, corresponding to the civil war years; 1971 — 1975, corresponding to the period of oil boom in Nigeria; 1976 — 1978, representing a period of minor economic recession and 1979 — 1983, corresponding fairly to a period of intensified economic malaise in Nigeria, the average yearly import figures for leather machinery, spare parts and tanning chemicals reveal a general rising trend. This general trend is confirmed by the average annual unit cost of the machines, spare parts and chemicals as can be observed in Table III (Federal Office of Statistics, 1962 — 1983). Implicit in the increasing reliance on foreign sources for the supply of machinery, spare parts and chemicals for the leather industry is the fact that foreign exchange constraints can lead to a forced import curtailment of these items and since Nigeria does not have the capacity to produce them presently, the industry could be grounded to a halt. Therefore the import — constraints hypothesis can be formulated in terms of a "technologically determined dependence" (Merhav, 1969) of the Nigerian economy on imports. This technologically determined dependence on imports can be measured by the share of imported leather working machinery in total net capital expenditure for the leather industry as shown in Table IV (Federal Office of Statistics, 1968 — 1978). The Table indicates that the share of leather tanning machines in total net capital expenditure in the leather industry for some selected years in the 1968 — 78 period was generally rising. It rose from 36.7% in 1968 to 62.9% in 1978 — an increase of 26.2% in a decade.

TABLE I-a

GROWTH PERFORMANCE OF THE NIGERIAN COMMERCIAL TANNING INDUSTRY 1962-78

	NO. OF PERSONS EMPLOYED		GROSS OUTPUT		VALUE ADDED	
YEAR	NUMBER	ANNUAL GROWTH RATE (%)	(₦'000)	ANNUAL GROWTH RATE (%)	(₦'000)	ANNUAL GROWTH RATE (%)
1962	271		480		142	
1963	425	+56.8	1486	+209.5	554	+290.1
1964	569	+33.8	3210	+116.0	1032	+86.2
1965	724	+27.2	3898	+21.4	1324	+28.2
1966	516	-28.7	4340	+11.3	1154	-12.8
1967	565	+9.4	4154	-4.2	720	-37.6
1968	141	-75.0	4046	-2.5	1390	+93.0
1969	670	+375.1	4966	+22.7	1540	+10.7
AVERAGE ANNUAL	485.1	56.9	3322.5	53.4	982.0	65.4
1970	668	-0.2	4352	-12.3	1330	-13.6
1971	868	+29.9	5700	+30.9	1654	+24.3
1972	990	+14.0	6783	+19.0	2204	+33.2
1973	1122	+13.3	8351	+23.1	2758	+25.1
1974	874	-22.1	8777	+5.1	4244	+53.8
1975	906	+3.5	10074	+14.7	3046	-28.2
1976	1035	+14.2	18059	+79.2	4306	+41.3
1977	1346	+30.0	18830	+4.2	5198	+20.7
1978	1436	+6.6	24506	+30.1	10920	+110.0
AVERAGE ANNUAL	1027.2	9.9	11,714.6	21.5	3,962.2	29.6
AVERAGE ANNUAL FOR 1963 — 78		30.4		35.5		45.2

TABLE I-b

MEAN ANNUAL GROWTH RATES IN MANUFACTURING INDUSTRIES AT 1973/74 FACTOR COST IN NIGERIA, 1960/61 — 1979/80

YEAR	GROWTH RATE (%)
1960/61	+ 13.0
1961/62	+ 11.6
1962/63	+ 14.9
1963/64	+ 13.2
1964/65	+ 10.3
1965/66	+ 23.2
1966/67	+ 0.6
1967/68	-14.0
1968/69	+ 4.0
1969/70	+ 36.9
MEAN ANNUAL GROWTH RATE FOR THE 1960s	11.3
1970/71	+ 21.4
1971/72	- 3.5
1972/73	+ 17.9
1973/74	+ 2.4
1974/75	- 1.6
1975/76	+ 21.3
1976/77	+ 17.1
1977/78	+ 10.4
1978/79	+ 10.3
1979/80	+ 10.6
MEAN ANNUAL GROWTH RATE FOR THE 1970s	10.6

TABLE II

NIGERIA: IMPORTS OF TANNING MACHINES, SPARE PARTS OF TANNING MACHINES, AND TANNING CHEMICALS 1962 — 83

YEAR	TANNING MACHINES (₦)	SPARE PARTS OF TANNING MACHINES (₦)	TANNING CHEMICALS (₦)
1962	20,272	N.A.	47,256
1963	14,582	3,920	32,370
1964	88,534	18,544	79,806
1965	976,930	51,174	200,972
1966	245,610	91,046	183,452
AVERAGE ANNUAL	269,185.6	41,171	108,771.2
1967	316,824	85,198	179,122
1968	529,832	127,712	169,536
1969	445,632	190,860	324,216
1970	933,374	265,074	202,190
AVERAGE ANNUAL	556,415.5	167,211	218,766.0
1971	1,243,244	383,918	427,902
1972	866,888	413,242	338,540
1973	419,570	511,579	324,482
1974	355,208	239,902	521,125
1975	1,880,591	483,959	1,231,336
AVERAGE ANNUAL	953,100.2	406,520	568,677.0
1976	1,950,494	812,804	1,185,510
1977	2,873,324	1,224,048	2,042,816
1978	2,980,369	2,051,557	5,520,375
AVERAGE ANNUAL	2,601,395.6	1,362,803	2,916,233.6
1979	2,157,261	1,641,013	4,028,842
* 1980	3,854,164	706,295	1,397,369
1981	3,460,640	1,186,748	3,408,956
1982	3,464,989	1,053,699	2,736,958
+ 1983	2,262,254	662,525	1,810,145
AVERAGE ANNUAL	3,039,861.6	1,050,056	2,676,454

* Figures from January to June only
\+ Provisional
N.A. = Not Available

TABLE III

NIGERIA: UNIT COST OF IMPORTED TANNING MACHINES, SPARE PARTS OF TANNING MACHINES AND TANNING CHEMICALS, 1962 — 83

YEAR	TANNING MACHINES ₦ PER KG. COST	SPARE PARTS ₦ PER KG. COST	TANNING CHEMICALS ₦ PER KG. COST
1962	0.0002	N.A.	0.04
1963	1.22	1.22	0.11
1964	2.32	0.91	0.62
1965	4.75	1.64	0.59
1966	2.05	1.69	0.34
1967	3.18	0.22	0.34
1968	3.73	0.19	0.02
1969	3.21	0.61	0.01
AVERAGE ANNUAL	2.55	0.92	0.25
1970	3.11	0.84	0.01
1971	2.66	2.35	0.01
1972	3.19	2.20	0.01
1973	2.87	3.54	0.05
1974	2.54	2.71	0.27
1975	3.06	4.68	0.75
1976	3.87	6.14	0.69
1977	3.82	4.57	0.99
1978	4.79	5.80	1.67
1979	5.32	5.22	1.21
AVERAGE ANNUAL	3.52	3.80	0.56
* 1980	4.30	5.44	1.20
1981	3.59	4.94	1.02
1982	3.85	5.38	0.54
+ 1983	3.69	5.65	1.15
AVERAGE ANNUAL	3.85	5.35	0.97

* Figures from January to June only

\+ Provisional

N.A. = Not Available

TABLE IV

NIGERIA: SHARE OF LEATHER WORKING MACHINE IMPORTS IN THE NET CAPITAL EXPENDITURE IN THE LEATHER INDUSTRY FOR SELECTED YEARS 1968 — 78

YEAR	LEATHER WORKING MACHINERY IMPORTS AS A % OF TOTAL NET CAPITAL EXPENDITURE
1968	36.7
1969	58.8
1970	45.5
1976	58.6
1977	44.0
1978	62.9

ESTIMATING THE NATURE OF IMPORT CONSTRAINTS IN THE NIGERIAN LEATHER INDUSTRY

In this Section, two hypotheses are investigated. The first is that the output level in the Nigerian leather industry is dependent on the import levels of leather working machinery, spare parts and tanning chemicals. The second hypothesis is that the acquisition of tanning machines, spare parts of tanning machines and tanning chemicals is dependent on the capacity of the Nigerian economy to import.

In investigating the first hypothesis, it is theoretically assumed that the level of output in the current period depends on the investment level of the past period. Having regard to the application of this theoretical formulation to the Nigerian situation, the machinery, spare parts or chemicals ordered in this period are assumed to take some time to arrive to be utilised for production. As a result of this time lag, the imported items will have effect on output in the next period when they arrive and are utilised for production. To investigate this hypothesis, import values for leather working machinery, spare parts and tanning chemicals are related separately (as independent variables) to the output value of leather (as the dependent variable). The basic regression model may therefore be specified as follows:

$$\text{Log}_e Y_t = \text{Log}_e B_o + B_1 \log_e X_{t-1} + U_t$$

where,

Y_t	=	Current Output Level
B_o	=	Constant term
Log_e	=	Natural Logarithm
B_1	=	Investment Coefficient
X_{t-1}	=	Investment in the past period
U_t	=	Error term

The regression results are presented as follows:

$$\log_e Y_t = 4.48 + 0.42 \log_e X_{t-1} \ldots\ldots (1)$$
$$(2.88) \quad (2.47)$$

R^2 = 0.70
F = 35.0
D-W = 1.14
N = 16 (N = number of observations)

$$\log_e Y_t = 4.95 + 0.37 \log_e X_{t-1} \ldots\ldots (2)$$
$$(3.64) \quad (5.52)$$

R^2 = 0.70
F = 30.4
D-W = 0.77
N = 15

$$\log_e Y_t = 3.53 + 0.61 \log_e X_{t-1} \ldots\ldots (3)$$
$$(2.11) \quad (7.92)$$

R^2 = 0.82
F = 61
D-W = 2.22
N = 16

The figures in parenthesis in the estimated regression equations (1), (2) and (3) are the t-ratios. They are placed directly below their corresponding estimated coefficients. The results clearly indicate that the Nigerian leather output was positively correlated with each of the items, that is, (a) imported leather working machinery as shown in equation (1); (b) imported spare parts of leather working machinery as shown in equation (2); and (c) imported tanning chemicals as shown in equation (3). The results are statistically significant at the 95% confidence level. Indeed, the R^2 for estimated equation (1) indicates that 70% of the variation in the level of current output of leather is explained by variation in the level of past investment on machinery imports. Also for estimated regression equation (1) the elasticity coefficient shows that 100% change in the level of past investment on imported machinery will bring about 42% change in the level of present output of leather in the same direction. The direction of change conforms to the apriori expectation.

Similarly R^2 for the estimated equation (2) indicates that 70% of the variation in the level of current output of leather is explained by variation in the level of past investment on the imports of spare parts of machinery. The elasticity coefficient shows that 100% change in the level of spare parts of leather working machinery imports in period t-1 brings about 37% change, in the same direction, in the level of leather output in period t. Again the direction of change is in conformity with apriori expectation.

For the estimated regression equation (3), the R^2 shows that 82% of the variation in the level of current output of leather is explained by variation in the level of past investment on imported tanning chemicals. The elasticity coefficient shows that 100% change in the level of tanning chemicals imports in the past period will bring about 61% change in the same direction, in the current level of leather output. The direction of change also conforms with the apriori expectation.

The second hypothesis to be tested is that the acquisition of tanning machines, spare parts of tanning machines and tanning chemicals is a function of the capacity of the Nigerian economy to import. The capacity of the Nigerian economy to import is measured by the level of external reserves. To investigate this hypothesis, firstly the combined monetary values of imported leather working machinery, spare parts of tanning machinery and tanning chemicals (TAI) were regressed on the import capacity (ER). Secondly, the monetary values for imported leather machinery spare parts (SPI), and imported chemicals (CI) were separately regressed on the import capacity (ER). The results are presented as follows:

Log TAI	=	-1.60 + 0.66 log ER......(4)
		(-0.87) (4.63)
R^2	=	0.53
F	=	21.42
D-W	=	1.05
N	=	21
Log SPI	=	-2.58 + 0.73 log ER......(5)
		(-1.11) (4.08)
R^2	=	0.46
F	=	16.18
D-W	=	0.89
N	=	21
Log CI	=	-2.34 + 0.75 log ER......(6)
		(-1.48) (6.09)
R^2	=	0.66
F	=	36.88
D-W	=	0.61
N	=	21

The figures in parenthesis in the estimated regression equations (4), (5) and (6) are the t - ratios, and the number of observations for the regression equations (4) to (6) is 21. These results show that the imports of leather working machinery, spare parts of leather working machines, tanning chemicals all combined and separately were positively correlated with import capacity of the Nigerian economy. The regression results (4), (5) and (6) were statistically significant as shown by the t - ratios. These results were confirmed at 95% confidence level. The elasticity coefficients in the estimated regression equations (4), (5) and (6) indicate that 100% change in the level of external reserves (the import capacity of the economy) would bring about 66% change in the level of imports of tanning machinery, spare parts of tanning machinery and tanning chemicals; 100% change in the level of foreign exchange reserves would bring about 73% change in the level of imported spare parts of leather working machinery; and 100% change in the level of foreign reserves would bring about 75% change in the level of tanning chemicals which the country can import.

CONCLUSIONS AND IMPLICATIONS FOR POLICY

The main conclusions reached in the foregoing brief analysis can now be summarised and their implications for policy discussed. In the past two decades, the Nigerian leather industry has witnessed a rapid growth. This growth process however was sustained under the aegis of imported machinery, spare parts and chemicals.

Results of the regression analysis clearly indicate the degree of reliance of the Nigerian leather output on imported machinery, spare parts and tanning chemicals. The results also show that shortage of foreign exchange can effectively limit the production capacity of the leather industry. Implicity, the reliance of the Nigerian leather industry on imported inputs particularly capital goods (machinery and spare parts) and intermediate inputs (chemicals) means that the vagaries of the external economies from where Nigeria obtains her capital and intermediate goods for the leather industry directly influence the development of the leather industry in Nigeria.

The central policy implication of these conclusions is that the economic policy makers should concern themselves with ways of generating a long-run economic growth which will emphasize expansion of economic activity based on a greater utilisation of domestic resources. Nigeria lacks the capacity to produce capital goods and most of the chemicals required for its industries. To acquire the capacity to produce capital goods and chemicals, Nigeria should devote a substantial part of investment to the establishment and rapid expansion of capital goods industries particularly machine tools and petrochemicals industries.

In other words, the case of the leather industry cannot be treated in isolation; there should be a comprehensive industrialisation strategy aimed at self-reliance. Such a comprehensive, self-reliant strategy of industrialisation, if properly implemented, would generate greater domestic savings and investment, thereby enhancing the capacity of the nation's industrial production to be in-ward looking both in terms of the resources needed for production and the product-mix. This means that the new industrial policy should be such that local resources would be used to produce the type of goods needed by the greater majority of Nigerians.

ACKNOWLEDGEMENT

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PARASITIC AND NUTRITIONAL DISEASES OF CATTLE AND THEIR EFFECT ON HIDE QUALITY

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ABSTRACT

A study of the parasitic diseases of the cattle skin as well as their nutritional status for [illegible] — 1984) was conducted. From a total of 73,500 cattle slaughtered at Zaria abattoir and [illegible] Ahmadu Bello University Farm, 3,480 (4.7%) and 18 (3.6%) respectively, [illegible] while over 50% of the total cattle slaughtered in Zaria abattoir were at various stages of [illegible] infestation (70.0%) had the highest prevalence rate followed by dermatophilosis [illegible] slaughtered at Zaria abattoir. From the University Farm, dermatophilosis (61.1%) [illegible] by tick infestation (38.9%). The effect of these results on the availability of good [illegible] leather industry is highlighted.

INTRODUCTION

The livestock population of Nigeria is estimated to be about 12.5m cattle [illegible] and 12m sheep. Raw hides and skins potentially available to the Nigerian leather [illegible] are of the order of 1.3m cattle hides, 11m goat skins and 2.3m sheep skins annually. [illegible] availability of hides and skins could be greatly increased through suitable [illegible] as scientific breeding, curtailing human consumption, controlling flaying and [illegible] practices (Mshelbwala *et al.*, 1983), as well as improvement in the [illegible] husbandry practices of livestock so as to reduce to the bearest minimum, such [illegible] and parasitic diseases that may affect hides and skins.

With the increasing difficulties of importation due to dwindling foreign [illegible] reserves, and the government's ban on imports of footwear and other [illegible] has correspondingly been an increase in demand for locally produced leather [illegible] is feared that such demands will far outstrip supply because the availability of [illegible] skins for leather production is hampered by a number of factors amongst which [illegible] slaughter of pregnant animals (Aganga and Belino, 1983) and [illegible] (Adewoye, 1982). Other factors that have not been given adequate attention [illegible] to hides and skins quality are the nutritional status of the slaughtered animals [illegible] the various parasitic infections of the integument of the animals. These [illegible] dependent on the management and husbandry practices adopted [illegible]

The major proportion of the livestock population of this country lies in the hands of the nomadic Fulani, who has to move from one ecological zone of the country to the other, depending on season, for adequate feed for his livestock. In the process of this nomadism, adequate veterinary services, especially on follow-up cases, cannot be maintained. This results in a great proportion of the livestock having various disease conditions. It is generally known that the Fulani man will rarely sell off his healthy and productive livestock, hence many of the slaughtered animals at the abattoirs are usually not the healthiest.

It is therefore the aim of this paper to highlight some of the various parasitic and nutritional diseases that have been reported to affect the quality of hides and ultimately availability of these items for the leather industry.

MATERIALS AND METHODS

Observations and records covering a five year period (1980 — 1984) of cattle slaughtered at Zaria abattoir as well as cattle kept at the Ahmadu Bello Univeristy Farm were analysed.

At the main slaughtering place in Zaria, a total of about 73,500 cattle were slaughtered. Various skin conditions were documented. The nutritional status of the animals brought for slaughter was estimated during ante-mortem inspection and was classified under well-fed or malnourished. The specific nutritional deficiency was not determined as these were animals meant for slaughter.

From the 500 animals kept at the University Farm for this same period, the various skin disease conditions were documented in records kept for each animal.

The results and observations are presented in Table I.

RESULTS

Results show that from the slaughter of about 73,500 cattle in Zaria abattoir, various skin disease conditions were encountered (Table I). From the records of the same slaughtered animals, over 50% of them were observed to be highly malnourished. Malnourishment as evidenced by the pronounced skinny look of the animals was differentiated from that resulting from chronic disease such as tuberculosis during routine meat inspection.

From the University Farm, a total of about 500 cattle were kept during the study period. There were only 18 cases (3.6%) of skin disease conditions and no observed case of malnourishment.

DISCUSSION

Bovine dermatitis is of considerable economic importance, posing a very great threat to the success of animal improvement schemes in the humid tropics. Very substantial losses are always encountered whenever there is an incidence of the disease due to damaged hides, chronic unthriftiness, lowered production, increasing culling rate and finally death (Olubunmi and Ayeni, 1983). Results from this study are particularly not surprising considering an earlier observation that a greater proportion of the animals brought to the abattoirs for slaughter are usually not the apparently healthy stock. The low results from the animals of the University Farm are essentially because these animals are kept under a good management system. Animals from this source also are kept mainly for teaching and research, hence given adequate feeding as well as prompt veterinary care whenever indicated.

External parasites have been incriminated frequently as a cause of skin conditions in cattle. Some of these conditions include the following:-

(a) *Tick infestation:* Considerable trauma is known to be inflicted on infested animals and this usually leads to a reduction in the quality of the hide so derived from such animals. This study reveals a 70% infestation among those with obvious skin disease.

(b) *Cattle mange or scabies:* This is caused by tiny parasitic mites, the effect of which lead to large numbers of puncture wounds on the skin. A 25% infestation rate was recorded in this study and this is quite substantial considering the type of damage done to affected hides.

(c) *Pediculosis or lousiness:* Lice have been reported to be common parasites of cattle in all parts of the world (Gibbons, 1963); they have been known to cause irritation and injury with their sharp claws as they move over the body resulting in large areas of skin bruised and raw from rubbing against solid objects. While a result of 10% in this study may be considered low, the damage to hides can be considerable.

(d) *Cattle warbles or hypodermiasis:* This condition is caused by warble flies which produce damage to the hides by irritation as the grubs enter the skin. This study showed a 15% infection rate amongst the slaughtered cattle from Zaria abattoir.

(e) *Bovine dermatophilus infection or dermatophilosis ("kirchi" in Hausa):* This has been reported to cause considerable damage to cattle skin, hence great economic loss due to poor hide quality. The disease is caused by *Dermatophilus congolensis* and characterised by the formation of horny crusts which adhere firmly to the infected skin (The Merck Veterinary Manual, 4th Edition, 1973). With a total of 42% infection rate from both slaughtered and University cattle population, this represents a substantial number of affected hides.

The ultimate effect of these various skin disease conditions manifests during the processing of the affected hides for leather, rendering such hides unsuitable for the production of leathergoods. If efficient and maximum production is to be obtained from cattle operations, it is necessary that herds be fed and managed adequately from birth to market age. Morbid processes, in most instances, greatly increase the nutritive requirements of cattle. Mineral elements in the skin have influence on those qualities that are desirable in the finished leather (Adegboye and Agina, 1983). The most common nutritional deficiency encountered in the field is a lack of enough total digestible nutrients. Emaciation, unthriftiness and weakness usually are evident. It is reported that the much improved performance of livestock in Latin America was due to good management, nutrition and genetic selection (Plasse, 1976). The core of nutritional and parasitic diseases of cattle, especially as they relate to hides, lies mainly with the management and husbandry practices adopted. With the present system of nomadic practice, very little can be achieved in terms of providing adequate and nutritious feed and supplement for the livestock population. The importance of protein being the first limiting nutrient for ruminants grazing indigenous forages during the dry season in Northern Nigeria is highlighted (Aganga *et al.*, 1983); it is however acknowledged that low quality forages, roughages and by-products which are very low in crude protein could be utilized for ruminant feeds when supplemented with a nitrogen source. Malnourished cattle which are generally highly emaciated present difficulties during the flaying of their hides after slaughter resulting in punctures and cuts. These defects, therefore, make such hides less suitable for the production of leathergoods.

Many parasitic skin infections require repeated treatments for complete recovery and this can only be achieved when the cattle population are maintained in ranches or farms. Here, regular spraying and dipping against ectoparasites, as preventive measures, can be practised.

The leather industry in Nigeria has a very bright future if, and only if, the traditional husbandry system can be modified so as to yield good management, nutrition and appropriate genetic selection.

TABLE I

CUTANEOUS DISEASES OF CATTLE IN ZARIA AREA (1980 — 1984)

Source	No. Surveyed	No. Infected	Disease Conditions (% on the No. infected)				
			Dermato-philosis	Tick-Infestation	Cattle mange	Pedicu-losis	Cattle warble
Zaria Abattoir	73,500	3,480 (4.7%)	1,462 (42.0%)	2,436 (70.0%)	870 (25.0%)	348 (10.0%)	522 (15.0%)
University Farm	500	18 (3.6%)	11 (61.1%)	7 (38.9%)	—	—	—
Total	74,000	3,498 (4.7%)	1,473 (42.1%)	2,443 (69.8%)	870 (24.9%)	348 (9.9%)	522 (14.9%)

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BIO-SCIENCES AND TECHNOLOGY

Kuberasampath, T. and Bose, S.M. (1980), "INFLUENCE OF PREDNISOLONE & L-THYROXINE ON THE CHANGES IN COLLAGEN CROSSLINKING IN RATS WITH ADJUVANT-INDUCED ARTHRITIS," Indian J. Biochem. Biophys., **17** (2), 99.

The efect of treating rats with adjuvant-induced arthritis with L-thyroxine and prednisolone in both the acute and chronic phases has been investigated. There are appreciable decreases in the percentage reversibility of dermal neutral salt-soluble collagen gels, the aldehyde-content of neutral salt-soluble collagen, susceptibility of insoluble collagen in potassium thiocyanate, urea and pronase and the changes in the subunit structure of neutral salt-soluble collagen in the arthritic rats treated with prednisolone or L-thyroxine. These observations indicate that the impairment of inter-and intra-molecular crosslinking of collagen in adjuvant-induced arthritis is significantly improved by the administration of prednisolone or L-thyroxine as compared to the control group during the chronic phase. L-thyroxine is more effective than prednisolone. The mechanism of action of both the drugs on the crosslinking of collagen is unknown. (3 Figs.; 3 Tabs.; 42 Refs.).

(GE)

Sehgal, P.K., Joseph, K.T. and Gowri, C. (1980), "STUDIES ON COLLAGEN KETOSTEROIDS INTERACTIONS," Indian J. Biochem. Biophys., **17** (3), 233.

Comparative studies of the interaction of five Δ^4 - 3 - ketosteroids with acid-soluble type I and type III collagen are carried out by spectrophotometric and equilibrium dialysis methods. The effects of such parameters as steroid molecular structure, pH and collagen concentration of the binding with both types of collagen are investigated. Results obtained showed that optimum binding capacity is achieved at physiological pH. Type III collagen has more affinity for the ketosteroids than type I. Among the ketosteroids studied, progesterone has the greatest affinity for the two types of collagen. Dissociable bonds are formed between ketosteroids and collagen and hence the reactions are reversible. (1 Fig.; 2 Tabs.; 26 Refs.).

(GE)

Joseph, K.T. and Kuehn, K. (1980), "EFFECT OF ALKYL UREAS ON THE AGGREGATION OF TROPOCOLLAGEN," Leath. Sc., **27** (3), 77.

The effects of urea and certain alkyl ureas with varying length of alkyl chains on the denaturation and aggregation of collagen are investigated. At low concentrations (0.1M or 0.2M) alkyl ureas have no effect on the denaturation temperature of collagen. However, inhibition of fibril formation is observed, the extent being proportional to the degree of hydrophobicity of the alkyl urea. A reverse order of effectiveness is observed in higher equimolar (8.0M) concentrations. The hydrophobic bonds may play little role in stabilising collagen molecules but are of great significance in fibril formation. (2 Figs.; 1 Tab.; 10 Refs.)

(GE)

Coker, D.T. (1981), "MONITORING EXPOSURE TO TOXIC GASES IN WORKPLACE ATMOSPHERES," The Analyst, 106 (1267), 1036.

The basis, objectives and shortcomings of personal monitoring as a means of both estimating the level of exposure and preventing the occurence of over exposure to air-borne toxic substances are discussed. Monitoring location and keeping of adequate records for medical statistics and for correct setting of a Threshold Limit Value (TLV) are also discussed. Available techniques such as biological monitoring, spot measurements using detector tubes or direct reading meters, continuous recording meters, vapour absorption tubes and exhaled breath are indicated with circumstances in which they are suitable. New developments and possible future alternative approaches are reviewed. (5 Ref.)

([illegible])

Arafat, N.M. and Glooschenko, W.A. (1981), "METHOD FOR THE SIMULTANEOUS DETERMINATION OF ARSENIC, ALUMINIUM, IRON, ZINC, CHROMIUM AND COPPER IN PLANT TISSUE WITHOUT THE USE OF PERCHLORIC ACID," The Analyst, 106 (1268), 1174.

A method for simultaneous determination of low concentrations of arsenic, aluminium, iron, zinc, chromium and copper in plant tissue is described. Digestion (0.5g. plant sample) was by nitric-suphuric acids and hydrogen peroxide. Perchloric acid was avoided in the digestion step as it might produce losses of elements, such as chromium, as volatile chromyl chloride. Hydrochloric acid was not used as it would reduce the arsenic to volatile arsine which would be lost upon analysis. Arsenic was determined by hydride generation method while aluminium, iron, zinc, chromium and copper were determined by direct flame atomic absoption spectrometry. The detection limits in the dry plant material using 50ml. of aqueous solutions for analysis were 0.5ng.g.$^{-1}$ for arsenic and 0.1μg. g.$^{-1}$ for aluminium, iron, zinc, chromium and copper. The relative standard deviations were 4, 6, 1, 11, 6 and 7% respectively. All the six elements were determined from the same aliquot with recoveries ranging from 93 to 118%. A study was made of the composition of the precipitate that settled out from the extracts using X-ray diffraction. The result revealed the presence of α-aluminium oxide (corundum) which was a source of contamination in the analysis of aluminium and some quartz in the antibumping granules. (2 Figs.; 3 Tabs.; 4 Refs.).

(FAL)

Bet-Pera, F. and Jaselskis, B. (1981), "SPECTROPHOTOMETRIC DETERMINATION OF MICRO-AMOUNTS OF CHROMATE IN THE PRESENCE OF IRON(III)-CHROMIUM(III) AND OTHER IONS," The Analyst, 106 (1268), 1234.

Various spectrophotometric methods have been adopted for the determination o micro-amounts of chromium(VI) using diphenylcarbazide, varamine blue, alizarin pyridine-2,4,6,-tricarboxylic acid, triethylenetetraaminehexaacetic acid (TTHA), cryst violet and α-naphthyl. Polarography, potentiometry and voltammetry have also bee employed. Many of these methods suffer from interference from ions such as iron(III), tungsten(VI), vanadium(V) and chromium(III). An indirect spectrophotometric method for the determination of chromium(VI) is described. In this method, chromium(VI) is reduced to chromium(III) in the presence of iron(II) and the excess iron(II) is then determined as a complex with FerroZine (monosodium3-(2-pyridyl)-5, 6-bis (4-phenylsulphonic acid)-1,2,4-triazine monohydrate) that has a molar absorptivity of 28000 l. mol.$^{-1}$ cm.$^{-1}$. Chromium(VI) at parts per million level has been determined by this method by measurement of the decrease in absorbance of the iron(II)-FerroZine complex at 562 nm. Relatively large amounts of iron(III), chromium(III) and vanadium(V) do not interfere in this method. The method is fast and sensitive; however, the range of chromium(VI) concentrations must be established by trial and error and pH control is very essential. (2 Tabs.; 16 Refs.).

(FAL)

LEATHER TECHNOLOGY/CHEMISTRY

Bird, J. (1982), "UNCONVENTIONAL FINISHES MAY COME TO FRUITION IN THE 80s," Leather, **184** (4484), 15.

The 1980's may probably witness the popularization of new leather finishes such as vinyl finishes, polyurethanes and cellulose acetate butyrate tops even though the conventional leather finishes may still be in use. The introduction of water-based polyurethanes and other finishing auxiliaries is gaining acceptability in the place of solvent-based materials and new pigments like carbon black and titanium dioxide with better covering power are becoming popular. Adiene resins have good prospects because of their synergistic effect on the covering power of many pigments and excellent flexibility at low temperatures. The use of acrylic resins as binders and water-based top coats is bound to be enhanced with their availability in 60% solids and the acrylic emulsions are likely to substitute nitrocellulose lacquers. The use of foils from transfer paper is becoming popular. Although conventional finishing methods may continue in the 80's, hand padding is definitely on its way out. Future developments in finishes would be determined by economic, environmental and safety factors.

(AAN)

Biles, J.J., DiCandilo, N.J. and Prentiss, W.C. (1984), "HIGH PERFORMANCE ACRYLIC RESINS," J. Amer. Leath. Chem. Assn., **79** (2), 34.

Acrylics used in the past as top coats or base coats for finishing leathers are briefly reviewed. Recently developed materials for the finishing of leather are described with emphasis on the performance of soft, but tough acrylic base coat emulsions. It is stated that they offer a superior balance of elasticity/tensile strength with freedom from tack normally associated with typical base coat resins. Acrylic top coat materials which are comparable to nitrocellulose lacquer emulsions in application, performance and physical requirements are also discussed. The newly available acrylic resins for both base coat and top coat provide the leather manufacturer a wider selection of acrylic resins for improved, high quality leather products than ever before. There will be also elimination or reduction in solvent use and reduction in tack, improving handling. (4 Figs.; 6 Tabs.; 6 Refs.).

(BBD)

Lamb, N.C.J. (1981), "AN INVESTIGATION INTO THE MANUFACTURE OF HIDE POWER," J. Soc. Leath. Tech. Chem., 65 (6), 120.

Literature survey on hide powder indicated that only two processes — [illegible] and Meunier — gave details of its manufacture. Tannin analysis, being an empirical method requiring strict adherence to the details of the method, an experimental evaluation of the hide powders obtained through these two processes in comparison with the commercially produced 'official' hide powder showed that the powders from the two processes were physically superior to the 'official' powder and provided results equivalent to each other and the standard. It is desirable to specify not only analytical parameters for the hide powder but also to define its method of production. (1 Tab.; 19 Refs.).

([illegible])

Ranganayaki, M.D., Vijayaramayya, T., Banerjee, S. and [illegible] (1980), "FACTORS INFLUENCING THE SUITABILITY OF FULL CHROME [illegible] LEATHER FOR DIRECT VULCANISATION PROCESS," Leath. Sc., 27 [illegible]

Studies were undertaken with full chrome and other types of leather to arrive at the optimum conditions for preparing leathers suitable for direct vulcanisation process (D.V.P.). The optimum percentage of chrome and type and amount of fatliquors [illegible] ed were determined from a study of the physical and chemical testing of leathers produced. The leathers were also tested at the factory level for their suitability for D.V.P. The results indicated that the leathers of following descriptions were suitable for D.V.P.: (1) Leathers with 4.25 percent Cr_2O_3 content fatliquored with 4 percent mixture of [illegible] neatsfoot oil and raw neatsfoot oil in the ratio 70:30. (2) Leathers produced with [illegible] percent Cr_2O_3 content using a fatliquor of 4 percent containing a mixture of [illegible] — lubrite + raw pungam oil (in different proportions). (3) Leathers produced by [illegible] process with 1 percent Cr_2O_3 followed by a mixture of 3 percent wattle — [illegible] myrob extract and finally top chromed with 1.5 percent Cr_2O_3. (4) Leathers produced [illegible] using Ladder-Link compound. (4 Figs.; 12 Tabs.; 37 Refs.).

(Authors' summary)

Pandey, N.D., Ashutosh and Mehrotra, J.K. (1980), "DYEING OF LEATHER WITH PYRAZOLONE DYES," Leath. Sc., 27 (2), 50.

Application of 1 - iso-nicotinoyl - 3 - methyl - 4 - substituted phenylazo - 5 - pyrazolone for dyeing of full chrome tanned leather of goat origin employing a 30:1 bath and [illegible] and colorimetric determination of the percentage exhaustion of the bath have been described. (1 Fig.; 1 Tab.; 7 Refs.).

(Authors' summary)

Subba Rao, M., Gupta, K.B. and Jayaraman, K.S. (1980), "GLOVE LEATHER FROM GOAT SKINS," Leath. Sc., **27** (2), 61.

Process details for the production of gloving leathers from goat skins are provided.

(ETO)

Olivannan, M.S. (1980), "SOAK-FREE PROCESS FOR THE MANUFACTURE OF FULL CHROME UPPER LEATHERS FROM WET SALTED COW HIDES," Leath. Sc., **27** (3), 88.

The production of full chrome upper leathers from wet salted cow hides through a combined "liming and soaking" process is described. It is claimed that the presence of salts in the hide has a mellowing effect on the high alkalinity of sodium sulphide. Another advantage is that sodium sulphide, soda ash and other additives present in the combined operation of "liming and soaking" enhance the effects of soaking. Calcium chloride, one of the reaction products in the system helps to open up the fibres. Process details subsequent to the combined "liming and soaking" operation are given. The physical test data on the finished leathers obtained through this process satisfied the standards stipulated for upper leathers from cow hides.

(ETO)

Dorairaj, P.L. and Kamat, D.H. (1980), "MODIFICATION OF CHAMOIS LEATHER FOR GARMENT PURPOSES," Leath. Sc., **27** (4), 121.

Chamois, as garment leather, has certain disadvantageous properties such as less shape retention, high water absorption and low shrinkage temperature. By retanning the leather with 20% chrome extract (on dry weight of leather) it is possible to overcome these undesirable properties to a great extent making the leather suitable for normal dyeing or screen printing and thus rendering it suitable for garment manufacture. (2 Tabs.; 12 Refs.).

(Authors' summary)

Khanna, J.K., Kamat, D.H. and Selvarangan, R. (1980), "UTILISATION OF DRY CHROME SPLITS BY REWETTING FOR SCHOOL SATCHELS," Leath. Sc., **27** (4), 133.

Process details for the production of leathers for fabrication of school satchels from chrome splits are provided.

(ETO)

James, C. (1981), "SHOE FITTING," Shoe and Leath. News, **Jan. 29, 27**.

Fitting changes which have taken place in the last twenty years are reviewed. Late Fifties and early Sixties saw shoe retailer as a specialist in fitting children's feet. Shoe fitting became an effective marketing tool than ever before. Children's styles are basic and they do not change much year-to-year. Stock holding requirement was adequate as two fittings were enough in infants' ranges and three fittings were sufficient in other ranges. In the middle Sixties and early Seventies the fitting of children's feet grew as the effects of the population bulge encouraged more retailers to sell fitting shoes. The story is different in the Eighties as the child population is small. Consumers demand shoes in various fittings. The shoe styles change frequently and the stock, if left on the shelves depreciate in value. The market situation demands that the retailer becomes a professional if he wants to remain in the business.

(ETO)

Jones, B. (1981), "MATERIALS CONSTRUCTION," Shoe and Leath. News, **Jan.29**, 28.

Plastics and other synthetic sole materials are described; they have better water resistance than their leather counterparts. This property is further enhanced where the shoe concerned is of moulded construction. The durability question is also discussed and among the synthetic soles, PU (Polyurethane) soles have the best wear property besides an added advantage of being lightweight. For light and elegant soling, according to the fashion trend, resin rubber is a first choice and this has found increasing use with women's fashion shoes. Where lightness is the most important feature as with the casual footwear, microcellular rubber is preferred for its cushion tread comfort; although its durability is poor, it is easily repairable. EVA (ethyl vinyl acetate), the lightest of the lightweights is said to have an added advantage of being available in bright colours as well as bright white. TR (thermoplastic rubber) is said to surpass all others mentioned earlier as it wears well, flexes well, does not crack and has an excellent grip; in addition, it is available in various weights and densities ranging from a sponge version as soft as microcellular to a firm version as stiff as a bend leather sole. TR appeared expensive when it was first introduced compared with other plastic soles but it is now competitive as its use has increased rapidly and it is anticipated that by the end of the year, 20% of all sole material would be TR.

(ETO)

Cooper, P. (1980), "BIOLOGICAL FLUIDISED BED TREATMENT FOR WATER AND WASTEWATER," Water Services, **84** (1014), 475.

This is a review of the first conference on biological fluidised beds (BFB), where 19 papers, all focused on the growing importance of BFB, were presented. Specifically, the BFB has been claimed to be the most important advance in wastewater treatment since the development of the ASP system, over 60 years ago. The BFB is reported to have enabled the development of very high biomass concentrations of 10 to 30 g./1. or 5 to 10 times the maximum concentrations in the ASP. Thus, in terms of size and capital costs, BFB promises to be much more economical than the ASP. Various aspects of the BFB, viz., basic principles of BFB; use of BFB for potable water treatment; sewage treatment in BFB; application of BFB to industrial effluent treatment; anaerobic BFB, applied to sewage treatment; BFB process engineering; BFB process economics were discussed at the conference. (3 Figs.).

(JBG)

Baston, V.F., Gale, L.G., Hurt, B., Stallings, J.W. and Young, C. (1980), "EVALUATING WASTES AS ENERGY SOURCES," Chemtech, **July**, 438.

Agricultural residues such as peach and olive pits, tomato pomace and sweet corn residues are potential energy sources. But their combustion for energy extraction poses certain engineering problems which can be solved by the use of fluidised bed technology. However, the organic wastes to be fed into the fluidised beds must first be evaluated to determine their suitability as economic energy source. Some important laboratory determinations necessary are (a) heating values of the residue, (b) moisture content, (c) volatile matter, (d) fixed carbon, (e) ash content and (f) ash fusibility. By these laboratory data, the energy resource potentials of the agricultural residues can be evaluated. (2 Tabs.).

(JBG)

Mazis, M.B., Staelin, R., Beales, H. and Salop, S. (1981), "A FRAMEWORK FOR EVALUATING CONSUMER INFORMATION REGULATION," J. Marketing, **45 (1)**, 11.

A framework for evaluating alternative consumer information regulation is developed by integrating economic, consumer behaviour and legal theories. In order to select the most appropriate regulatory approach given the marketplace problem, the application of certain basic principles are suggested. The first principle is that information remedies be classified along a "Remedies Continuum" which runs from the least to the most restrictive of market forces; in order to enhance benefit-cost ratio, remedies which are incentive-compatible and which effectively communicate information to consumers should be selected; many benefits and costs associated with information regulation, particularly those that enhance consumer choice, improve product quality and make for lower prices can be identified prior to rule enactment. (1 Fig.; 24 Refs.)

(AAI)

Buzzell, R.D. (1981), "ARE THERE "NATURAL" MARKET STRUCTURES?" J. Marketing, **45 (1)**, 42.

This article shows that distributions of market shares in narrowly-defined product markets follow the same general pattern found in earlier studies of broad "industries" and in the economy as a whole. Typically, the structure of a market conforms to the semi-logarithmic distribution; this pattern is so pervasive as to suggest that it is a "natural" phenomenon. The nature of growth processes that lead to unequal distributions of size is explored, and evidence from the PIMS data base is used to test two key assumptions about business growth and its relationship to size. (3 Figs.; 2 Tabs.; 17 Refs.)

(Author's summary)

Dolan, R.J. and Jeuland, A.P. (1981), "EXPERIENCE CURVES AND DYNAMIC DEMAND MODELS: IMPLICATIONS FOR OPTIMAL PRICING STRATEGIES," J. Marketing, **45 (1)**, 52.

Recent empirical research shows that supply and demand conditions are typically not stable over time. The evolution of these factors and the firm's ability to impact the evolution have important pricing implications. This paper presents a general methodology for determining the optimal pricing strategy over the product life cycle given evolutionary forces in the environment, and derives the optimal pricing strategy for some well known dynamic models. (6 Figs.; 2 Tabs.; 23 Refs.)

(Authors' summary)

Simmonds, W.H.C. (1980), "TECHNOLOGY TO THE RESCUE," Chemtech, May, 290.

The notion of uninterrupted economic growth has been discarded. Economic growth has rather been found to be self-limiting and could gradually grind to a halt if left alone. The reasons for the impressive economic growth witnessed in the 1950s and 1960s are presented. The self-limiting nature of economic growth is discussed. The new concept of sustainable growth, business situation in the 1980s and beyond and the roles of the chemical and chemical process industries in the new dispensation are examined. (2 Figs.; 4 Tabs.; 14 Refs.)

(AAI)

DISSEMINATION

Goldhor, H. (1981), "EXPERIMENTAL EFFECTS ON THE CHOICE OF BOOKS BORROWED BY PUBLIC LIBRARY ADULT PATRONS," The Library Quarterly, 51 (3), 253.

In 1978 — 79, two experiments were made on a sample of 144 books of individual biography for adults in the Kingston and St. Andrew Parish Library, Jamaica. One was the shelving for three months of 66 of the books in a prime display location; the other was the listing of 39 books in a book list of which 1,000 copies were distributed. The remaining 39 books constituted a control group. Persons who borrowed any of these books in the six-month period were asked to fill out a brief questionnaire on their selection and use of the book. Both experiments resulted in significant increases in circulation compared with the three-month pre-experimental period and with the control group. No consistent significant correlation was found between changes in circulation and any of a wide variety of other factors — for example, quality assessment of the book, date of publication, number of pages, sex of borrower, or method of selection. (2 Tabs.; 7 Refs.).

(Author's summary)

Najarian, S.E. (1981), "ORGANIZATIONAL FACTORS IN HUMAN MEMORY: IMPLICATIONS FOR LIBRARY ORGANIZATION AND ACCESS SYSTEMS," The Library Quarterly, **51** (3), 269.

Psychological studies on memory and learning are examined for what they might reveal about human categorizing processes and the organizing principles and limitations of human memory. Particular attention is given to evidence for a model which represents the organization of knowledge in memory in terms of hierarchical type of structure. The experimental findings suggest several considerations for the design of library systems of organization and access that would take into account characteristics of the conceptual organization of knowledge. Such systems are likely to be particularly effective in aiding the user in his search for information since they would (1) employ organizational schemes that are familiar to the individual, (2) permit a strategy for the exploration of a subject area similar to the type of search procedure which seems to facilitate the retrieval of items from memory, and (3) take into consideration the apparent limits on the amount of information that the individual can successfully attend to at one time. (15 Refs.).

(Author's summary)

Bookstein, A. (1981), "AN ECONOMIC MODEL OF LIBRARY SERVICE," The Library Quarterly, **51** (4), 410.

In times of economic distress, the roles and activities of institutions are scrutinized with particular fervor. The library is no exception. Yet, though library activity is increasingly being discussed in economic terms, no economic model exists that expresses what it is that a library does. At the core of the difficulty is the abstract character of library output. To circumvent this difficulty, various measures of library performance, for example, circulations of library materials, have been recommended as criteria for funding libraries. In this paper a microeconomic model of library activity is suggested. This model treats library output as an abstract quantity and shows how it relates to other components of library performance. In terms of this model, the likely consequences of basing funding on such measurable outputs as circulation are analyzed. In both the "centralized authority", and "free market" versions of the model, it is concluded that basing funding on circulation will result in a diminution in service level as defined in the paper. Because of the abstract nature of library service, it is not possible to derive the optimal amount of money to be allocated to libraries. However, models such as this one do allow us to assess how libraries are likely to respond to changing economic conditions, and provide conceptual guidelines for rational decision making in the allocation of library funds. (4 Figs.; 13 Refs.)

(Author's summary)

Linklater, P. (1980), "EDUCATION AND INDUSTRY," Chem. and Ind., **20 Sep.** (18), 744.

Education can be defined as equipping people for their role in society. The relationship between education and industry and their impacts on society are discussed. The future work is also reviewed with reference to South Germany, a highly industrialised area and Britain which is considered less industrialised. The success of South Germany is traced to the fact that the school system is closely integrated with the world of work with wide opportunity for job sampling connected with the curriculum, and providing the basis for informed career choice. Based on this, an analysis of the direction of industrial effort is structured as positive support for work experience and job sampling at school level, cultural emphasis on self-sufficiency and the entrepreneurial approach at all levels of educational system, more cooperation between industry and education in the exchange of experienced personnel preferably on part-time basis, greater emphasis on the content and consequences of technological change, and greater support from industry for postgraduate, post-experience research and education. This is considered to have a key role to play in anticipating the sort of changes in society. (1 Fig.).

(BBD)

Walgate, R. (1980), "TECHNOLOGICAL FORECASTING — RUSH PROGRAMME," Nature, **286** (5770), 197.

A five-year programme in science and technology forecasting, called FAST project has been set up. Universities and research institutes are to participate in the project whose main aim is to map out the research and development priorities for Europe over periods of 10, 20 and 30 years. Areas to be covered by the project include work and employment, the role of information technologies and the role of biotechnology. One of the goals of the project is the establishment of a forum for collaboration between specialised research groups within the community that would lead to a series of community forecasting networks.

(GE)

(The numbers within the brackets indicate the issue No. of the journal)

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The scope for the papers intended for publication in the JLR could project the research and development work conducted on science and technology of leather and leather-products such as footwear and all types of leathergoods, chemistry, biochemistry, physics, biophysics, biology, microbiology, environmental engineering, by-product utilisation, quality control and standardisation, machinery and equipment, industrial chemicals, management, technical education and training, economics, marketing and dissemination as applicable to leather and leather-products industries.

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PREVENTOL WB — BIODEGRADABLE PRESERVATIVE FOR LEATHER

H.J. Rother and M/s. Bayer A.G.
Leverkusen, West Germany

ABSTRACT

The indispensability of preservatives in the leather industry is emphasized. The methods and areas of application, effectiveness over specific test organisms, biodegradability and advantages of a preservative, taking Preventol WB as a model, are described.

INTRODUCTION

Preservatives are indispensable in the leather industry for preventing damage and losses caused by mould fungi and bacteria. Wet blues, pickled pelts and vegetable-tanned leathers are particularly susceptible to mould attack, while raw hides have to be protected against bacteria during storage and in the soak. However, fungi may also multiply on wet blues' and cause discoloration. Consequently, products with both fungicidal and bactericidal effects are required to ensure that leather is adequately protected. It is ideal that a preservative which possesses all the properties expected of a modern leather preservative is specially developed for the leather industry.

MATERIALS AND METHODS

Preventol WB has a broad spectrum of fungicidal and bactericidal effectiveness, good biodegradability and low toxicity, is simple to handle and measure and is compatible with other auxiliaries used in the leather industry. It is a liquid and freely miscible with water, giving a clear solution and is generally diluted with two to five parts water before use.

In the preservation of wet blues, good results are obtained if Preventol WB is added to the pickle a few minutes after the salt. The usual salt addition follows after a running time of approximately ten minutes. If the pickle float is drained off, Preventol WB should be added at the start of the chrome tannage. Preventol WB gives long-lasting protection, as its active ingredients have good chemical stability and are virtually non-volatile, which means that they remain fully effective in the leather. When working out how much preservative to be added, the climatic conditions, storage time and the susceptibility of the wet blues to microbial attack must be taken into consideration. If necessary, *in-situ* trials should be carried out to determine the optimum addition.

EFFECTIVENESS

Preventol WB has a broad and well-balanced spectrum of fungicidal and bactericidal effectiveness. This can be seen from the Table I, which gives the minimum inhibitory concentrations (MIC) in nutrient agar.

TABLE I

MINIMUM INHIBITORY CONCENTRATIONS (MIC) OF PREVENTOL WB

Test Organisms	MIC in mg/l Preventol WB
Escherichia coli	500
Staphylococcus aureus	500
Alternaria tenius	200
Aspergillus niger	200
Aureobasidium pullulans	150
Chaetomium globosum	100
Penicillium glaucum	200
Rhizopus nigricans	200
Trichoderma viride	200

Fig.1 shows the effect of Preventol WB on *Trichoderma viride* using wet blue leathers as the substrates; the Fig.1a shows an untreated piece of wet blue which is completely overgrown with the mould fungus, *Trichoderma viride;* there is no mould growth on the sample itself and the rim around the sample is also free of mould in respect of the wet blue sample treated with 0.2% Preventol WB, as can be seen in the Fig.1b.

Fig.1. Effectiveness of Preventol WB

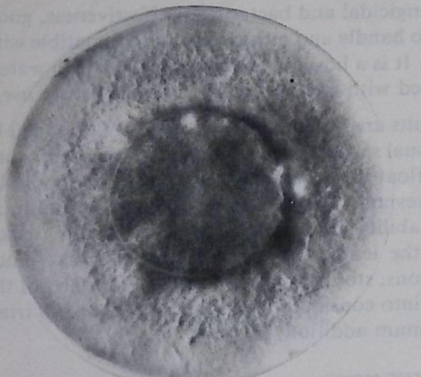

Fig.1a

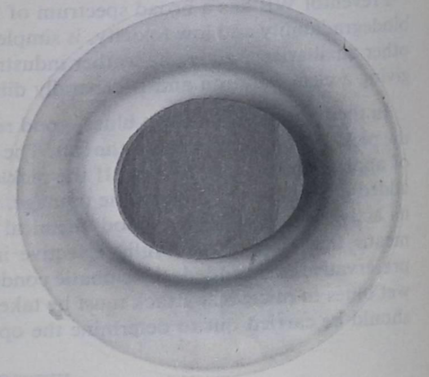

Fig.1b

BIODEGRADABILITY

Preventol WB contains a combination of two microbiocides whose biodegradability has been studied. The active ingredients are p-chloro-m-cresol (PCMC) and o-phenylphenol (OPP). Both compounds are completely biodegradable (Paulus and Genth, 1983). Fig.2 shows the degradation process for PCMC and OPP, the two active ingredients of Preventol WB. For the purpose of these tests, 50 ppm PCMC and 100 ppm OPP were added to the activated sludge from a sewage treatment plant. Both active ingredients were biodegraded after only a few days. Preventol WB has the same good biodegradability.

The degradation performance of biological sewage treatment plants is not impaired by Preventol WB in concentrations up to 100 mg/1. This concentration is not exceeded with normal additions of Preventol WB. No more than approximately 0.01 — 0.02% Preventol WB was found in the residual floats after chrome tannage, and the residual floats do not go into the sewage treatment plant in concentrated form, but are diluted to between 1/10 and 1/50 of their original concentration with other effluent. The effluent then contains no more than 0.0002 — 0.002% Preventol WB, corresponding to 2 — 20 mg/1. There is therefore no risk of Preventol WB residue in the effluent causing a breakdown of the sewage treatment plant.

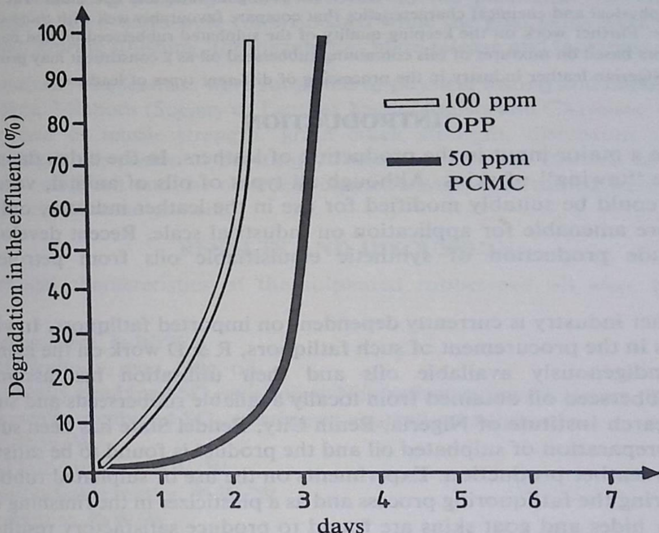

Fig.2. Biodegradability of the active ingredients of Preventol WB (OPP = o-phenylphenol, PCMC = p-chloro-m-cresol)

Preventol WB is suitable for application to raw hides; dried hides; soaking of raw hides; pickled pelts; chrome leather/wet blues; vegetable tannage; finished leather (in the fatliquor); and pigment finishes/top coats. Its advantages can be summarised as follows: broad spectrum of fungicidal and bactericidal effectiveness; free of pentachlorophenol; completely biodegradable; degradation performance of biological sewage treatment plants is not impaired by Preventol WB in concentrations up to 100 mg/1; low toxicity: LD_{50} 2,700 mg/kg rat.; does not have a sensitizing effect; liquid, low setting point (-28°C)) and high flashpoint (>100 °C); and freely miscible with water, giving a clear solution.

REFERENCES

Paulus, W. and Genth, H. (1983), ''Bio-deterioration 5'' (ed. Oxley, T.A. and Barry, S.), John Wiley and Sons Ltd.

USE OF INDIGENOUS RUBBERSEED OIL IN THE LEATHER INDUSTRY*

S. Bangaruswamy and E.T. Obonukut
Leather Research Institute of Nigeria
P.M.B. 1052, Zaria, Nigeria

ABSTRACT

Rubberseed oil available within Nigeria was used in the production of a fatliquor for the leather industry. The sulphated rubberseed oil was employed in the fatliquoring operation as a fatliquour and was used as a plasticizer in the finishing process in the manufacture of leathers from both goat skins and cow hides. The leathers were found to possess physical and chemical characteristics that compare favourably well with those obtained with imported fatliquor. Further work on the keeping quality of the sulphated rubberseed oil and development of composite fatliquors based on mixtures of oils containing rubberseed oil as a constituent may prove even more beneficial to the Nigerian leather industry in the processing of different types of leathers.

INTRODUCTION

Oil constitute a major input in the production of leathers. In the olden days, egg yolk was used in the "tawing" of skins. Although all types of oils of animal, vegetable and marine origins could be suitably modified for use in the leather industry, only some of them prove more amenable for application on industrial scale. Recent developments in this field include production of synthetic emulsifiable oils from petroleum-based chemicals.

Nigerian leather industry is currently dependent on imported fatliquors. In view of the great difficulties in the procurement of such fatliquors, R & D work on the identification of alternate, indigenously available oils and their utilisation has assumed great significance. Rubberseed oil obtained from locally available rubberseeds and supplied by the Rubber Research Institute of Nigeria, Benin City, Bendel State has been successfully utilised for the preparation of sulphated oil and the product is found to be satisfactory in its application in leather production. Experiments on the use of sulphated rubberseed oil as a fatliquor during the fatliquoring process and as a plasticizer in the finishing operation for both the cow hides and goat skins are found to produce satisfactory results.

MATERIALS AND METHODS

Sulphated Rubberseed Oil: The rubberseed oil was subjected to sulphation by conc. sulphuric acid at a controlled temperature of 25°C.; the resultant product was treated with saline water, and after allowing to settle, the bottom aqueous layer was discarded by siphoning; the top layer was neutralised with caustic soda solution. The clarity and stability of the emulsion obtained with the product were observed. Chemical analysis of the sulphated oil was conducted as per the Official Methods (Society of Leather Technologists and Chemists, 1965).

Fatliquoring of Leathers: Six chrome-retanned cow hides, cut into sides and processed together were separated into left sides and right sides; the left sides were fatliquored with 6% of sulphated rubberseed oil ("Experiment") while the right sides were fatliquored with 6% of an imported fatliquor ("Control"), maintaining a float of 100% and a

*Paper presented at the "National Conference on Industrial Uses of Rubberseed", organised by the Rubber Research Institute of Nigeria, Benin City, Bendel State: January 1985.

temperature of 50°C. during 1 hour. At the end of the fatliquoring process, the exhaustion of the fatliquor was checked. The post-tanning processes were kept uniform for all the leathers.

Similar trials were carried out on twelve numbers of goat skins, using 3% of the sulphated rubberseed oil for the "Experiment" and 3% of the imported fatliquor for the "Control".

Finishing of Leathers: Sulphated rubberseed oil was used as a plasticizer in both the glaze and resin finishing compositions for the experimental leathers. An imported fatliquor possessing plasticizing property was employed as the plasticizer for the finishing of control leathers. Cow hides were resin-finished while the goat skins were both glaze and resinfinished. During finishing, the glazability, plate-release and tackiness were observed.

Testing/Analysis: The leathers were subjected to physical testing and chemical analysis as per the Official Methods (Society of Leather Technologists and Chemists, 1965). Physical tests comprised of tensile strength, grain crack strength, distension at grain crack, bursting strength, distension at bursting, fastness to rubbing, fastness to water spotting and adhesion of finish and the chemical characteristics determined were moisture, free fatty matter and chrome-content.

RESULTS AND DISCUSSION

The chemical characteristics of the sulphated rubberseed oil were found to be as follows:

(i)	Water-content, %W/W	27.90
(ii)	Total alkalinity, meq./10g. oil	3.56
(iii)	Organically combined SO_3 existing as Neutralised sulphuric esters, %W/W	7.33
(iv)	Organically combined SO_3 existing as neutralised sulphonic ester, %W/W	Negligible
(v)	Total fatty matter, %W/W	57.05
(vi)	Unsaponifiable matter, %W/W	3.90
(vii)	Ash content, %W/W	11.50
(viii)	pH of 10% emulsion	6.10

The oil was found to provide clear and stable emulsion with water and complete exhaustion of the fatliquor was observed during the fatliquoring process. The sulphated rubberseed oil, as plasticizer, behaved quite well during finishing in respect of easiness of glazing, plate-release and tackiness characteristics.

Table-I presents the data of physical test conducted on the leathers and Table-II provides the chemical characteristics of both the goat skins and cow hides.

The figures for tensile strength, grain crack strength, distension at grain crack, bursting strength and distension at bursting indicate that the experimental leathers are comparable to their respective controls. As regards the fastness to rubbing, fastness to water spotting and adhesion of finish too, the leathers obtained using the sulphated rubberseed oil are quite comparable to those using the imported material.

The free fatty matter represents the fatty matter extractable with petroleum ether (40°—60°C.); the experimental leathers show comparatively less figures for free fatty matter. As the fatliquor has been thoroughly exhausted during the fatliquoring operation,

TABLE — I

PHYSICAL CHARACTERISTICS

Sl No.	Characteristics	Goat skins				Cow hides	
		Resin-finished		Glaze-finished		Resin-finished	
		Expt.	Control	Expt.	Control	Expt.	Control
1.	Tensile strength, N/mm^2	25.9	22.6	21.5	28.5	18.1	19.3
2.	Grain crack strength. N/mm thickness	365.0	357.3	295.5	307.7	—	—
3.	Distension at grain crack, mm.	9.7	9.6	7.4	7.4	—	—
4.	Bursting strength, N/mm. thickness	365.0	372.7	494.0	461.0	—	—
5.	Distension at bursting, mm.	10.1	9.9	10.0	9.3	—	—
6.	Fastness to dry rubbing, Grey Scale Rating for colour change (1024 revolutions)	4	4	3/4	3/4	4	4
7.	Fastness to water spotting, Grey Scale Rating for colour change (16 hrs.)	4	4	4	4	4	4
8.	Adhesion of finish, N/mm. width.	—	—	0.4	0.4	0.5	0.4
	(Sl. Nos.2 to 5: Lastometer tests)						

TABLE —II

CHEMICAL CHARACTERISTICS

Sl. No.	Characteristics	Goat skins				Cow hides	
		Resin-finished		Glazed-finished		Resin-finished	
		Expt.	Control	Expt.	Control	Expt.	Control
1.	Moisture, % by wt.	10.9	11.1	11.2	11.2	10.6	10.7
2.	Free fatty matter, % by wt.	1.5	4.3	1.6	3.9	3.4	6.1
3.	Cr_2O_3 — content, % by wt.	4.5	4.9	4.2	4.0	3.5	3.7

the lower figures of free fatty matter indicate that most of the fatty matter given got fixed to the leather fibres thereby showing that the sulphated rubberseed oil gets bound to the leather; this may prove to be beneficial in the dry-cleaning of leathergoods fabricated out of such leathers. The values for Cr_2O_3 demonstrate that the experimental leathers compare favourably well with the control leathers.

In conclusion, the rubberseed oil available within the country is found to be quite satisfactory and could therefore be profitably utilised in the leather industry. Composite fatliquors based on mixtures of oils containing rubberseed oil as a constituent may prove even more satisfactory for varied applications in the leather industry. Commercial production of rubberseed oil and the fatliquors based on same, alone as well as in admixture with other oils, on industrial scale, by prospective entrepreneurs, will greatly help curtailing imports of fatliquors aimed at conserving the much-needed foreign exchange for the nation.

ACKNOWLEDGEMENT

The authors wish to thank the Director, Rubber Research Institute of Nigeria, Benin City, Bendel State for the supply of the rubberseed oil and Dr. A.S. Mshelbwala, Director and Dr. R.O. Adewoye, Assistant Director, Leather Research Institute of Nigeria, Zaria, Kaduna State for their keen interest during the course of the work.

REFERENCE

Society of Leather Technologist and Chemists, (1965), ''Official Methods of Analysis,'' Surrey, UK

ABSTRACTS
(FROM OTHER PUBLICATIONS)

HIDES AND SKINS

GDG Ratnagiri, P., Nayudamma, Y., Krishnan, G. and Ramanathan, N. (1980), "OCCURRENCE OF MITES BELONGING TO THE GENUS *IPONEMOUS* IN ASSOCIATION WITH LARVAE OF *DERMESTES MACULATUS,*" Leath. Sc., 27 (4), 138.

Biological measures for control of insect pests on leathers are studied as alternatives to the use of insecticides, which are chemical measures. *Dermestes maculatus,* the major insect pest that causes considerable damage to raw hides and skins, is in turn fed upon and eventually killed, only at the larval stage by mites belonging to the genus *Iponemous.* They rupture the surface of covering cuticle, causing escape of water, hence lethal effects. They are likely to be feeding on body tissues as well, to cause the same effects within a few days. These mites, which attack the larvae on the ventral side in varying numbers, are host-specific. They do not occur free and do not feed on the adult. They are also found not to damage leather. (2 Figs.; 4 Refs.)

(GDG)

BIO-SCIENCES AND TECHNOLOGY

Fraga, A.N., Lupin, H.M. and Williams, R.J.J. (1981), "COLLAGEN LEACHING FROM HAKE SKIN," Ind. Eng. Chem. Prod. Res. Dev., 20 (1), 194.

Collagen was leached from patagonian hake (Merluccius hubbis) skins with acetic acid solutions at different temperatures. Processing for 3h at 80°C with solutions of acetic acid with concentrations ranging from 0 to 8.3% v/v and with a weight of skin (g) to volume of solution (mL) ratio of 1:1 produced a liquor containing 8-10g of protein/dL. Neither agitation nor a 24h alkaline pretreatment affected the concentration of the final liquor. A kinetic model, stating that the rate of protein leaching is proportional to the second power of the concentration of the recoverable solid protein, fitted the experimental curves after the first 5min of extraction. Approximately 50% of the initial content of protein in the skin was extracted. The protein solution was composed mainly of α and β chains from denatured collagen. Intrinsic viscosity and infrared measurements showed that polypetides were random-coiled chains. The yield in glue with 45% solids, obtained from concentrating the liquor, was 200g/1000g of fresh hake skins. (8 Figs.; 9 Refs.)

(Authors' summary)

Kuberasampath, T. and Bose, S.M. (1980), "THE MECHANICAL PROPERTIES OF ADJUVANT INDUCED ARTHRITIC SKINS AND TENDONS," Leath Sc., 27 (4), 126.

The mechanical properties viz. stress-strain behaviour, loss of energy and permanent set due to hysteresis and stress relaxation of skins and tendons were determined during the acute and chronic phase of adjuvant induced arthritis. The results are discussed with respect to the impaired collagen cross-linking in adjuvant induced arthritis. (4 Figs.; 1 Tab.; 22 Refs.)

(Authors' summary)

Padma Bai, R., Anandam, B.V., Narasimhan, K. and Joseph, K.T. (1980), "ACTION OF SINGLET OXYGEN ON ELASTOIDIN," Leath. Sc., 27 (4), 137.

The effect of singlet oxygen generated by the decomposition of potassium perchromate on elastoidin has been studied. Increasing additions of potassium perchromate led to corresponding decreases in hydrothermal stability, as evidenced by the progressive decrease in the shrinkage temperature of elastoidin, due to the breaking of intermoleculer cross-linkages. The observed loss in tyrosine-content of the modified elastoidin is attributed to an oxidative modification of tyrosine residue. The action of singlet oxygen on elastoidin is by modification of specific amino acid side chains and not by peptide bond cleavange. (1 Tab.; 8 Refs.)

(GE)

TANNING AGENTS AND MECHANISM OF TANNAGES

Mahadeswaraswamy, Prathiba, V., Theresa, Y.M. and Nayudamma, Y. (1980), "HISTOCHEMICAL STUDIES ON THE DISTRIBUTION OF TANNINS IN INDIAN AND AFRICAN BABUL BARKS *(ACACIA NITOLICA* SSP. *INDICA* AND *A. NILOTICA* SSP. *NILOTICA),*" Leath. Sc., 27 (5), 157.

Comparative tannin analysis of the three layers of Indian and African babul barks revealed that the middle layer contains the highest percentage of tannins in both sub species followed by the inner layer. An improvement on the tannin content and reduction of colour and pH of the tan liquor can be achieved by excluding the use of the outermost layer. (3 Tabs.; 13 Refs.)

(AAN)

Theresa, Y.M. and Mahadeswaraswamy (1980), "A NOTE ON TANNINS OF TEA PRUNES AND WASTES," Leath. Sc., 27 (5), 172.

The tannin analysis of tea prunes and de-caffeinated tea wastes shows that the former contain more tannins than the latter. In the case of de-caffeinated tea waste, the addition of lime prior to extraction with hexane may be responsible for the loss of tannins. (1 Tab.; 9 Refs.)

(AAN)

Madhusudanamma, W., Sastry, K.N.S., Sundara Rao, V.S. and Reddy, K.K. (1980), "ISOLATION OF FLAVAN 3-OLS FROM ARJUNA *(TERMINALIA ARJUNA)* BARK," Leath. Sc., 27 (6), 199.

The bark of *Terminalia arjuna* has an average tannin-content of 16%; (+)-catechin, (+)-gallocatechin, epicatechin and epigallocatechin were separated from ethyl acetate extract of *(Terminalia arjuna* bark by column chromatography over sephadex LH 20 and indentified by paper chromatography and TLC using authentic samples. (13 Refs.)

(AAN)

Covington, A.D. and Sykes, R.L. (1984), "THE USE OF ALUMINUM SALTS IN TANNING," J. Amer. Leath. Chem. **79** (3), 72 (3), 72.

For more than 2,000 year aluminium salts have been used in the production of leather and nineteenth century literature records processes where it was used in conjunction with both vegetable tans and chromium salts, yet in volume terms, relatively little aluminium is used by the leather industry today. Research at BLMRA has been motivated by: 1. Demand for a white leather as a substrate for dyeing; 2. Reduced environmental impact by replacing chrome; and 3. Strategic concern over chrome supplies. Developments to be described include: The Semi-Alum Process — Vegetable tan followed by alumium in regular commercial production gives leathers with shrinkage temperatures well over 110°C. The leathers have a very high level of chemical and thermal stability making them particularly useful where extended service under arduous conditions is required. Pure White Leathers — With shrinkage temperatures of about 100°C pure white leathers can be produced from combinations of polycarboxylic polymers and aluminium. Sheepskin Garment Leathers -- Using predominantly aluminium salts with 0.5-0.75% Cr_2O_3 the leathers have shrinkage temperatures in the region of 100°C and 99% utilisation of chromium has been achieved. Pre-tannage of Bovine Stock — Pretannage with alumiunium salts enables chromium offers to be reduced by 20% with no reduction in chromium content of the finished leather and a substantial reduction in sewered chrome. (5 Figs.; 11 Tabs.; 26 Refs.)

(Authors' summary)

Covington, A.D., Sykes, R.L., Barlow, J.R. and White, E.T. (1983), "A PRACTICAL CHROME RECOVERY SYSTEM USING MAGNESIUM OXIDE," J. Soc. Leath. Tech. Chem., **67** (1), 5.

A simple practical method of recovering chrome from tannery waste liquors for re-use has been developed. Spent chrome bearing liquor is collected and allowed to settle. It is screened or filtered to remove hide fibres and coarse materials and then treated with magnesium oxide to pH 7 — 8. After settling, the supernatant solution is discarded; the chrome precipitate is then solubilised with sulphuric acid. The recovered chrome can be recycled to tannage. A prolonged trial accompanied by chemical and physical tests showed that no deleterious effect accumulated in the leather produced. The system reduces both capital expenditure and operating costs; model calculations indicate a payback period (at 1981 prices) of 14 — 22 months, with considerable savings thereafter. (5 Figs.; 9 Tabs.; 8 Refs.)

(FAL)

Subba Rao, M., Kamat, D.H. and Selvarangan, R. (1980), "SUEDE LEATHER FROM CHROME-ZIRCONIUM COMBINATION TANNAGE," Leath. Sc., **27** (5), 169.

Process details for the production of suede leather from goat skins are provided.

(ETO)

Ashutosh, Pandey, N.D. and Mehrotra, J.K. (1980), "MONOAZO DYES FOR LEATHER," Leath. Sc., 27 ^6), 189.

Application of three series of monoazo dyes derived from naphthol derivatives for dyeing leather, employing a 30:1 bath and 5% dye at 50°C has been discussed. The percentage exhaustion of the bath was determined colorimetrically. (1 Fig.; 1 Tab.; 7 Refs.).

(Authors' summary)

Venkateswara Rao, M. and Ganesan, A. (1980), "SEMI-CHROME-ALUM (COMBINATION TANNED) SOFTY BAG LEATHERS," Leath Sc., 27 (6), 192.

Process details for the production of softy bag leathers from vegetable-tanned cowhides are provided.

(ETO)

LEATHER PRODUCTS

Bata, T.J. (1982), "A NEW WAVE OF PROSPERITY IS COMING," Leather, 184 (4485), 26.

The progress being made by the machinery manufacturers is giving the shoe manufacturers the much needed driving force to modernise their production line. Today's situation is that a shoe maker has to be a computer expert, an assembler of shoes, a leather expert and a marketing man. The introduction of electronics will enable the developing countries to make better standard shoes but the advantage gained on cheap labour will be lost. Developed countries with high technology will be able to make shoes more quickly, efficiently and cheaply. Protectionism is unnecessary and the high technology will be available first to the industry in Europe and America. Better business is being reported in India, Brazil and Europe and this improvement will be maintained since a new wave of prosperity will certainly occur and standards of living in the third world will rise as most people would to be able to afford shoes.

(ETO)

QUALITY CONTROL AND STANDARDISATION

ETO Glenn, G.W., Ward, A.G. and Wolstenholme, S. (1981), "AIR PERMEABILITY OF SHOE UPPER LEATHERS. PART 1. FLEXING OF UNFINISHED AND FINISHED LEATHER," J. Soc. Leath. Tech. Chem., 65 (6), 109.

Experimental work has been carried out to determine the effect of the leather finish and of laboratory flexing on the permeability of upper leather to air. The experimental results have been analysed statistically to determine the significance of the differences observed (3 Figs.; 4 Tabs.; 8 Refs.)

(Authors' summary)

Glenn, G.W. and Ward, A.G. (1981), "AIR PERMEABILITY OF SHOE UPPER LEATHERS. PART 2. EFFECT OF NORMAL WEAR FOR BOYS' SHOES," J.Soc. Leather Tech. Chem., **65 (6)**, 114.

Upper leather, with two types of finish, has been made into boys' shoes and worn for periods of 3, 9 and 27 weeks before measuring the permeability of the upper leather in the vamp region of the shoe. Highly significant increases in permeability were observed, resulting from wear, which could be fitted reasonably to linear regression equation of permeability on time of wear. The overall increase in permeability was approximately 20-fold in 27 weeks' wear for one leather and 40-fold for the second leather. An important factor in causing this increase is the repetitive flexing of the upper in the vamp region. This flexing is more severe in its action, after 27 weeks' wear, in increasing permeability than 400,000 flexes with the Satra Vamp Flexer. (3 Figs.; 8 Tabs.; 5 Refs.)

(Authors' summary)

CONTROL AND TREATMENT OF EFFLUENTS/ENVIRON. SC. AND TECH.

Stover, E.L. and Kincannon, D.F. (1983), "BIOLOGICAL TREATABILITY OF SPECIFIC ORGANIC COMPOUNDS FOUND IN CHEMICAL INDUSTRY WASTEWATERS," J. Water Pollution Control Federation, **55** (1), 97.

The characterization, limitation and treatability of effluent discharges have been based on the measurements of gross properties such as BOD, COD and TOC of the wastewaters. It has now become necessary to pay attention to the characterization, limitation and prediction of treatability of certain specific organic compounds in the watewaters. The data base for the treatability of specific compounds is practically non-existent. Substrate removal has been based on biological consumption with little consideration for stripping and biological adsorption. This paper reported the work done to collect treatability data on some twelve specific organic compounds such as benzene, phenol etc., present in certain complex industrial wastewaters. The data were compared with those for the combined wastewaters. The effects of stripping on biokinetic constants were shown for various compounds. A systematic method for the analysis of these effects was proposed, by way of modifying the existing mathematical models. (6 Figs.; 9 Tabs.; 9 Refs.)

(JBG)

Gruber, D. and Cairns, Jr., J. (1981), "INDUSTRIAL EFFLUENT MONITORING INCORPORATING A RECENT AUTOMATED FISH BIOMONITORING SYSTEM," Water Air, and Soil Poll. **15**, 471

An automated, continuous biological monitoring facility which is in opration at a U.S. Army ammunition manufacturing plant is described. The system monitors the ventilatory behavior of bluegill sunfish, Lepomis macrichirus Raf., to assess the quality of two watewater discharges with the aid of an on-line minicomputer system. Certain chemical/physical parameters are also monitored automatically on a continuous basis. The capability for detecting unapproved discharges is discussed. The overall concept of this system and discussion of its potential for economically monitoring water and wastewater discharges, both automatically and continuously, are presented. (4 Figs.; 38 Refs.)

(Authors' summary)

Rosen, B. (1980), "15 YEARS PRACTICAL EXPERIENCE WITH DISSOLVED AIR FLOTATION (DAF)," Water Services, **84** (1015), S26.

The Dissolved Air Flotation (DAF) system is used for surface water purification as well as advanced tertiary treatment of sewage. The process involves the creation of extremely small bubbles of 30 — 80 microns diameter, which attach to the solids to be separated, causing them to rise rapidly. Several design and operational information for the efficient performance of existing DAF facilities are reported. The DAF has been found specially useful in the removal of algae in surface waters treatment. Also, its use after bilogical treatment of sewage resulted in the effective removal of phosporous and achieved very good stability for the final effluent. The overall economy for DAF is reported to be very favourable when compared with other systems. (3 Figs.)

(JBG)

(1980), "TANNERS TELL EPA OFFICIALS OF OBJECTIONS TO GUIDELINES," The Leath. Manufacturer, **98** (3), 16.

This is a report on the tanner's reactions to the proposed Effluent Guidelines and Standards for the tanning industry. EPA had earlier sought the opinion of the industry before issuing the final guidelines. Several tanning companies and associations raised many issues that were apparently not sufficiently considered by the EPA officials. Most objections centred on the seemingly unattainable high effluent standards demanded and the severe cost implications of complying with them. The industry's position was well presented and received by the EPA.

(JBG)

Larre, D. (1980), "UNEP CONCERN FOR THE FUTURE ENVIRONMENT PLANNING," Pure and Appl. Chem., **52** (8), 1955.

The United Nations are seeking a renewed international development strategy that would bring about a more stable, more dynamic and less vulnerable world economy. Sound environmental management is to be part of development patterns is all their components, and particularly in agriculture, human settlements and industry. Using practical examples, the roles of the United Nations family and of the world wide community of environmental engineers are illustrated. Necessary actions include: (i) assessment of the economic, social and environmental impact of projects; (ii) land use planning and project siting; (iii) articulation of standards in keeping with resources; (iv) development and use of resource conserving technologies that are soft on environment and cost effective; (v) co-operation between all interested partners, government, industry, professionals towards the operation of an efficient capacity for exchange of technical information.

(Author's summary)

De Reeder, P.L. (1980), "LOW WASTE TECHNOLOGY IN CHEMICAL INDUSTRIES" Pure and Appl. Chem., **52** (8), 1991.

Low waste technology is explained to mean adoption of "clean technologies" (ct) in chemical industries based on techniques which produce a product with the most rational use of raw materials and energy, and also reducing the amount of polluting effluents and the quantities of wastes produced during the manufacture and consumption of the product. It is contended however that there is hardly any realistic technology that can be so described, especially as the economic implications of the choice of such technology was not considered. A manufacturer can adopt a cleaner technology only if this does not prevent him from maintaining a competitive position. Basically, there are two costs involved in production: internal costs and social costs. The former is the concern of the industry while the latter is primarily the concern of the society. Examples are given of several countries and international bodies which actively promote the ct principle. As for the industry, it is called upon to continue to accept its environmental responsibilities, to develop and implement the ct concept, in the awareness of its economic and social responsibilities. (2 Refs.)

(JBG)

ECONOMICS AND MARKETING

Smith, R.E. and Swinyard, W.R. (1982), "INFORMATION RESPONSE MODELS: AN INTEGRATED APPROACH," J. Marketing, **46** (1), 81.

This article reviews the development of advertising response theories including the hierarchy of effect areas, and low involvement learning models. By combining concepts from several areas a new "integrated information response model" is proposed that appears to be in close accord with existing evidence. (1 Fig.; 1 Tab.; 60 Refs.)

(Authors' summary)

DISSEMINATION

McClure, C.R. (1980), "LIBRARY MANAGERS: CAN THEY MANAGE? WILL THEY LEAD?" Lib. Journal, **105** (20), 2388.

The hard times facing Library Managers in academic libraries are enumerated. Library managerial positions in the American Library system are held by Librarians who lack formal managerial educational preparation, but rather have practical experience and as such are unable to effectively utilize new managerial techniques in the administration of the library. A study revealed that Library Managers are primarily committed to the profession confined to the institution and are unable to provide leadership that could meet societal information needs. The accountability of Library Managers in terms of human and physical resources is rated as priority for improvement of library management. There is emphasis on the effective leadership of Library Managers, enabling them work successfully on libraries' response to the information needs of society. (1 Fig.; 20 Refs.)

(EOAF).

Bradbury, F. and Russell, J. (1980), "TECHNOLOGY CHANGE AND ITS MANPOWER IMPLICATIONS — A COMPARATIVE STUDY OF THE CHEMICAL AND ALLIED PRODUCTS INDUSTRY IN THE UK, USA AND JAPAN. PART 4: DEMANDS OF TECHNOLOGY AND THE EXPECTATIONS OF PEOPLE," Chem. and Ind., **Oct.4** (19), 761.

The demands of technology and the expectations of people in the UK, USA and Japan are compared, taking into account employment trends, employment practices, education and training, industry and education, adult retraining, higher added-value products, productivity and innovation, the productivity syndrome and finally people's expectations and the demands of technology. It is established that there is need to introduce into organisations the capability for faster responses to the changes in social and technological conditions that are likely to be experienced in the future by way of creating systems that are less rigid and flexible. Greater emphasis should be given to engineering social changes on an incremental basis aiming to develop 'folding organisational tents rather than building permanent palaces'. There is need to free senior management from exclusive concentration on today's problem-solving so that they may spend more time on tomorrow's world and its needs. Accepting the need for a more open form of management, the political element in management activity should be recognised and that it is just as important to equip the managers with these skills as with those concerned with technical problem analysis. Some of the existing trades or occupations presently known will become obsolete soon. The study has shown that the UK firms are already operating imaginative and advanced practices in relation to the problems being confronted in technology change. (3 Figs.; 5 Tabs.; 11 Refs.)

(BBD)

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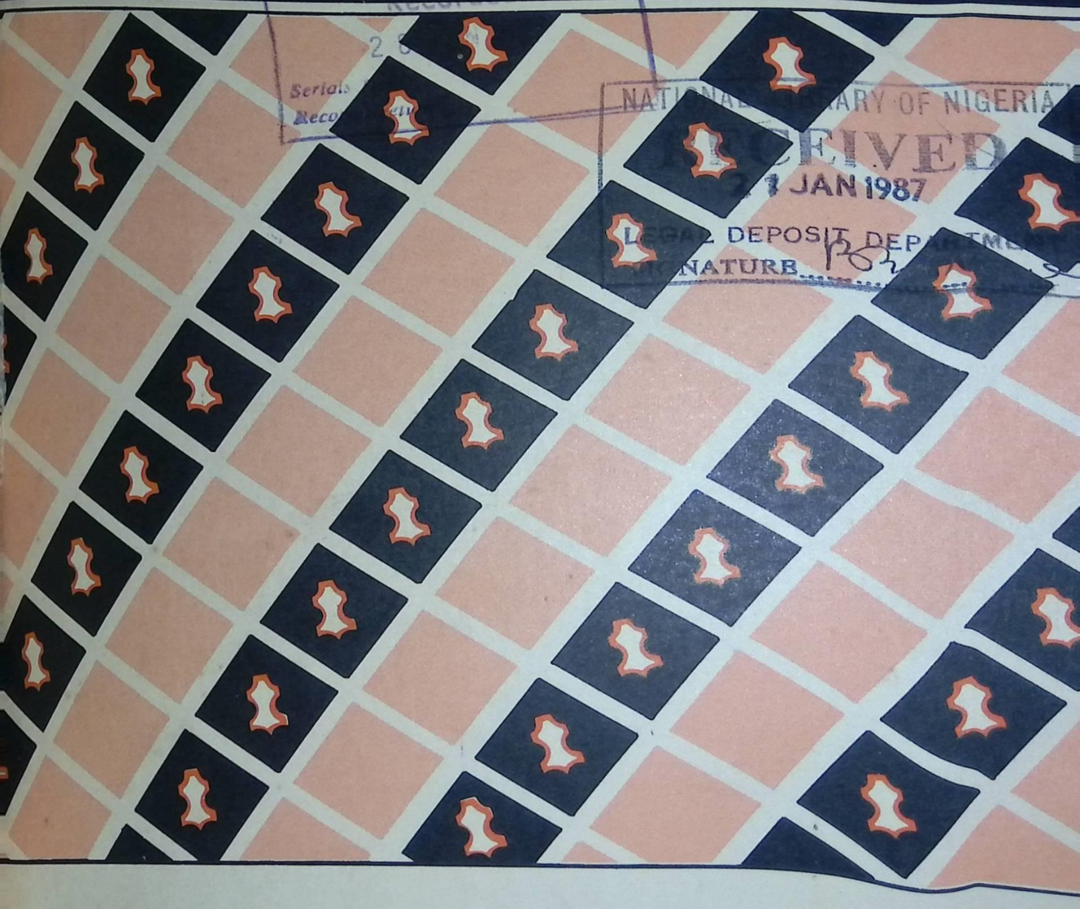

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The scope for the papers intended for publication in the JLR could project the research and development work conducted on science and technology of leather and leather-products such as footwear and all types of leathergoods, chemistry, biochemistry, physics, biophysics, biology, microbiology, environmental engineering, by-product utilisation, quality control and standardisation, machinery and equipment, industrial chemicals, management, technical education and training, economics, marketing and dissemination as applicable to leather and leather-products industries.

As regards the methodology of publication of articles, please go through the papers appearing in JLR. The format and arrangement of various Sections of the article shall be:- Abstract, Introduction, Materials and Methods, Results along with Figure(s)/ Table(s) if any, Discussion, Acknowledgement(s) if any and Reference(s). The names of Sections of the paper "Abstract" etc., shall be at the middle of the line and in block letters. Sub-sections (sub-headings) can start at the margin and normal-typed and underlined or italicised. References shall be given within brackets in the running line eg., (Author's name, year); in case, there are only two authors, the names of both the authors be given eg., (—and—, year); references to articles contributed by more than two authors be indicated as follows: (Name of the first author et al., year); references to more than one article by the same author/s in the same year are to be indicated as follows: (first reference, year a); (second reference, year b) and so on. Reference to books shall indicate the name(s) of the author(s), (year of edition/publication), "title of the book", (name of the editor), name of the Press and page number (p.--). The "References" shall contain the names of all the authors who have contributed the article, arranged in alphabetical order, (year), name of the journal, **Vol. No.** (Issue No.) or **Month**, Page Number.

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CONTENTS

FACTOR INTENSITY IN THE NIGERIAN LEATHER INDUSTRY: A PRODUCTION FUNCTION ANALYSIS

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ABSTRACT

One of the goals of industrialisation is the generation of employment. But the extent to which manufacturing industries can do this depends largely on the production techniques which they use. For example labour intensive industries have relatively greater capacities for labour absorption than capital intensive industries. The less developed countries being relatively labour-abundant and capital-scarce are often urged to concentrate industrial investments on labour intensive activities so as to reduce their unemployment problems. It is against this background that this paper investigates the factor bias of the Nigerian leather industry. The paper contends that production in this industry is biased in favour of capital intensive methods and against labour intensive methods This contention is supported by the findings. The paper attempts explanations of the observed capital intensive bias of production in the industry from the neoclassical and structuralist view-points. The policy implications of the findings are indicated.

INTRODUCTION

By factor intensity we refer to the degree of use of various factors of production in the production process. In other words, we refer to the relative contribution of the various production factors to output. In economics, there are four main factors of production, namely, land, labour, capital and entrepreneur. Land may be subsumed into capital while entrepreneur is subsumed into labour. For most empirical investigations which use production functions as bases of economic analysis, two factors of production, that is, capital and labour are assumed. A production function is a mathematical function which relates the quantities of inputs and the quantities of outputs within a production unit; the latter may be variously defined as an activity or process, a firm, an industry or a national economy. A production function is usually regarded as a technical relationship between the quantities of inputs and the maximum amount of output which can be produced with a given set of inputs (Wynn and Holden, 1974). More specifically the production function indicates the available techniques of production from which the firm must choose, given factor prices (Ekuerhare, 1978). In choosing a particular technique of production, the aim of the firm is to maximise the amount of output obtainable from any given amount of inputs. The study of factor intensity in the leather industry is necessary because factor intensity relates to the issue of appropriateness of technology used in any industry, firm, process or economy. This paper investigates the factor bias of the Nigerian leather industry. The paper argues that production in the Nigerian leather industry is biased towards capital intensive methods. In other words, capital inputs rather than labour inputs account for a greater share of the industy's output.

The rest of this paper is structured as follows: Section A reviews the main theoretical framework of our analysis. Section B discusses factor use in Nigerian manufacturing industries. Section C presents the test for factor intensity in the Nigerian leather industry while Section D summarises the policy implications of the conclusions reached in the study.

A. THEORETICAL FRAMEWORK

In verifying the factor proportions in the Nigerian leather industry, we shall make use of the Cobb-Douglas production function which takes the general form:

$$Q = AK^{\alpha} L^{\beta} U$$

where,

A = Constant term
K = Capital input
α = Capital input coefficient
L = Labour input
β = Labour input coefficient
U = error term

This production function has the following properties: First, the elasticity of substitution is equal to one at every point on the Cobb-Douglas production function. Secondly, the function makes for easy estimation of returns to scale. The coefficients α and β are the elasticities. The sum of elasticities equals to one ($\alpha + \beta = 1$). This means that "the function is homogeneous of first degree and thus constant returns to scale are ensured" (Osakwe, 1975). If the sum of elasticities of capital and labour inputs is greater than one (if $\alpha + \beta > 1$), there are increasing returns to scale and if the sum of the elasticities are less than one (if $\alpha + \beta < 1$), we have decreasing returns to scale. Since both inputs are necessary to the production process, if either input is zero ($L = 0$ or $K = 0$), output will be zero. Thirdly, using the Cobb-Douglas production function, it is possible to measure the efficiency in the organisation of the factors of production. For example, if two firms have the same capital input (K), labour input (L), capital input coefficient (α) and labour input coefficient (β) and still produce different quantities of output, the difference can be due to the superior organisation and entrepreneurship of one of the firms which results in different efficiencies. The more efficient firm will have a larger constant term (A) than the less efficient one. Fourthly, in the Cobb-Douglas production function, factor intensity is measured by the ratio α / β; given our definition of α and β above, it follows that the higher this ratio, the more capital intensive the technique of production. Similarly, the lower the ratio α / β, the more labour intensive the technique of production.

From the foregoing therefore, it is clear that studies of factor intensity relate essentially to the question of choice of industrial techniques. Choice of industrial techniques is an issue which has in recent times attracted a large volume of literature in the field of economic development. An extensive bibliography has been published (Baranson, 1967) on this issue.

In a generalised way, a model of choice of techniques of industrial production may be sketched on the basis of the neoclassical production function as shown in Fig. 1.

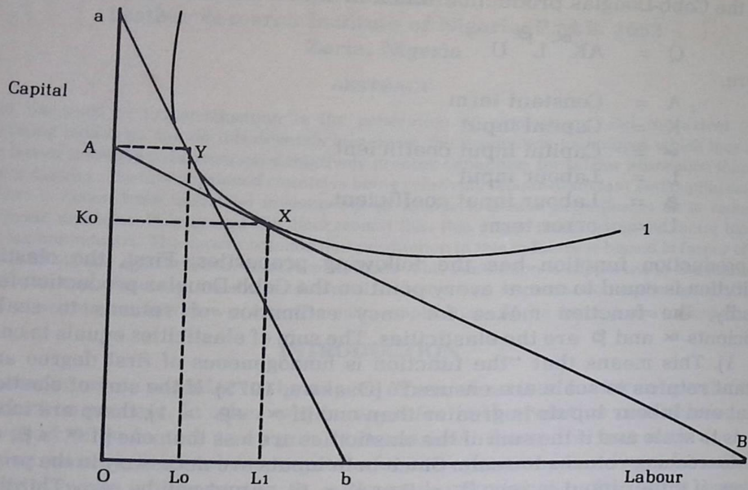

Fig. 1 *A model of choice of technique*

Underlying this model is the maximisation of output obtainable from any given combination of inputs. This therefore implies long-run profit maximisation or long-run cost minimisation (Sen, 1968; Sutcliffe, 1971a; Stewart and Streeten, 1973; Ekuerhare, 1978). The model assumes a world of two factors namely, capital and labour where output is a function of capital and labour. The input cost line (isocost) AB shows relative prices of capital and labour. It represents total money or cost outlay. The line ab shows changes in relative prices of capital and labour. The point X can be interpreted in three different ways. Firstly, it is the cheapest way of producing a particular level of output represented by isoquant 1. Secondly, it is the highest level of output given the total cost outlay. Thirdly, it can be interpreted to represent the point at which the marginal rate of substitution (MRS) between capital and labour is equal to the ratio of their relative prices. These three interpretations specifically imply that X represents the point of maximum profit. The comparatively flat equal-cost curve (AB) represents a low price of labour in relation to capital while the comparatively steep equal-cost curve (ab) represents a relatively high price of labour. The relatively flat equal-cost curve (AB) clearly demands the use of a more labour-intensive technique of production than in (ab) which demands the use of a more capital-intensive production technique. Provided that the prices used in the determination of the equal-cost curves are market prices, then the choice of techniques on this basis for individual entrepreneurs simply represents the minimisation of costs for each level of output which is part of the maximisation of profits.

The essence of the neoclassical model of choice of techniques is that labour-abundant (or capital-scarce) countries, notably, the underdeveloped nations, should adopt industrial techniques of production which are labour-intensive. The reason for this prescription is that labour-intensive techniques relate very closely to the domestic factor availability in such countries. Since labour in underdeveloped countries is cheaper than it is in developed countries, the former should adopt techniques which economise on the use of the relatively more expensive factor, capital. This then means that in terms of the foregoing neoclassical model, the equal-cost curve has a flatter slope in the underdeveloped countries indicating that the optimum allocation of resources will be achieved by using a more labour-intensive technique. The implication of this theory is that investments in such countries should be concentrated in labour-intensive activities thus maximising both current national income and employment. This argument has a special appeal in the developing countries which face serious problems of unemployment. Related to the employment argument is the contention that labour-intensive production techniques would make for a relatively even distribution of income between factors of production thus reducing the extreme inequalities in the distribution of income (in favour of capital owners arising from huge profits) which characterise most underdeveloped countries. Proponents of capital intensive methods of production however quickly point to the fact that since the marginal savings rate out of profits is higher than the marginal savings rate out of wages (Jhingan, 1981; Myint, 1973), "the rate of investment to be expected in the future will depend rather critically on the choice of techniques made now since this has effect on the creation of investible surplus" (Oyejide, 1977a). This imples that the use of labour-intensive methods of production which appears a wise decision in the short run may slow down the rate of economic growth by increasing the share of wages (which largely goes in for consumption) while reducing the share of profits (which largely goes into further investments). There is however a counter argument (Sutcliffe, 1971b) that in the underdeveloped countries where most manufacturing industries are owned or controlled by foreign entrepreneurs, a high proportion of these profits is not reinvested locally but is repatriated.

B. FACTOR USE IN NIGERIAN MANUFACTURING INDUSTRIES

Having reviewed the theoretical literature relating to factor intensity, the factor use in Nigerian manufacturing industries can now be examined. It is common knowledge that the Nigerian industrialisation process developed within the framework of import substitution. The import substitution strategy involves a policy of selective import liberalisation and the erection of tariff barriers or importation quotas on certain commodities, and then establishing domestic industries to replicate the goods using the technology of the developed country from where commodities being replicated were formerly imported. The importation of advanced country technology characterising this strategy of industrialisation limits the "freedom of choice of a developing country in terms of making an optimal choice of technique of production" (Oyejide, 1977b). The implication of this limited choice of techniques for the Nigerian manufacturing industries is that the techniques are generally capital-intensive. Table I (Oyejide, 1977c) which compares the capital-labour ratios of some Nigerian and Japanese manufacturing industries for the year 1967 illustrates the high capital intensity of the Nigerian manufacturing industries. It can be observed from the Table that for all the industries where corresponding data were available for the two countries, Nigeria's capital-labour ratios (and hence capital intensity) were higher than those of Japan.

Similar conclusions can be drawn from Table II (Fed. Office of Statistics, 1969 — 1978; United Nations Organisation, 1969 — 1978) wherein comparison is made between the capital-labour ratios in the Nigerian, Brazilian and Japanese leather tanning industries. It can be observed that for the entire 1969 — 78 period, the capital-labour ratios in the Nigerian leather industry were higher than those in the Japanese leather industry. Similarly, excepting the years 1969 and 1972, the capital-labour ratios in the Nigerian leather industry for the years for which corresponding data were available, were higher than those of Brazil.

The higher capital intensity in the Nigerian manufacturing industries identified in the foregoing analysis can be said to reflect Japan's and Brazil's "greater success in relating their choice of techniques to" their "domestic factor availabilities" (Oyejide, 1977d).

TABLE I

CAPITAL-LABOUR RATIOS IN NIGERIAN AND JAPANESE MANUFACTURING INDUSTRIES: 1967

Industry	K/L Ratio (₦'000)	
	Nigeria	Japan
Food Products	2.455	0.130
Beverages	3.410	—
Tobacco Products	1.880	—
Textiles	1.154	0.120
Footwear and Clothing	0.769	—
Wood and Furniture	0.834	0.110
Paper and Printing	1.042	0.121
Leather Products	0.571	0.060
Rubber Products	0.561	0.111
Chemicals, Petroleum, Coal	1.415	0.400
Non-Metals, Mineral Products	3.144	0.140
Metals	1.068	0.510
Machinery	0.537	0.160
Transport Equipment	0.925	0.131
Miscellaneous Products	0.991	—

TABLE II

CAPITAL-LABOUR RATIOS IN NIGERIAN, BRAZILIAN AND JAPANESE LEATHER TANNING INDUSTRIES, 1969 — 78

Year	Nigeria	Brazil	Japan
1969	0.104	0.352	0.040
1970	0.869	N.A.	0.071
1971	0.597	0.435	0.032
1972	0.383	0.558	0.055
1973	0.520	0.500	0.047
1974	0.609	0.503	N.A.
1975	4.102	N.A.	0.035
1976	2.563	N.A.	0.030
1977	0.877	N.A.	0.027
1978	0.724	N.A.	0.038

N.A. = Not Available

C. TEST FOR FACTOR INTENSITY IN THE NIGERIAN LEATHER INDUSTRY

The test for factor intensity in the Nigerian leather industry as carried out in this Section rests on the proposition that the capital inputs rather than labour inputs account for a larger share of the output of this industry which means that the industry is biased towards capital intensive methods. It has been stated in Section A that in verifying the factor proportions in the leather industry, we shall employ the Cobb-Douglas production function of the general form:

$$Q = AK^{\alpha} L^{\beta} \; U$$

But for convenience of direct estimation by ordinary least squares methods, it is transformed into the following logarithmic form:

$$\text{Log } Q = \log A + \alpha \text{ Log} K + \beta \log L + U \ldots\ldots (1)$$

All the parameters have been previously defined.

To determine the contribution (in the 1969 — 78 period) of each of the factor inputs to total output of leather, leather output(Q) as the dependent variable was regressed on capital input(K) and labour input(L) as explanatory variables. The period 1969 — 78 was chosen for this study because the relevant data for this time series analysis were regularly published for this period only. Relevant data for the years after 1978 are not available. The regression results are presented below:

$$\text{Log } Q = \underset{(13.189)}{1.071} + \underset{(1.984)}{0.894} \log K + \underset{(1.108)}{0.045} \log L \ldots\ldots (2)$$

$R^2 = 0.656$
F = 6.674
D-W = 2.504
N = 10

The figures in parenthesis of the estimated regression equation(2) are the t-ratios and they are placed under the estimated coefficients to which they refer. The number of observations(N) is 10. The results (as expected) show that both capital- and labour-inputs positively correlate with the gross output of leather. The regression results are statistically significant at 90% confidence level. Extension of confidence level of 90% was in full cognisance of the limitation imposed by the number of observations. The result in respect of the elasticity coefficient of capital shows that 100% change in the level of capital inputs in the leather industry would bring about 89.4% change in the level of leather output in the same direction. The labour input elasticity coefficient indicates that 100% change in the level of labour inputs would bring about 4.5% change in the level of leather output. These resultsclearly show that the capital input coefficient is higher than the labour input coefficient. The sum of capital and labour coefficients equals 0.939 indicating that the industry was operating at decreasing returns to scale. It is explained (Koutsoyiannis, 1980) that the cause for decreasing returns may be found in the exhaustible natural resources as illustrated by the fact that doubling the fishing fleet may not lead to a doubling of the catch of the fish. Hides and skins may be regarded as exhaustible natural resources in the sense that any calamity that threatens the livestock population tends to reduce correspondingly the quantity of hides and skins available. The Sahelian drought that devastated most parts of the northern States in the early 1970s could be seen in this light. It can thus be argued that the massive loss of animals as a result of the drought led to the reduction in the number of animals subsequently available for slaughter and consequently a reduction in the quantity of hides and skins reaching the tanneries. This could partly account for the observed decreasing returns to scale in the leather industry. The observed decreasing returns to scale in this industry may also be explained by the fact that over the years there had been increasing competition for the available hides and skins between leather processing and human consumption, with the latter tending to out-compete the former by offering prices far beyond what the tanners can pay irrespective of the quality of such materials. In addition to this situation, additional tanneries sprang up thus intensifying competition among tanners themselves for the available hides and skins. The R^2 indicates that 65.6% of the variation in the level of leather output is explained by variation in the level of capital and labour inputs. The measure of factor intensity α/β which equals 19.86 shows that the contribution of capital inputs to total output of leather is nearly twenty times that of labour inputs. This is an indication of relatively high capital intensity in the industry.

To determine the contribution of each of the factor inputs to the net output (value added) of leather (for the period 1969 — 1978), the net output of leather(V) as the dependent variable was regressed on capital input(K) and labour input(L) as explanatory variables. The regression results are presented as follows:

$$\text{Log } V = \underset{(5.122)}{0.625} + \underset{(1.984)}{0.960} \log K - \underset{(-1.108)}{0.050} \log L \quad \ldots\ldots (3)$$

$R^2 = 0.714$
F = 8.737
D-W = 1.876
N = 10

The figures in parenthesis of the estimation equation(3) are the t-ratios and they are placed directly under the estimated coefficients to which they refer. The number of observations(N) is 10. The results, as expected, indicate that capital input positively correlates with the net output of leather. The negative sign of the labour input is unexpected. The results are statistically significant at 90% confidence level. As in equation (2) the extension of the confidence level to 90% was in cognisance of the limitation imposed by the number of observations. The capital input coefficient indicates that 100% change in the level of capital inputs in this industry would bring about 96% change in the level of net output of leather. The labour input coefficient shows that a 100% increase in labour input was accompanied by a fall of 5% in the net output of leather. It would appear from this result that the law of diminishing returns would be set in motion earlier than expected in this industry if labour were to be substituted for capital or if labour were to be increased holding capital constant. On the other hand, production would appear to expand with increase in capital input. The sum of capital and labour input coefficients indicate decreasing returns to scale. The measure of capital intensity α/β equals 19.20 and shows that the contribution of capital inputs in the net output of leather is about nineteen times that of labour inputs.

From the foregoing empirical analysis, it can be stated that production in the leather industry was biased in favour of capital intensive methods. Reasons for the observed relative bias of technique of production in favour of capital and against labour can be discussed under two alternative explanations, namely, the neoclassical and the structuralist explanations. (Ekuerhare, 1978; Arrighi and Saul, 1973; Lewis, 1967).

The neoclassical explanation is based on the proposition that a critical determinant of choice of industrial techniques is the relative price of capital and labour that is, the ratio of price of labour to the price of capital. The neoclassical explanation posits that such institutional factors in Nigeria as powerful trade unions, minimum wage legislation, tax incentives, currency over-valuation, low import duties on capital equipment and low interest on investible fund have tended to artificially raise the effective market cost of labour relative to the cost of capital. This economic situation has tended to make capital (imports) too cheap relative to labour thus encouraging entrepreneurs to use more of capital inputs than labour inputs in their production process. Since the leather industry together with other industries has been operating within the framework of the economic policies just described, it cannot be isolated from the side effects of such policies.

The structuralist explanation derives from the view that the choice of techniques by firms in an industry may be significantly determined by the competitive conditions and the ownership and control structure of such an industry (Ekuerhare, 1982) and also by the desire to secure a dominant share of the market (Kilby, 1969). The Nigerian industrialisation process was engendered by foreign private firms which were hitherto engaged in merchandise activity and forced into manufacturing by a combination of government–restrictive trade policies and the market-protection investment motive. Part of the market-protection mechanism was the adoption by firms of capital-intensive techniques of production so as to raise productivity and ensure profits. Following the structuralist perspective, it can be argued that firms in the leather industry like firms in other industries adopted relatively capital-intensive methods of production in order to withstand competition in the Nigerian market. It can also be argued on the basis of the structuralist explanation that since foreign entrepreneurs played an important role in the establishment of the modern leather industry in Nigeria, the observed capital-intensive methods of production in the industry are reflective of the type of technology used in leather production in their home countries. Since these entrepreneurs are used to this technique of production, they might be reluctant to use any other type of technique because they would look at such attempts from the viewpoint of increased costs and lower profits.

D. CONCLUSION

The analysis in the previous Section has shown that production techniques in the Nigerian leather industry have been biased in favour of capital-intensive methods and against labour-intensive methods. Explanations for this bias have been made from the neoclassical and structuralist standpoints.

The question that comes to mind at this stage is since Nigeria is much more endowed with labour than capital and since she is currently being plagued by mass unemployment, what measures should be taken at the policy level to ensure that leather production activity takes cognisance of the relative availabilities of labour and scarcities of capital in the country? The answer lies in the capability of Nigeria to generate her own technology. It is by so doing that she will be able to fabricate relatively simple and cheap tanning tools and equipment which the ordinary tanner can operate and maintain. These tools would be less sophisticated than those imported from the technologically advanced countries, but relatively more advanced and much more productive than those used at the local craft level. This calls for the establishment and rapid expansion of a capital goods sector within the economy. Through the production and use of simpler and cheaper tools in the industry, not only will the industry be able to employ more people, labour productivity in the industry will also be raised.

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INTRA-AFRICAN INDUSTRIAL TRAINING PROGRAMME IN LEATHER INDUSTRY

January 21 — 27, 1985

An intra-african industrial training programme in leather and leatherproducts industries, sponsored by the United Nations Industrial Development Organisation in association with the Leather Research Institute of Nigeria, was held at the institute during January 21 — 27, 1985. This Study Tour programme was aimed at strengthening the industrial, technical and managerial capabilities available in the member African countries, through institutional upgrading and regional co-operation. Based on the available knowledge on specific problems on the leather and leatherproducts industries in the region, a comprehensive training programme was prepared covering industrial man-power training; development of indigenous training aids; hides and skins management; implementation of training policies; screening and development of indigenous tanning agents and leather auxiliaries; industrial design and plant layout; tannery/footwear factory organisation and management; leather/footwear industry manpower needs and training assessment; quality côntrol and standardisation; and industrial pollution control in leather and allied industries, followed by factory visits.

Participants from six English-speaking countries of the region viz., Cameroun, Ethiopia, Kenya, Nigeria, Tanzania and Zimbabwe, were sponsored for the Study Tour. The UNIDO Consultant for the Study Tour was Dr. Assad Takla and the Co-ordinator Dr. R.O. Adewoye. The salient points of the lectures are provided in the following lines:

Lecture I: "Industrial Manpower Training"

By

T.O. Odufuwa
Assistant Director & Head of Training
Industrial Training Fund, Jos

The lecturer said that the Industrial Training Fund was set up by the Federal Government of Nigeria with the objectives of encouraging and promoting the acquisition of skills in industry towards building up a pool of skilled manpower in the country. A systematic approach to manpower training in other African countries was also said to be required to guarantee an efficient job performance in the industry.

Workers in the industry should be motivated right from the planning stage of the enterprise, especially on the needs and benefits of training. Inplant training according to him, often worked out to be less costly and quite effective. It should be made obligatory on the part of the industry to seek such training periodically through recognised training organisations like the Industrial Training Fund.

Lecture II: "Training for Trainers"

By

T.O. Odufuwa
Assistant Director & Head of Training
Industrial Training Fund, Jos

While the lecturer considered the identification of training needs of industrial workers as of paramount importance, the industries themselves, he said, should maintain such a training policy that was geared towards achieving a healthier and more rapid industrial growth of the particular countries they were operating in. Where training was organised in a foreign environment, the trainees should be advised to bear in mind the local conditions and working situations in their respective home countries with a view to easily adapting the acquired knowledge on their return.

The role of training manager, the lecturer opined, included developing the trainers to look for better ways of performing the same job and motivating them to take more interest in the job. The employers should arrive at proper decisions in the choice of staff to be trained and the field of training. The evaluation of a training programme should be both concurrent and terminal and the curriculum designed should take cognizance of the type of training, the background of trainees/trainers and the availability of training equipment and aids.

Lecture III: "Design and Development of Indigenous Training Equipment, Aids and Materials"

By

David A. Balogun
Head of Instructional Technology
Department of Education
Ahmadu Bello University, Zaria

Keeping in view the local needs and conditions, the lecturer was of the view that indigenous development of machine designs and models should be given utmost encouragement. The developing nations must identify and encourage talented people to take on the role of developing indigenous technology. Suitable existing machinery and tools could first be identified and thoroughly studied, then attempts should be made to develop similar prototypes using local materials.

Industries, he further submitted, must be made to contribute a good percentage of their profits to the government's research and development efforts while indigenous developments should be encouraged by both the industry and government and talented inventors given the right environment and proper incentives as a matter of policy.

Lecture IV: "Effective Hides and Skins Management in Africa"

By

A.S. Mshelbwala
Director, Leather Research Institute of Nigeria
Zaria

The lecturer used the export-import figures on the trade between the developing nations, particularly those in Africa, and the developed nations to establish the fact that the former continued to be the producers of raw materials being processed by the multi-national corporations belonging to the latter. African countries, he said, must thoroughly explore the market potentials towards better and fuller utilisation of their hides and skins. Appropriate R & D work should be conducted to ensure better quality of the raw materials.

Relevant regulations already formulated, such as the ones in Nigeria, should be enforced in order to ensure the provision of good quality hides and skins to the leather industry and to prevent wastages, such as human consumption. Nigerian tanneries, he disclosed, have curtailed the volume of processing of hides in view of prohibitive cost of the raw material. Communication system amongst African nations, in his opinion, needed improvement towards overall development of inter-African trade.

Lecture V: "Implementation of Training Policies and Training Systems"

By

S.A. Akinruli,
Inspectorate Division, Federal Ministry of Education,
Science & Technology, Kaduna

The training policy of the industries in the developing nations, according to the lecturer, should be oriented towards utilisation of indigenous raw materials and development of equipment using local resources. A well-planned educational policy, purposeful overseas training and incentives to talented inventors were recommended to achieve a significant technological break-through.

Students, he advocated, should be given incentives to undergo technical training on the lines of self-sufficiency in indigenous technology while research results should be tested and given fair trials, arguing that the promising ones should be adopted without loss of time, as opposed to the present situation whereby they were left unutilized indefinitely.

Lecture VI: "Screening and Development of Indigenous Tanning Agents in Africa for Commercial Exploitation"

By

R.O. Adewoye
Assistant Director
Leather Research Institute of Nigeria, Zaria

The lecturer stated that Africa was blessed with much natural resources, particularly those of plant and mineral origin, that were yet to be fully tapped due to lack of proper survey, inadequate information about their economic potential or non-availability of necessary infrastructural facilities. He delved extensively into the procedures often adopted for screening materials suspected to be of any potential to the leather industry saying that investigation should start from known to unknown. For the vegetable tanning materials, the state of the knowledge of the nation's forestry department with regard to the country's flora survey and plantation growth conditions should be taken advantage of while the chemical, physical and aesthetic characteristics of any promising material coupled with economics of production should always be kept in view. He said vegetable tanstuffs were usually screened for abundance, tannin content plus tan to non-tan ratio, colour and tannin classification. Production of tannin extract on pilot or commercial scale coupled with large scale plantation cultivation of selected materials should be well-planned and well-integrated.

In the case of screening suspected mineral tanning materials, the procedure would be similar, except that the services of the national geological survey department would be required as the start-off point. He said, based on their mechanism of tannage, mineral tanning agents would be required to be prepared in the basic chemical form and that utmost care should be exercised in carrying it out to prevent the precipitation of their respective hydroxides, particularly those mineral salts such as zirconium and aluminium that were very acidic on hydrolysis. According to him, bichromate salts, where not naturally mined as in Zimbabwe, could be imported and economically reduced by individual tanneries but added that the risk of having carcinogenic hexavalent chromium in the effluent due either to incomplete reduction or re-oxidation of the trivalent salt would make taking such a step unattractive.

He encouraged participants not to discard marginally viable vegetable tanning materials but to use them in combination with mineral tanning agents. Apart from complementing each other's deficiencies, the resulting interaction might yield desirable synergistic effect as LERIN had discovered in semi-alum tannages involving local vegetable tanning materils. The phenomenon, he said, had a very good prospect in upgrading the quality of leathers produced by traditional tanners. The development of synthetic tanning agents should not be ruled out especially in countries where the required petro-chemical ingredients could be obtained cheaply.

Lecture VII: "Industrial Planning, Design and Project Lay-out"

By

G. Makarem
Senior Lecturer, Dept. of Mechanical Engineering
Ahmadu Bello University, Zaria

Two types of project layout were treated by the lecturer namely: Product Layout (for continuous manufacturing) and Process Layout (for intermittent manufacturing). He said space requirement for production department depended on the type of layout adopted, adding that, in general, process layout required more space than the product layout in the ratio 5 to 3 by his estimation.

According to him, essential facilities to be alloted suitable space in a plant layout included:

1. Shipping and receiving sections
2. Inspection section (centralized or decentralized)
3. Maintenance section (centralized or decentralized)
4. Workshop offices
5. Cafetaria
6. Washroom and lockers
7. Toolroom and Tool cribs
8. Clinic or Medical Unit.

Lecture VIII: "Tannery Organisation and Management Problems"

By

D. Hocke
General Manager
International Tanners Ltd., Kano

According to the lecturer, the organisation of a tannery should be based on a well-planned lay-out in such a way that it would provide for easy flow of men, materials and other inputs. Vast differences in the availability of land, environmental conditions and costs that existed between the European and African countries necessitated different approaches in the pattern of construction of tanneries in the latter. He was of the opinion that effective technical and administrative controls were necessary to achieve cost-minimization and profit-maximization and that an efficient administration could ensure lasting cordial relationship between the management and workers.

While government policies should aim at improving the status of the industry, he agreed that necessary steps must also be taken by the industry to provide some funds for R & D, encourage training of personnel etc. He felt that there was a great scope for applied research in the fields of development of local substitutes and in pollution control activities of the commercial tanneries. It was advisable, he said, to develop a maintainance crew for individual tanneries.

Lecture IX: "Tannery Manpower Needs and Training Assessment"

By

B.B. Dashe
Ag. Principal, School of Leather Technology
Leather Research Institute of Nigeria, Zaria

The lecturer asserted that LERIN's training programme was adequate for the production of the manpower requirements of Nigerian tanneries. He said, in doing so standards acceptable to the industry were maintained. He added that a recent survey revealed that 5 technologists per year were adequate to meet the needs of the commercial tanneries in the country. He frowned at the situation whereby the largest number of technicians were being absorbed in the public sector where there were barely any tanning activities. This, he said, supported an earlier claim that training in leather technology was not evolved as a fundamental policy to produce manpower for the tanning industry but for the general public, like the university. That was why the school, in collaboration with the institute's extension services, was conducting the feasibility study into the manpower needs of the tanning industry. He said experience had shown that for a specialised field like leather technology, training should be according to specific needs to avoid wasting of resources.

He looked at assessment from the point of view of an educationist and contended that the purpose of assessment had to be defined for the test-method and test-instrument to be correctly selected. He said development of test-instrument along with the curriculum was most appropriate and as a result the curriculum had to be properly drawn in the behaviourial or performance objectives, for the assessment to be valid, reliable and objective.

Lecture X: "Development of Leather Auxiliaries from Indigenous Raw Materials"

By

S. Bangaruswamy
Chief Research Officer
Leather Research Institute of Nigeria, Zaria

The lecturer opined that the paramount objectives of any industry in the African region was to develop, as many as possible, indigenously available materials and that the approach was more relevant for the leather industry since virtually everything except the hides and skins were being imported. He believed that most of the inputs into leather production could be produced locally from the naturally occuring reserve potentials of the individual member countries of the region.

He referred to Nigeria which, he said, had good amount of limestone deposits and that the local tanning industry could hope to get its entire lime requirements therefrom. He also disclosed that the enzymes present in *Adenopus breviflorus* ("Tagiri") fruits, *Cissus aralioides* ("Gaba-gaba") and *Pergularia tomentosa* ("Fataka") plant materials were successfully utilised in the beam house operations viz., unhairing and bating. He further added that R & D work on the preparation of a bate based on the locally-available animal pancreas was already in progress. Synthetic fatliquors and finishing agents, he noted, had a great scope of being locally manufactured once the local petrochemical industry started supplying the needed raw materials. Fatliquors based on industrial grade cottonseed oil, rubber seed oil and other vegetable oils could now be supplied to the leather industry. He suggested that developing countries should give utmost priority to exploring their local reserves towards the development of appropriate indigenous leather auxiliaries.

Lecture XI: "Quality Control, Standardisation and Technical Services in Leather and Leather Products Industry"

By

S. Bangaruswamy
Chief Research Officer
Leather Research Institute of Nigeria, Zaria

The lecturer pointed out that the reputation of an industry could be maintained only through quality-oriented production by the adoption of quality control measures and standardisation procedures. He emphasized that the need for controls and standardisation during the processing of leather and leather products became urgent in order to meet the requirements of the international market.

Input control, process control and product control in respect of various raw materials, unit-processes, leather and leather products were discussed. Scale of sampling, sampling procedures, physical, chemical and instrumental test-methods were also dealt with. Certification schems, "Q"-marking practices and activities of various internationally recognised standards organisations were also mentioned. The lecturer emphasized the need for an effective technical services department in R & D institutions in Africa and advocated the establishment of common facility centres for the rural sector. Mobile extension service units and field extension centres were also recommended. Creation of a regional information centre for leather and leather products for Africa was considered an immediate necessity. The activities at the Leather Research Institute of Nigeria in the above areas were indicated.

Lecture XII: "Footwear Factory Organisation and Management Problems"

By

S.P. Uki
Assistant Leather Factory Manager
Bata (Nigeria) Limited, Lagos

The lecturer pointed out that the multiplicity of complicated operations in a shoe factory led to the formation of individual departments, each of which had to carry out its clearly defined tasks under a precisely determined organisational schedule in order to ultimately produce a readily saleable quality final product.

He likend the making of shoes today to the manufacture of a motor vehicle where several components were separately prepared and then assembled to form the finished product. He informed participants that, as in car factories, ready-made parts were often purchased from outside suppliers, particularly unit soles, heels and insoles. He emphasized that the success of any shoe industry depended entirely on good production planning and identified the problems in the shoe factory as: labour turnover, absenteism, machine breakdown, non-availability of materials, sub-standard quality etc.

He contended that one of the more important causes of loss of productivity in workshops of any kind was downtime which he said could reduce the profits of any manufacturing organisation significantly. He defined downtime as a time when the production line ground to an unexpected halt as a result of, for example, machine breakdown, lack of materials, lack of skilled operators or lack of energy.

He said the problems could be contained by proper planning through the application of 'production freeze' that would ensure that energy, people, materials and machines were all ready to go at the right time.

Lecture XIII: "Footwear Industry Manpower Needs and Training Assessment"

By

E.A. Ekong
The Training Manager
Bata (Nigeria) Ltd., Lagos

The lecturer was of the view that every successful enterprise must have need of talented personnel. He noted that such enterprises would need to seek the co-operation of relevant training institutions so that appropriate individuals could be identified as part of the recruitment exercise.

A deliberate policy of cordial relationship with research and training institutions, he went on, needed to be established in assessing the level of training with respect to quality and requirement as well as to maximally utilise the local materials/products in production. He added that necessary encouragement would need to be given to local suppliers of manufacturing inputs in developing countries to enable them meet certain minimum requirements. Such practice, he said, was particularly needed in African countries if the continent was to have any chance of making a significant technological impact.

Lecture XIV: "Industrial Pollution Control in Leather and Allied Industries"

By

J.B. Gabriel
Head, Pollution Control Programme
Leather Research Institute of Nigeria, Zaria

The lecturer advised that efforts be made to minimise generous use of chemicals and encouraged the recycling of those that were themselves considered essential for the required unit operations. He advocated the development of processes using less-polluting alternative materials and separate collection of process liquors on a sectorial basis for ease of either treatment or recycling.

Appropriate segregation of solids through precipitation/sedimentation, disposal of solid wastes by burning/burying and suitable anaerobic/facultative lagoons for the treatment of tannery wastes in Africa were suggested. He expressed the concern that most tanneries in the region were not aware of the importance of pollution control to human, animal or plant life, although he acknowledged that a few of them had introduced some reasonable treatment measures.

ABSTRACTS
(FROM OTHER PUBLICATIONS)

HIDES AND SKINS

Haines, B.M. (1983), "MICROSCOPY OF GRAIN DEFECTS OF BOVINE LEATHER," J. Soc. Leath. Tech. Chem., **67** (2), 25.

The need to produce full grain and aniline leathers has sharpened the awareness of the blemishes or damages to the grain surfaces of hides. Microscopy, especially, scanning electron microscopy (SEM), has been effectively used to detect a wide variety of such grain surface blemishes and their causes. These grain surface damages, which become apparent in the final leather, occur either as antemortem or postmortem damages. Antemortem damages are characteristically permanent, hence the easy identification of the cause; the two most common parasites causing such damages in Britain are tick and demodectic mange. Putrefaction by bacteria due to delay in curing and inadequate control of temperature, pH etc. measures during processing cause postmortem damages. An operating liming temperature of 25 — 28°C and a partial deliming prior to washing with warm water and bating are suggested, to minimise the incidence of sueded grain. (24 Figs.)

(GDG)

Barrett, J.C. (1983), "BACTERICIDES FOR PRE-TREATMENT IN SUSPENSION DRYING OF HIDES AND SKINS: A REVIEW," J. Soc. Leath. Tech. Chem., **67** (2), 31.

In the tropical wet season, for example in West Africa, putrefaction of hides and skins during suspension drying is significant but may be reduced by pre-treatment of the raw stock with a bactericide. A suitable chemical must be cost-effective, have no adverse effects on leather-making qualities and acceptable with respect to health, safety and the environment. For application in less developed countries and small throughputs, a simple method of application with minimum expertise in process control is required. The chemical must remain effective during drying. The purpose of this paper is to review chemicals which have been used previously either as salt additives or for salt-free short-term preservation of hides and skins, with a view to potential application in suspension drying. Among inorganic chemicals, boric acid and sodium silicofluoride appear most promising and zinc compounds may have limited potential. Sulphites, chlorites, hypochlorites and sodium carbonate are less attractive. Among organic and proprietary chemicals, Vantocil IB presently offers most potential. Phenol and cresol type preservatives have several disadvantages, although sodium pentachlorophenate may have value as an auxiliary in spray treatment. Naphthalene and derivatives, quaternary ammonium compounds (benzalkonium chloride) and various proprietary chemicals of current interest for salt-free short-term preservation also have disadvantages. The use of antibiotics and medicinal compounds is discouraged. (1 Tab.; 93 Refs.)

(Author's summary)

Dennis, D.A. (1984), "THE STATUS OF COLLAGEN AS A GRAS INGREDIENT," J. Amer. Leath. Chem. Assn., **79** (4), 129.

A select committee is set up to evaluate the safety of two substances on the Food and Drug Administration's GRAS (generally recognised as safe) list. These substances are regenerated collagen and gelatin. It is concluded that both native and regenerated collagen are safe for use in food at current or reasonably expected future levels of use. There is however no basis yet for GRAS affirmation for the use of native collagen as a food ingredient. Gelatin is also considered safe at current and future anticipated levels of use. However, there are reservations about the sources of food grade gelatin especially with regard to hides that have been treated with pentachlorophenol or toxic tanning chemicals such as chromium. Hides from these sources are not acceptable as food grade gelatin.

(GE)

Henrickson, R.L., Turgut, H. and Rao, B.R. (1984). "HIDE PROTEIN AS A FOOD ADDITIVE," J. Amer. Leath. Chem. Assn., **79** (4), 132.

Several functional properties of native bovine collagen that can be useful in various food systems are provided. The central role of hydration in imparting functional properties on collagen such as swelling, gelation, emulsification, wettability, adhesion and heat stability in a food system is emphasized. Other factors that influence the behaviour of collagen include its pH and that of the food system. Additions of salts like sodium chloride and phosphate to the food system have significant influence on the action of collagen. Wet hide collagen, the cheapest and most abundant, contains a soluble fraction which functions as a binder and an insoluble fraction that provides an open texture to hold additional water. Heating wet collagen in a saline-water slurry to 70°C causes gelation and increased water-holding capacity. (12 Figs.; 5 Tabs.; 4 Refs.)

(GE)

Hughes, K.E., Fink, D.J., Hutson, T.B. and Veis, A. (1984), "ORIENTED FIBRILLAR COLLAGEN AND ITS APPLICATION TO BIOMEDICAL DEVICES," J. Amer. Leath. Chem. Assn., **79** (4), 146.

Battelle's proprietary methodology for collagen thermal gelation can be used to form unique 3-dimensional fibril structures whose morphology and mechanical wet-strength approach those of natural collagenous tissues. Morphological alignment and preferential aggregation of collagen fibrils were observed and substantiated by numerous replication experiments. The orientation effect is detectable by various microscopic studies of the gel matrix, and by mechanical and optical property measurements on dehydrated gels. These dehydrated and cross-linked collagen gels exhibited remarkable mechanical properties, with yield stress observed as high as 18,000 psi. Cross-linked collagen materials were used successfully to fabricate small, helically wound tubing, woven flat-sheet and filamentous materials, including collagen/ceramic composites. Lay-up and bonding methods were devised which allow reliable assembly of specialized built-up components. This reconstitution process could lead to advantageous new designs for use in the surgical repair of body tissues. Applications are suggested in the following areas: vascular grafts, skin substitutes, tendon and ligament grafts, hernia repair materials, wound healing augmentation, drug delivery matrices, sutures and bone repair materials. (9 Figs.; 1 Tab.; 17 Refs.)

(Authors' summary)

TANNING AGENTS AND MECHANISM OF TANNAGES

Mandal, A.B., Mukherjee, D. and Ramaswamy, D. (1981), "PHYSICO-CHEMICAL STUDIES OF MICELLE FORMATION OF SYNTHETIC TANNING MATERIALS IN VARIOUS ENVIRONMENTS," Leath. Sc., **28** (8), 283.

The results of spectrophotometric and conductometric investigations suggest that the synthetic tanning materials formed micelles at a particular concentration below which they do not form micelles. The CMC is determined for different syntans in aqueous as well as in different additive environments at different temperatures. With this micellization concept, a new equation for the determination of association constant (K_A) for the mixed system is framed obeying law of mass action principle. The validity of this equation is established in glycine and urea environments as model systems. From the temperature dependence of the association constant and with the help of the Gibb's equation, various thermodynamic parameters were estimated. The above analysis has also been modelled conceptually as a different phase. The thermodynamic parameters supported the transfer of syntan to glycine and urea containing sites whereas, the reverse is not true. Evidence was also obtained for the Syntan-25 micelles to exist freely in the hydrophilic group of glycine than that of Syntan PUR. In presence of urea, destabilisation of Syntan-25 micelles has been observed through disruption of hydrogen bond. (3 Figs.; 5 Tabs.; 4 Refs.)

(Authors' summary)

Colella, M.B., Siggia, S. and Barnes, R.M. (1980). "SYNTHESIS AND CHARACTERIZATION OF A POLY(ACRYLAMIDOXIME) METAL CHELATING RESIN," Anal. Chem., **52** (6), 967.

Divinylbenzene (DVB) crosslinked poly (acrylamidoxime) resin was synthesised by reaction of a n-butanol solution of hydroxylamine with 5% DVB crosslinked poly (acrylonitrile). The resin was air dried, ground and sieved. It is found to have consistent metal uptake characteristics, high capacity for use in simultaneous concentration and determination of several metals and stability over a long period of time. Preliminary investigations on the application of the resin for the concentration of trace metals from aqueous solution are reported. The pH dependence of metal-resin chelation has been determined for Na, K, Mg, Ca, Ti (IV), V(V), Cr(III), Cr(VI), Mn(II), Fe(II), Fe(III), Co(II), Ni(II), Cu(II), Zn(II), Ag(I), Cd(II), Hg(II) and Pb(II). The resin exhibits no affinity for the alkali or alkaline earth metals tested over the pH range of 2 — 8 and the resin selectivity has been determined at pH 5 for several of the metals. The order of decreasing selectivity is Cu(II), Ni(II), Co(II), Zn(II), Mn(II). (12 Figs.; 5 Tabs.; 36 Refs.)

(FAL)

LEATHER TECHNOLOGY/CHEMISTRY

Smith, R.A. (1984). "ALUM-BASED HIDE PROCESSING," J. Amer. Leath. Chem. Assn., **79** (3), 94.

Aluminium salts used to preserve hides and skins temporarily provide answers to some of the needs of the hide and tanning industries. This concept is reviewed and experimental results using aluminium salts as temporary preservatives are presented. (1 Fig.; 3 Tabs.; 3 Refs.)

(Author's summary)

Ravichandran, S., Sambasiva Rao, P.V., Jayaraman, K.S. and Krishnan, T.S. (1980). "SEMI CHROME SHEEP NAPPA BY FRINGE TANNAGE — CO-RELATION OF PROPERTIES," Leath. Sc., **27** (5), 162.

A study has been made on the characteristics of leathers processed by fringe tannage system in semi chrome tannage and the economic advantages of choosing proper type of tanning system has been brought out, without sacrificing the qualities as compared to conventional semi chrome tannage. (4 Tabs.; 6 Refs.).

(Authors' summary)

Venkateswara Rao, M. and Ganesan, A. (1980). "SOFTY BAG LEATHERS," Leath. Sc., **27** (6), 195.

Process details for the production of softy bag leathers from cowhides are provided.

(ETO)

Srinivasan, K.S.V., Rajadurai, S. and Joseph, K.T. (1980), "ACRYLIC EMULSIONS AND THEIR APPLICATION IN LEATHER INDUSTRY — A REVIEW," Leath. Sc., **27** (7), 214.

The application of acrylates, nitrocellulose and polyurethanes in the leather industry as finishing materials had resulted in the formulation of suitable substitutes for protein-based finishes which have been used over the years. The methods and mechanisms of polymerisation of acrylic polymers, their properties, additives and utilization in leather finishes as well as their comparative advantages over other polymers were discussed. (4 Tabs.; 43 Refs.)

(AAN)

Kamat, D.H., Khanna, J.K., Subba Rao, M., Selvarangan, R. and Venkatachalam, P.S. (1980), "ALTERNATIVE SOURCES AND TECHNOLOGY FOR MAKING NAPPA AND SOFTY LEATHERS," Leath. Sc., **27** (7), 226.

Possibility of making nappa and softy leathers from buffalo, cow and goat skins by certain modifications in bating, pickling, tanning and fatliquoring is indicated. The approach consists of acid bating in addition to normal bating, pickling in the presence of naphthalene sulphonic acid, retanning with chrome syntan and fatliquoring using a mixture of marine and synthetic fatliquors. Variety of leathers such as softy shoe upper, clothing and gloving leathers could be produced following the above approach.

(Authors' summary)

Stellmach, J.J. and O'Connor, S.C. (1980), "THE RETANNAGE OF CHROME LEATHER IN THE EIGHTIES," Leath. Manufacturer, **98** (6), 13.

Various methods of retanning chrome tanned leathers were discussed. The retannage of chrome tanned leather is characterized into two broad types viz., Inorganic or Mineral and Organic retannages. The Inorganic or Mineral retannage chiefly utilises chrome while the Organic utilises vegetable extracts, naphthalene and phenolic syntans, and amino-aldehyde resins. Three specific processes considered to be useful in the eighties were discussed. The first is a chrome retannage that yields high chrome fixation and low chrome effluent. The second is a chrome-free retannage and the third, a retannage that results in water resistance, low extractables and cleanability. It was shown that the processes were successful and very promising for the eighties. (1 Tab.; 25 Refs.)

(BBD)

(1982). "UV CURED COATINGS ON LEATHER DEVELOPED BY ERRC," Leather, **184** (4486), 31.

The development of Ultra-violet (UV) cured coatings on leather is described: significant advantages claimed by the Eastern Regional Research Centre (ERRC) include non-involvement of solvents, absence of requirement of baking oven and non-consumption of energy during drying the coats. The UV curing equipment is however very expensive and the project is just one among fourteen major on-going projects at the ERRC.

(ETO)

LEATHER PRODUCTS

(1982). "TO DRY CLEAN, OR NOT TO DRY CLEAN," Shoe and Leath. News, **Sep.2**, 32.

The debate over whether or not dry cleaning companies should be involved in the repair trade is growing. There is no doubt that dry cleaning companies are attracted to shoe repairing but their motives are always different. For instance, some consider the shoe repairing trade as part of their marketing plan while others do so for profit-making. In the recent Dry Cleaning Exhibition in Birmingham, shoe repair machinery with complete gadgets were displayed unrestrained. Although none can foretell the future trends, there are indications that shoe repairing and dry cleaning are coming closer together for their mutual benefits. Some existing repairers have already recognised this fact. This should not be seen as an unhealthy competition but rather as a changing market requirement.

(ETO)

CONTROL AND TREATMENT OF EFFLUENTS/ENVIRON. SC. AND TECH.

Madhavakrishna, W. and Santappa, M. (1980). "TECHNO-ECONOMIC FEASIBILITY OF TANNERY EFFLUENT TREATMENT," Leath. Sc., **27** (1), 20.

This is a study on the technical and economic implications of treating tannery effluents. It gives the various treatment options available and the costs involved, under Indian conditions. The selection of a suitable treatment method depends on the quantity and nature of the wastes, installation and running costs of the treatment system, land availability and the required final effluent quality. Based on these criteria, three treatment systems were selected and costed: (a) anaerobic lagoon followed by aerated lagoon; (b) anaerobic lagoon followed by oxidation ditch; and (c) aerated lagoon followed by oxidation ditch. Certain design criteria for the treatment systems are given in addition to some cost estimates for three waste flows of 10,000 litres/day, 50,000 litres/day and 100,000 litres/day. For example, for a system of anaerobic lagoon followed by oxidation ditch, and a waste flow of 50,000 litres/day, the total capital cost was 130,000 Rupees and annual running cost 37,180 Rupees, using a land area of 2,900m^2. (1 Tab.; 2 Refs.)

(JBG)

Shimp, G.F., Houck, C.P. and Baumgartner, B. (1983), "DEVELOPMENT OF A REGIONAL SLUDGE DEWATERING FACILITY USING PRESSURE FILTERS," J. Water Poll. Cont. Fed., **55** (2), 130.

Sludges from various plants at Summit County, U.S.A., were being used as land-fill until 1976 when the sludge production rates far outstripped the capacity of the land-fill. Three methods were then considered as viable options for the central management of the sludges: (a) transport the sludges from the plants to a more suitable land-fill site; (b) transport the sludges to a central location and compost into soil conditioner; and (c) transport to county-wide dewatering locations and use the final sludge for land-fill or reclamation. A cost analysis of the three methods showed option (b) to be most expensive while (a) and (c) are about the same. Option (c) was finally selected as most suitable based on engineering, environmental and socio-economic considerations. For the dewatering, pressure filters were used to achieve cake solids with 32% solids by weight and solids capture of 99.9 + % which cannot be achieved with other filter types. The Summit County authority served as the strong central agency needed for the co-ordination and development of the regional sludge management plan. (1 Fig.; 4 Tabs.)

(JBG)

Kincannon, D.F., Stover, E.L., Nichols, V. and Medley, D. (1983), "REMOVAL MECHANISMS FOR TOXIC PRIORITY POLLUTANTS," J. Water Poll. Cont. Fed., **55** (2), 157.

This paper describes studies conducted in complete-mix, continuous-flow reactors, batch reactors, and ozonation of wastewater prior to biological treatment. Fifteen different toxic priority pollutants were studied in continuous-flow reactors. In addition to the continuous-flow studies, acrylonitrile, 1, 2-dichloropropane, 2, 4-dinitrophenol, and phenol also were studied in batch reactors and ozonated before biological treatment. It was found that priority pollutants can be removed by several mechanisms, the most important mechanisms being stripping, biodegradation, and a combination of stripping and biodegradation. The removal mechanism was found to be consistent with the classification of the chemical. In general, nitrogen compounds, phenols, and oxygenated compounds were removed by biodegradation. Aromatics were removed by a combination of stripping and biodegradation. Halogenated hydrocarbons generally were removed by stripping. There were some exceptions. It was also found that the removal of specific organic compounds during biological treatment can be significantly impacted by treatment with ozone prior to biological treatment. (6 Figs.; 4 Tabs.; 5 Refs.)

(Authors' summary)

Murphy. Jr., C.B. and Spiegel, S.J. (1983). "BIOACCUMULATION AND TOXICITY OF HEAVY METALS AND RELATED TRACE ELEMENTS," J. Water Poll. Cont. Fed., **55** (6), 816.

This is a review of the available literature on the bioaccumulation of heavy metals such as Cu, Hg, Pb, Zn, As, Mn, Fe, Cr, Cd and Ni. It gives a survey of the various heavy metals in the environment, their bio-concentration and toxicity in aquatic organisms, biodetoxification, and the applications of heavy metal toxicity in monitoring environmental pollution. The associated effects of pH and salinity are also given. (95 Refs.)

(JBG)

Krishnamoorthi, K.P. and Sarkar, R. (1980). "BIOLOGICAL SYSTEMS OF WATER QUALITY EVALUATION USING AQUATIC ORGANISMS," J. Scient. Ind. Res., **39** (11), 647.

Biological estimation of water quality on the basis of the responses of flora and fauna to stresses in the environment is a rapid and reliable procedure which provides valuable information on the effect of such stress on life. Several systems are employed for the biological monitoring of water quality. The methods based on the ecology and physiology of aquatic communities are summarized. The results of investigation of fresh water and polluted aquatic ecosystems carried out at the National Environmental Engineering Research Institute (NEERI), Nagpur are summarized. The significance of biotic communities as a parameter for detecting water pollution levels is discussed and conclusions drawn from the studies undertaken at NEERI are given. (1 Fig.; 1 Tab.; 30 Refs.)

(Authors' summary)

ECONOMICS AND MARKETING

Gutman, J. (1982). "A MEANS-END CHAIN MODEL BASED ON CONSUMER CATEGORIZATION PROCESSES," J. Marketing, **46** (2), 60.

The relationship between product characteristics and values is brought out by means of a model (a Means-End Chain Model). The fundamental assumptions underlying the model are specified. The first fundamental assumption of the model is that people's choice patterns were guided by values. The second is that people, through a process of categorisation, were capable of narrowing down the complexity of choice arising from diverse products which potentially could satisfy their values. In addition to these assumptions, there are two others of a more general nature, namely, that all consumer actions have consequences and that consumers generally attributed certain consequences to certain actions. Besides reviewing the available literature on the Means-End Model, the method of measurement for the Means-End Chain is demonstrated and the practical applications of the model are indicated. (7 Figs.; 29 Refs.)

(AAI)

Assael, H. and Keon, J. (1982), "NONSAMPLING VS. SAMPLING ERRORS IN SURVEY RESEARCH," J. Marketing, **46** (2), 114.

The components of total survey error for several research designs are examined and compared empirically. Total survey error is made up of two components, namely, sampling and non-sampling errors. In a survey research, the sampling error arises from the fact that the selected sample is not a perfect representation of the test population while the non-sampling error arises from non-response and misrepresentation of answers by respondents. A detailed analysis of a study undertaken to select research procedures that would be used to obtain information on small businesses is presented. Results of the study showed among other things that non-sampling error accounted for an average of 95% of total survey error. (1 Fig.; 4 Tabs.; 27 Refs.)

(AAI)

DISSEMINATION

Stieg, M.F. (1980), "CONTINUING EDUCATION AND THE REFERENCE LIBRARIAN IN THE ACADEMIC AND RESEARCH LIBRARY," Lib. Journal, **105** (22), 2547.

The article attempts to re-examine continuing education from the perspective of reference librarianship. A widely quoted definition of continuing education is stated. Subject knowledge for reference librarian is emphasized to prevent him from becoming an 'arid, superficial technocrat'. The literature on continuing education concerns itself with the broad picture and with administrative aspects and not written from the perspective of the practising librarian. Hence, the concerns of practising reference librarians are conspicuously not addressed. Continuing education and insecurity are discussed. The decline in enrollment for continuing education and reasons for such decline are mentioned. The importance of liberal education is emphasized. The role of the librarian and the scholar is discussed; a symbiotic relationship between the two is suggested. General knowledge is considered to be an indispensable attribute of the librarian; continuing education is recommended for acquiring same. (15 Refs.)

(EOAF)

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NOTES TO CONTRIBUTORS OF PAPERS

The scope for the papers intended for publication in the JLR could project the research and development work conducted on science and technology of leather and leather-products such as footwear and all types of leathergoods, chemistry, biochemistry, physics, biophysics, biology, microbiology, environmental engineering, by-product utilisation, quality control and standardisation, machinery and equipment, industrial chemicals, management, technical education and training, economics, marketing and dissemination as applicable to leather and leather-products industries.

As regards the methodology of publication of articles, please go through the papers appearing in JLR. The format and arrangement of various Sections of the article shall be:- Abstract, Introduction, Materials and Methods, Results along with Figure(s)/ Table(s) if any, Discussion, Acknowledgement(s) if any and Reference(s). The names of Sections of the paper "Abstract" etc., shall be at the middle of the line and in block letters. Sub-sections (sub-headings) can start at the margin and normal-typed and underlined or italicised. References shall be given within brackets in the running line eg., (Author's name, year); in case, there are only two authors, the names of both the authors be given eg., (—and—, year); references to articles contributed by more than two authors be indicated as follows: (Name of the first author et al., year); references to more than one article by the same author/s in the same year are to be indicated as follows: (first reference, year a); (second reference, year b) and so on. Reference to books shall indicate the name(s) of the author(s), (year of edition/publication), "title of the book", (name of the editor), name of the Press and page number (p.--). The "References" shall contain the names of all the authors who have contributed the article, arranged in alphabetical order, (year), name of the journal, **Vol. No.** (Issue No.) or **Month**, Page Number.

The expression shall be in lucid language and shall follow the mode of construction under each Section. The article could be of about 10 typewritten (double spacing) quarto-size pages. The contents of the paper shall be original and not reproductions of earlier publications. Three copies of the paper are requested to be forwarded for publication. The author(s) of the paper will be provided with 25 numbers of reprint of their publication; request for extra copies of reprint may be made while forwarding the paper and the same will be available on payment of nominal charges.

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The readers of Journal of Leather Research are also requested to make use of a new column viz., "Letters to the Editor" to be introduced in the journal, to convey their views/relevant information pertaining to leather and leatherproducts industries; materials that are considered appropriate will be published.

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CONTENTS

THE DEVELOPMENT OF NIGERIAN LEATHER AND LEATHER PRODUCTS INDUSTRIES AND THE PLACE OF KWARA STATE*

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ABSTRACT

The position of the leather and leather products industries as obtaining in the world in general, and Nigeria in particular, is discussed. Future outlook and prospects for these industries are pointed out. The present situation and possible areas of development of the industry in the Kwara State of Nigeria are outlined. The whole discussion covers many aspects of the industry including availability and utilization of raw material, status of the industrial units, employment and trading.

INTRODUCTION

Production and trade in hides and skins are greatly influenced by the fact that they are, in most cases, the by-products of the meat industry and to a lesser extent, in the case of skins, that of the wool. It can safely be said that all countries have livestock and, therefore, produce some hides and skins. A basic feature of hides and skins production, therefore, is its wide, almost universal, geographical distribution. Demand for hides and skins, on the contrary, varies greatly from country to country depending on the standard of living, size of the tanning industry, the major end-uses of leather, and the country's international trade in leather products. Within a particular country, there is likely to be a considerable difference between the demand for hides and skins and their supply. The resulting surpluses or deficits are therefore, the determining factors for the volume of international trade in hides, skins, leather and leather products.

International trade in each of the four main types of hides and skins — cattle hides, calf-, sheep- and goat-skins — has certain general features. Heavy hides are used mainly for footwear soles, harnesses, belting and other industrial purposes. The main outlet for lighter cattle hides and calfskins is as shoe uppers. Other end-uses for cattle hides include upholstery, suitcases and other fancy goods. Sheep-and goat-skins are extensively used for shoe linings and for clothing and may also be used for shoe uppers, particularly goat-skins.

GLOBAL PICTURE

Leather production was for a very long time concentrated in the high-income, industrialized countries. In such countries, the production of heavy leather for soles and industrial purposes has particularly declined in the past two decades. The greatest fall has been in Western Europe, where output has approximately halved, reflecting a rapid replacement of leather by synthetics for footwear soles. The number of tanneries in general in most developed countries, except Italy, has also substantially declined during the past decade. This is mainly because most developing countries have refused to supply only raw materials and have set up

*Paper presented at the "National Seminar on the Economy of Kwara State," Kwara State College of Technology, Ilorin, September 26 — 29, 1984.

their own processing plants. During the same period, exports of leather (including rough-tanned hides and skins) from the main developing producing countries have, as a result, expanded (Leather, 1983) as can be seen from Table I. India and Pakistan are now among the world's leading exporters. Exports of all types of leather from these countries have expanded very rapidly during the period.

Much of the growth in the exports of developing countries arises from their specialization on the production of rough-tanned, unfinished leather which are retanned by the importing countries. The seeming advantage is that developing countries can concentrate on those parts of the tanning process which require much labour, while the importing countries can finish the leather according to quality and fashion requirements. Until recently, for instance, almost all rough-tanned leather exported from India was vegetable-tanned but between 1957 and 1982, exports of chrome-tanned hides and skins and finished leather increased more than a hundred fold (Bangaruswamy, 1983) as can be seen from Table II. A similar progress has been made by Argentina, Brazil and Pakistan as recorded in Table I. Thus the value of exports of semi-processed hides and skins as well as leather has increased in developing countries many fold over the past decade, a large share of this being chrome-tanned leather.

In most developed countries footwear probably accounts for between 50 and 70 percent of total leather used. Both the main producers of leather shoes, the United States and the U.S.S.R., are net importers. Most Western European countries are also net importers of footwear but the region as a whole is a net exporter, owing to the position of Italy as the world's largest exporter of shoes. Most developing countries also have their own domestic footwear industry, in many cases based on small-scale or cottage type of production. There is, however, a growing trend towards modern large scale shoe factories. The major producers of leather footwear among developing countries: South Korea, Hong Kong, Brazil and Argentina, have had their output more than trebled in the past ten years.

The export of leather and leather products is being actively encouraged in several other developing countries, including Uruguay, India and Pakistan as can be seen in Table I. This is usually done by protecting the domestic tanning industry by means of an embargo or high export duty on raw hides and skins, combined with incentive schemes for the export of leather and leather products. Such exports incentives are, however, often countered by the imposition of substantial import duties on such goods in the developed countries.

In those countries, hides and skins can, usually, be imported duty free or at low rates of duty, whereas the import duties on leather could range from 7 to 20 percent *ad valorem* and on footwear up to 30 percent, depending on the importing and exporting countries. The duties on rough-tanned leather, which developing countries are tending to export in increasing amounts, vary according to the importing country's classification of this product. In some countries it is treated as raw material and enters duty free or with only a low duty. In others, it bears the same rate as finished leathers.

Future Global Outlook

The future of exports of leather and leather products from the developing countries will depend on progress in two main areas: first, on the degree to which developed countries reduce their present barriers to leather imports; and, second, on the extent to which the developing countries can become more efficient producers. It is to be expected also that as population and incomes rise in developing countries, the domestic market for footwear etc. will expand, probably faster than in developed countries. This may make feasible the establishment of more modern leather processing facilities and shoe factories. The substitution of domestically-produced for imported footwear will save foreign exchange and there may also be scope for exporting the surplus to other developing countries with expanding markets.

The success of such schemes, however, will depend on general improvement in the efficiency of hides and skins recovery and leather manufacture in developing countries. In some cases, this would involve the adaptation and modernisation of the local tanning industry and a closer co-ordination and integration of slaughter-houses and tanning operations. It will also depend on a close contact with the end-users and a greater awareness of market requirements with respect to qualities, prices and fashion.

NIGERIAN SITUATION

Raw Material Resources

The main raw materials for the leather industry in Nigeria are cattle hides, sheep and goat skins. Their volume of production depends on livestock population and the rate of slaughter which, in turn, depends on the demand for meat. Accurate data on livestock population, total slaughter figures and the number of hides and skins produced in the country are, however, usually not available. Production figures in Table III are, therefore, estimates, based on off-take rates and utilization pattern. These figures include 'imports' of hides and skins from neighbouring countries, particularly Niger and Chad, which may come into the country in the form of live animals which are later slaughtered or they may be brought directly into the country in a dry state by traders, in both cases without being recorded.

Despite the considerable expansion in tanning capacity of the Nigerian leather industry and the Federal Government's export prohibition orders of 1978, Nigeria still ranks among the remaining few principal developing countries exporting raw hides and skins. She exports mainly raw goat and sheepskins through selective issuance of export licences during the so-called surplus seasons. Equally disturbing in terms of unproductive/unpatriotic pattern of utilization is the human consumption of raw hides and skins which has now reached an unprecedented proportion of about 60% according to a recent survey conducted by the Leather Research Institute of Nigeria (LERIN). As shown in Table IV, this unhappy trend seems to have been fairly established as far back as 1975 (Federal Office of Statistics, 1975; Rao, 1976).

The Tanning Sector

This sector of the industry has two distinct branches, the small-scale rural and the large scale mechanized tanneries. The former dates back to many centuries and famous for its 'bagaruwa' tanned, so-called Morocco leather produced by using mainly Sokoto red-goatskins and exported to West Europe by caravan route through the North-African port of Morocco. The inception of the latter, however, is relatively recent, dating back to some 40 years ago. The status of leather production in Nigeria by 1981 (LERIN Field Survey, 1981) is summarized in Table V. When compared with estimated hides and skins production figures for 1980 in Table III, the figures would represent over 80% of available skins (projected for 1981) and about 30% of hides. Production by the rural tanners as revealed by a recent LERIN Survey is however, quite significant in the various categories when compared with the total output by Nigeria (Adewoye *et al.*, 1981).

Leather Products Sector

Leather is utilized in Nigeria mainly in the manufacture of footwear and a variety of leathergoods. The various goods are manufactured by 25 mechanized or partly mechanized units and numerous cottage/small-scale units. A picture of production activities in this sector during 1982 (LERIN Field Survey, 1982) is summarized in Table VI. About 95% of all the footwear manufactured in the mechanized sector have rubber or PVC soles while almost all those manufactured in the non-mechanized units have rubber soles. The bulk of the requirements of the rural leather-works is met largely by the rural tanning units.

Trade in Hides, Skins, Leather and Leather Products

Before the indigenization decree of 1972 in Nigeria, the major buyers and exporters of all raw hides and skins and rural tanners' crust skins were a handful of long-established foreign companies. Majority of them had several collecting and exporting centres in the most important locations. Growing overheads and shortage of trained personnel, particularly in the area of selection and grading, led to a reduction in the number of centres of some of the firms and a centralization of collection for exports in Kano. Before shipment, a re-selection and grading would be carried out, followed by weighing and baling in accordance with individual oversees buyers' requirements.

With the indigenization decree, most of the businesses passed into Nigerian hands who continued to run them much along the same lines, although some of the big firms decided to establish their own tanneries aimed at semi-processed or semi-finished type of production. With the official ban on exportation of raw hides and skins, however, the remaining dealers were forced to engage in contract tanning, especially since the major tanneries have resolved to buy directly by appointing their own agents at strategic locations. In view of the numerous problems militating against contract tanning, a few of the dealers decided to build their own tanneries while most of the others resorted to illegal exportation of the rawstock under flimsy excuses and the issuance of special export licences earlier referred to.

Until the ban on the importation of leather and leather products in 1983, Nigeria imported (Table VII) much of its light hide leather requirements and the whole of its heavy leather requirements (Federal Office of Statistics, 1973 — 1975). In other words, Nigeria is heavily dependent on foreign sources for these types of leather which are almost exclusively made from cattle hides, despite its own reasonable production of the commodity. Of course, the heavy human consumption of hides produced in the country, as compared with the skins, is an obvious explanation for the unfortunate situation. These imports are expected to rise further if suitable measures for their substitution are not implemented. From Tables V and VI, Nigeria ought to be reasonably comfortable in production of leathers for leather products (other than those made from heavy hides) with limited demands for imports. The domestic leather products manufacturing industry, however, is always complaining of gross inadequate supply of locally-produced leathers which can only be explained in terms of the current under-capacity production of virtually all the mechanized tanneries.

Nigeria has traditionally been a net importer of leather footwear while export of the locally produced ones is virtually nil, apart from samples shipped on an export trial basis. There has, however, been a drastic decline in the importation of leather footwear since 1983, the limited quantities being only through restricted issuance of import licences and they attract heavy duties. Decline is also traceable to the fast expanding domestic output of the commodity at relatively low costs. As shown in Table VII, other leathergoods apart from footwear have always been imported, particularly those made of heavy leather which is currently not being produced in the country. It is also to be noted that all the footwear accessories, particularly lasts, laces, eyelets and adhesives, are also being imported because there are no local factories for their production.

Prospects for the Development of the Industry in Nigeria

Hides and skins, being by-products of the meat industry, the quantity and quality produced in future could be boosted through intensified and improved practices in animal husbandry. Beef production in the country is still largely due to the efforts of the Fulani herdsmen. As their nomadic way of life is not conducive to increased productivity and general livestock improvement, efforts should be made to settle them by provision of better pastures and water all the year round. Measures such as the eradication of tsetse flies, drilling of boreholes, construction of more dams, feeding with protein-rich concentrates and establishment of grazing reserves and ranches will, in no small degree, help to raise the productivity and production of livestock in the country. While these measures will help to improve the quantity and quality of raw hides and skins, more abattoirs should be established in urban centres, with provisions for more efficient flaying, curing and preservation of the commodity to ensure considerable reduction of waste. The current situation whereby large quantities of hides and skins are being 'imported' from the neighbouring countries should not be expected to continue indefinitely since each of the 'exporting' countries has seen the need to set up its own tanneries and add value to their raw materials. It is encouraging to note that flocks of goat and sheep which are well-distributed all over the country have steadily increased in recent years and would most probably continue to do so with measures taken by the Federal

Government for the control of parasitic and skin diseases, better feeding and improvement of indigenous breeds through cross-breeding with suitable exotic breeds of high productivity.

In the tanning sector, the output of good quality hide-based leather has not grown with the expanding domestic production of leather products, particularly footwear. To augment the supply without unnecessarily increasing imports of such leathers, it is necessary to ban the exportation of locally produced hide-based rough-tanned leather, either in the wet-blue or crust which is still quite sizeable at present. Exportation of rough-tanned skin-based leathers, which has been growing steadily primarily due to labour and pollution control costs in the developed countries, should also be discouraged to allow for their finishing in the country for local consumption or export. Goatskins can easily be processed to finishing stage as shoe-upper leather and can be used to supplement those derived from cattlehides which are presently in short supply in the country. This need has been recognized, not only by existing tanneries in the country but also by the footwear manufacturers who are the targeted end-users. Although there may be plans to expand existing tanneries or to establish new ones, Nigeria now seems to have enough tanneries to effectively utilize available raw materials. Emphasis of future developmental efforts should therefore be directed towards fuller utilization of already installed capacities and local production of tanning chemicals and auxiliaries.

In the leather products sector, the demand for leather footwear has increased fairly rapidly during the past decade and will most probably continue to grow in the nearest future. In response to this rise in demand, existing shoe producers have made plans for expansion of their capacities; some have actually implemented such plans while other companies have indicated intent to establish new factories. The rural footwear units may grow less rapidly, however, as government drive for mechanized industrial production continues, although the small-scale producers, most of whom are partially or wholly mechanized, would continue to expand and secure a sizeable portion of the domestic market. Although there is no institution at present in the country offering comprehensive training in the manufacture of footwear and other leathergoods, the Leather Research Institute of Nigeria has, however, completed studies to assess the specific areas of need and may offer suitable training programmes in the future.

CASE FOR THE DEVELOPMENT OF KWARA STATE SECTOR OF THE INDUSTRY

The Present Situation

Table VIII presents available 1983 livestock slaughter figures for Kwara State (Federal Livestock Department Field Survey, 1983). These were obtained from eleven of the twelve local governments in the State and should therefore be regarded as the minimum figures. A field survey (Adewoye et *al*.. 1981) has revealed that Kwara State has seven cottage tanneries, employing some 38 workers and producing, annually, about 8,000 hides, 6,000 sheepskins, 7,000 goatskins and 600 reptileskins as semi-processed leathers. Kwara State has no mechanized tannery. From these data, therefore, and the potential slaughter figures for the whole State, it would appear as if the bulk of the hides and skins produced go for non-leather end-uses.

At present there is little or no activity in the State with regard to this sector of industrial planning and development and there does not seem to be any such move by the State Government, either now or in the immediate future. Several reasons could be adduced for this unfortunate state of affair. These include lack of adequate basic raw materials, shortage of well-trained technical manpower and inadequate allocation of funds. Of these three main reasons, the last is the most serious, since it had made it impossible to implement any of the several development programmes earlier drawn up for the sector despite the fact that most of the proposals were found to be reasonable, realistic and achievable.

Prospects for the Development of the Industry in the State

It is true that the total hides and skins production in the State, including those unaccounted for and assuming that none goes for other end-uses other than leather manufacture, may not be able to feed a full-size mechanized tannery such as one of the first three listed in Table V. It would, however, suffice for full capacity production of a medium-size tannery like any of the next four in the same list which means it would surpass the remaining ten scattered all over the country. It is even more interesting to note that a good number of these other tanneries are located south of Kwara State where annual production of hides and skins is generally lower and other conditions for leather production less favourable. The State's position can be further improved by ensuring better recovery of raw hides and skins for leather-making purposes, proper curing and preservation. These could be achieved by consistently applying the legal provisions of Nigeria's Hides and Skins Regulations and taking appropriate measures to enforce same. Other improvement or development measures are as earlier suggested for the whole industry in Nigeria, viz., development efforts starting from improved livestock production, through better and efficient slaughter-house practices to the well-planned and executed programmes for the manufacture of leather and leather products. It should always be borne in mind that the most efficient utilization of raw hides and skins is to process them right through to the very final stage, which is, the manufacture of various leather products. It would be expedient, therefore, for the State's industrial planners to note this point because it is only by so doing that any accruing profits from this sector could be maximized. This is in view of the fact that the value added to these basic raw materials and hence the resultant sale prices are known to increase approximately in the order of 1:3:5:10 with respect to rough-tanned leathers, finished leather and the final leather products.

It is also pertinent to note that some of the tanning materials and auxiliaries that constitute about 25% of the total inputs into leather manufacture are available in reasonable abundance in the State. Specifically, *Acacia nilotica* trees ('Booni' in Yoruba and 'Bagaruwa' in Hausa) whose pods contain about 30% tannins (Adewoye and Rao, 1977) are found, growing wild, in the guinea savannah zone of the State. This material has been found to impart desirable characteristics into leather, thereby resulting in its wide application in both rural and mechanized tanneries in this country and it also has a bright prospect in the international market. As already implemented by Kano and Sokoto States and being planned or seriously being considered by many of the other Northern States, the commercialisation of the tanning material can be encouraged by growing the trees in plantations and supplying the ripe fruits for use in the tanneries. Better still, tannin extraction plants could be set up for the manufacture of liquid, solid or spray-dried extracts which lend themselves to improved handling, better colour and other desirable characteristics and ease of exportation.

Research has also revealed that the fruit-husk of locust bean tree, *Parkia clappertoniana* ('Igba' in Yoruba and 'Dorowa' in Hausa), which abounds all over the State contains about 50% more tannins than 'bagaruwa' and has tanning characteristics similar to that of *Acacia meansii*, one of the most popular vegetable tanning materials of the world.

Also found in abundance, growing wild in the State, is the vine plant, *Adenopus breviflorus* ('Tagiri' in Yoruba and 'Gojin Jima' in Hausa) whose fruit has been confirmed through laboratory studies to contain proteolytic enzyme capable of removing hair from hides and skins and imparting 'bating' action on the resultant pelt, thereby performing two of the essential pretanning processes in the conversion of raw hide or skin into leather in a single operation (Adewoye and Lollar, 1983). The Leather Research Institute of Nigeria is already seeking the co-operation of the Kwara State Government in establishing a 500-hectare plantation for the cultivation of the plant in the State. The prospects for the anticipated enzymatic preparations to make a big impact on the international market are quite good, not only because two manufacturing operations can be combined in one but also because of its possible further application in the treatment of discharged liquid wastes. This pollution control ability is exercised in two ways. First, by replacing sodium sulphide, a very toxic chemical normally used for unhairing during leather processing, and second, by further digesting any proteinaceous matter in the discharged effluents, thereby reducing them to smaller sizes such that micro-organisms could easily degrade further before any additional treatment or final discharge into a designated receiving stream, lake or landmass.

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TABLE I

SELECTED DEVELOPING COUNTRIES: VALUE OF EXPORTS (IN MILLION U.S. DOLLARS) OF LEATHER AND LEATHER PRODUCTS

	1977—79 (average)	1980	1981
Rough-tanned and Finished Leather			
Far East			
India	365.9	325.3	294.9
Pakistan*	84.9	127.7	90.0
Africa			
Kenya	6.8	12.0	10.0
Nigeria	19.5	40.0	35.0
Latin America			
Argentina	287.3	307.8	325.0
Brazil	100.8	87.8	70.0
Uruguay	32.8	39.1	46.0
Total	898.0	939.7	870.9
Leather Footwear and Other Leather Products			
Far East			
Hong Kong	155.0	198.0	205.9
India	50.1	66.6	113.7
South Korea	488.5	523.9	681.4
Pakistan*	13.6	16.7	27.7
Africa			
Kenya	0.5	0.4	0.4
Latin America			
Argentina	124.7	124.0	120.0
Brazil	282.0	384.3	390.0
Uruguay	106.3	98.1	100.0
Total	1220.7	1412.0	1639.1

*Ending 30 June of Year shown.

TABLE II

EXPORT EARNINGS OF INDIA THROUGH LEATHER AND ALLIED PRODUCTS

A QUARTER — CENTURY DEVELOPMENT

Items	Naira Equivalents, in millions 1957 (12 months)	April 1981 — January, 1982 (10 months)
Raw Skins	5.0	Nil
E.I. Hides & Skins	14.4	19.9
Wet Blue Hides & Skins	Nil	14.6
Finished Leather	1.0	119.5
Footwear	1.7	11.4
Footwear Components	Nil	36.3
Leathergoods	0.1	14.8
Other Leather Manufactures (e.g. Industrial Leather Manufactures)	0.1	7.7
Total	22.3	224.2

TABLE III

ESTIMATED PRODUCTION OF HIDES AND SKINS IN NIGERIA 1974 AND 1980

	Estimated Population (million)		Production of hides and skins (million) Official estimate*		Estimates based on the utilization of hides and skins	
	1974	1980	1974	1980	1974	1980
Cattle	8.50	9.26	0.64 (7.5)	0.83 (9.0)	1.21 (14.2)	1.68 (18.1)
Goat	22.00	24.30	6.60 (30)	7.29 (30)	10.17 (46.2)	12.15 (50)
Sheep	8.00	8.80	3.00 (37.5)	2.20 (25)	2.45 (30.6)	2.64 (30)

*Based on the offtake rates, the production of hides and skins was estimated as given in the Third National Development Plan 1975—80 (Vol. 1).

Note: Figures shown in parenthesis represent offtake percentage rates for the respective populations.

TABLE IV

UTILIZATION PATTERN OF HIDES AND SKINS IN NIGERIA, 1975

	Cattle hides ('000)	Goat skins ('000)	Sheep skins ('000)
1. Hides and skins exported in dry and pickled condition	60 (4.92)	3,140 (30.86)	1,270 (51.94)
2. Hides and skins tanned and utilized in the domestic sector	446* (36.59)	1,318 (12.96)	535 (21.88)
3. Tanned leather exported	14 (1.15)	5,316 (52.25)	40 (1.64)
4. Hides and skins used for human consumption	641 (52.58)	400 (3.93)	600 (24.54)
5. Total supply	1,161	10,174	2,445
6. Wastage in hides, 5%	58 (4.76)	— —	— —
Total potential	1,219 (100.00)	10,174 (100.00)	2,445 (100.00)

*Includes 75,000 hides processed in the rural sector.

Note: Figures in parenthesis represent percentage of the total.

TABLE V

LEATHER PRODUCTION IN NIGERIA, 1981

State	Name of Tannery	No. of Employees	Hides	Goat skins	Sheep skins
Kano	Great Northern Tanning Company, P.O. Box 844, Kano	350	200,000	1,500,000	—
..	International Tanners Ltd., Sharada Industrial Estate, P.M.B. 3213, Kano	200	118,000	300,000	120,000
..	Holts Nigerian Tanneries, 10, Maganda Road, P.O. Box 341, Kano	350	70,000	2,000,000	100,000
..	Tanarewa (Nig.) Ltd., Box 41, Kano	30	—	600,000	120,000
..	Arewa Tanneries Ltd., Box 192, Kano	45	—	750,000	200,000
..	Darum Enterprises, Box 775, Kano	35	—	600,000	400,000
..	Kapitan Company Ltd., Box 530, Kano	40	—	750,000	250,000
Borno	LERIN Extension Centre, Maiduguri	27	2,500	12,000	2,500
Sokoto	Leather Products Ltd., Box 92, Sokoto	40	—	720,000	—
..	LERIN Extension Centre, Sokoto	22	2,000	10,000	2,500
..	Sokotan Limited, Kalambane Road, Sokoto	80	3,000	72,000	7,200
..	Gusau Tanning Company Ltd., Box 83, Gusau	60	—	300,000	72,000
Kaduna	LERIN Pilot Tannery, Zaria	11	250	5,000	500
Lagos	Limson Tannery, Kilometre 12, Lagos—Ibadan Expressway, Lagos	70	100,000	—	—
..	Lagos State Hides, Skins & Leathers Project, Ikeja	3	250	750	800
Oyo	Leather & Shoe Project, Oyo State Min. of Agric. & Nat. Res., Sango, Ibadan	17	500	3,500	3,500

TABLE V (Contd.)

State	Name of Tannery	No. of Employees	Hides	Goat skins	Sheep skins
Ogun	Ogun State Hides, Skins & Leathers Project, Abeokuta, Ijebu-Ode, Shagamu and Ilaro				
Ondo	Government Tanning Centre, Akure	78	4,000	10,000	2,500
Anambra	Federal Government Tannery, Oji River	12	250	500	500
Northern and Western States	924 Rural Tanning Units	100	10,000	15,000	15,000
		4,072	—	2,772,926	1,018,855
	Total	5,642	510,750 or Approx. 10.22 million ft^2	10,421,676 or Approx. 41.69 million ft^2	2,315,855 or Approx. 9.26 million ft^2

Conversion Ratio: 1 hide ≡ 20 ft^2 and 1 Sheep or Goatskin ≡ 4 ft^2

TABLE VI

OUTPUT OF LEATHER FOOTWEAR AND LEATHERGOODS IN NIGERIA, 1982

Company	Location	No. of Employees	Output (million pairs)
Bata (Nig.) Ltd.	Lagos	1,500	5.10
Perfecta (Nig.) Shoes Ltd.	"	200	1.20
Passat Industries Ltd.	"	550	1.40
Limson & Company Ltd.	"	500	1.00
Silver Shoe Manufacturing Co. Ltd.	"	200	0.80
New Nigeria Shoes Company	"	150	0.50
Eleganza Industries Ltd.	"	100	0.05
Ajalyn Shoes Ltd.	"	200	0.32
Omimi Shoe Company Ltd.	Sapele	45	0.50
Dandy Shoe Manufacturing Co. Ltd.	Benin City	45	0.10
Nigerian Leather Works Ltd.	Kano	110	0.85
Nigerian Shoe Factory Ltd.	"	25	0.05
Bata (Nig.) Ltd.	"	200	1.00
Nig. Shoe Rubber Products Co. Ltd.	Ogbomosho	250	0.50
Leather Shoes Company Ltd.	Ibadan	40	0.10
New Obisco Industrial Co. Ltd.	Owerri	45	0.12
Standard Shoe Company Ltd.	"	130	0.10
Mambo Shoe Company Ltd.	Aba	110	0.03
Gabros Shoe Company Ltd.	"	15	0.04
Imperial Shoe Industry Ltd.	Onitsha	15	0.03
Niger Shoe Manufacturing Co. Ltd.	"	10	0.04
United Shoe Industry Ltd.	Enugu	30	0.05
Kingsway Shoe Works	Port-Harcourt	10	0.04
OPODA Shoe Factory	Ilorin	25	0.05
Awujale Leatherworks Industry	Ijebu-Ode	50	0.15
Rural Footwear Units	All the States	3,000	5.40
Sub-Total		7,555	19.52
			Requiring 48.8 million ft^2
Footwear repairs	—	—	1,250,000 ft^2
Eko Leatherwear Factory	Ota	20	100,000 "
Co-operative Leather Workers' Society	Oyo	100	400,000 "
Bagco (Nig.) Ltd.	Lagos	250	1,200,000 "
Nigerian Craftbags	"	350	500,000 "
Perfecter Leathergoods	"	100	40,000 "
Doyin Investment Ltd.	"	300	1,500,000 "
Beo Industry	"	60	200,000 "
Maryland Leathergoods	"	100	50,000 "
Midland Leather Co. Ltd.	"	30	10,000 "
Naraguta Leather Works (Nig.) Ltd.	Jos	20	100,000 "
Salamada Leathergoods Co. Ltd.	Kano	70	400,000 "
Leathergoods Factory	Sokoto	30	150,000 "
Rural Leathergoods Units	All the States	2,500	7,500,000 "
Other Leathergoods (e.g. agricultural implements, industrial leathers etc.)	All the States	400	1,500,000 "
Total		11,885	63.7 million ft^2

Conversion Ratio: Approx. 2.5ft^2 is required for 1 pair of shoes.

TABLE VII

STRUCTURE OF NIGERIA'S IMPORTS OF HIDES, SKINS, LEATHER FOOTWEAR AND ALLIED PRODUCTS IN 1973, 1974 AND 1975
(MILLION NAIRA)

	Classification	1973	1974	1975*
211—00	Hides and skins (raw and pickled)	negligible	0.02	0.21
			(0.5)	(2.5)
611—00	Leathers, tanned and dressed	1.33	0.39	0.93
		(23.3)	(9.0)	(11.5)
612—10	Industrial leathers	0.19	0.10	0.15
		(3.3)	(2.3)	(1.9)
612—80	Saddlery and harness	0.41	0.59	0.84
		(7.2)	(13.6)	(10.4)
612—90	Leather manufactures	0.97	0.36	0.11
		(17.0)	(8.3)	(1.4)
613—00	Fur skins, tanned	negligible	negligible	negligible
841—30	Apparel and clothing accessories	0.58	0.66	—
		(10.2)	(15.3)	—
815—02	Leather footwear	2.23	2.21	5.85
		(39.0)	(51.0)	(72.3)
	Total	5.71	4.33	8.09
		(100.00)	(100.00)	(100.00)

*Estimated on the basis of imports for the 9 months ending September 1975.

Note: Figures in parenthesis indicate percentage of total imports.

TABLE VIII

KWARA STATE SLAUGHTER FIGURES, 1983

Local Government	Cattle	Sheep	Goats
Ilorin	41,920	38,559	38,410
Oyi	4,243	33	57
Kogi	2,859	611	2,321
Irepodun	2,491	111	136
Ifelodun	3,129	181	350
Asa	2,270	3	4
Moro	2,000	109	130
Okene	18,894	648	617
Lafiagi	1,139	424	372
New-Bussa	3,228	316	2,701
Oyun	3,965	133	757
Total	86,138	41,128	45,855

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EFFECT OF SYNTHETIC TANNING AGENT ON THE UPTAKE OF MONOAZO ACID DYES BY NYLON 6 FABRIC

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ABSTRACT

The effect of treatment of undyed nylon 6 fabric with a synthetic tanning agent (syntan) on the rate of adsorption of C.I. Acid Orange 7 and C.I. Acid Red 88 has been studied. The observed reduction in the rate of dyeing becomes more pronounced with increasing concentration of syntan present on the fabric before the coloration process. This is likely to be due to the blocking of protonated amino groups (potential dye sites) by anions derived from the syntan or to physical impedance to diffusion of dye molecules, particularly at the fibre surface.

INTRODUCTION

Acid dyes are highly substantive towards polyamide fabrics but, unfortunately, the fastness to washing leaves much to be desired, particularly in the case of medium and heavy depths of shade of unmetallised dyes. Improvements in the fastness to wet treatments and to washing processes can be obtained by the use of either natural (Ashworth and Blackburn, 1965) or synthetic tanning agents (Shore, 1971).

Synthetic tanning agents have been used in the leather industry for many years and a recent development in their use is their application to fabrics to improve the wash fastness of certain dyestuffs. They show few disadvantages when compared with natural tannins and can have similar efficiencies. Details of the chemical structure of syntans are not generally disclosed but the most commonly used compounds can be described as anionic polycondensates of the substituted phenol-formaldehyde type. Such compounds possess both hydroxyl and sulphonic acid (or sulphone) groups which are considered to be necessary for the attraction of syntan molecules to polyamides. Examples of syntans currently available for application to nylon are Cibatex PA (Ciba-Geigy, 1975), Matexil FA-SN (ICI) etc.

The effectiveness of a syntan in improving the wet-fastness of anionic dyes on nylon is determined not only by its ability to reduce the rate of diffusion of dye out of the fibre, but also by the combined strength of the forces responsible for binding it to the fibre (Cook and Herbert, 1971).

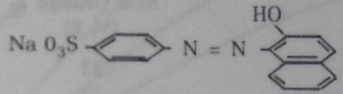
The work described herein relates the retardation of dye uptake by nylon to the increasing concentration of a synthetic tanning agent.

Nylon 6 Fabric

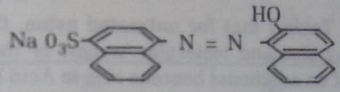
The nylon 6 fabric used throughout this work was supplied by Chemical and Allied Products Limited, Lagos (formerly ICI). The fabric was first scoured for 20 min. at 85°C in an aqueous solution of 'Omo' detergent (5g./1.); it was then removed, rinsed thoroughly in distilled water and allowed to dry in the atmosphere.

Dyestuffs

Two acid dyes viz., C.I. Acid Orange 7 and C.I. Acid Red 88 were supplied by Chemical and Allied Products Limited, Lagos. The structural formulae of the dyes are as follows:-



C.I. ACID ORANGE 7 (ORANGE II)
(C.I. 15510) (MOL. WEIGHT 350)



C.I. ACID RED 88 (NAPHTHALENE RED J)
(C.I. 15620) (MOL. WEIGHT 400)

Synthetic Tanning Agent (Syntan)

A sample of Cibatex PA was supplied by Ciba-Geigy Limited, Lagos.

Application of Syntan

Cibatex PA 2%, 5% and 10% on the weight of the fabric were individually applied to 1g. each of scoured nylon 6 fabric using a liquor to material ratio of 100:1, 80°C and pH 4 (aqueous acetic acid) for 30 min. The pretreated samples were then removed and rinsed with cold water.

Application of Dyestuffs

Each of the two dyes (2% on the weight of the fabric) was applied to treated and untreated nylon (1g.) at 80°C and pH 4, using a stock solution (100 ml.) of acetic acid-sodium acetate buffer over 80 min.

Measurement of Dye Up-take (%)

A small sample of the dye liquor was taken at 10 min. intervals and the optical density at the λ max. of each dye measured using a Unicam SP 800 Spectrophotometer. The concentration of dye was found from previously constructed calibration graphs. Exhaustion figures (% E) showing the adsorption of the dye were thereby obtained, and plots of %E against time were constructed for each system.

RESULTS AND DISCUSSION

Two anionic dyestuffs were employed, both having a relatively simple structure with the same degree and pattern of sulphonation, but differing only in an additional benzene nucleus.

The values of dye adsorption for each of these dyes, when applied to nylon, pretreated with increasing concentrations of Cibatex PA, at the end of 80 min., are shown in Table I.

TABLE I

THE % EXHAUSTION (% E) OBTAINED FOR NYLON FABRIC PRE-TREATED WITH SYNTAN (CIBATEX PA)

Pre-treatment	Acid Orange 7 (% E)	Acid Red 88 (% E)
Untreated	82	98
Treated with 2% Cibatex PA	73	82
" " 5% " "	62	71
" " 10% " "	44	53

It can be observed from Table I that for untreated nylon, the % dye exhaustion increased with increasing size and molecular weight of the dye molecule. This clearly shows the effect of an additional benzene ring in Acid Red 88 to promote dye uptake on the fibre. Increasing the concentrations of the syntan gave significant reductions for the amount of each dye adsorbed as illustrated in Figs. 1 & 2. This is likely to be due to the amino sites on the pretreated nylon having been occupied by anions of the syntan. The anions of the dye molecule have to compete with those of the syntan for ultimate fixation with the substrate.

When syntans are applied to nylon the main attractive forces will be due to hydrogen bonding between uncharged polar groups in the syntan and amide groups in the polyamide as well as to electrostatic attraction between sulphonic acid groups in the agent and protonated amino groups in the fibre (Shore, 1971).

If a syntan is applied to undyed nylon prior to the dyeing process, the bulk of the material will be present as a partly diffused ring around the surface of the fabric and it has been found from this study that, during a subsequent coloration with acid dyes, a reduced adsorption of dye was observed as illustrated in Figs. 1 & 2.

The reduced adsorption of dye ions by nylon which has been pretreated with a water-soluble polymeric compound which also contains $-SO_3H$ groups could be due to repulsion between the two sulphonic groups or to blocking of protonated amino groups (potential dye up-take sites) by anions derived from the syntan or to physical impedance to diffusion of dye molecules, particularly at the fabric surface. Increasing the concentration of Cibatex PA in the application bath will result in increased amounts of syntan taken up at the fabric surface, progressively increasing the thickness of the deposited layer of the syntan. The presence of a syntan on a polyamide fabric thus results in a decreased rate of sorption of acid dyes which becomes more marked as the concentration of the syntan is increased.

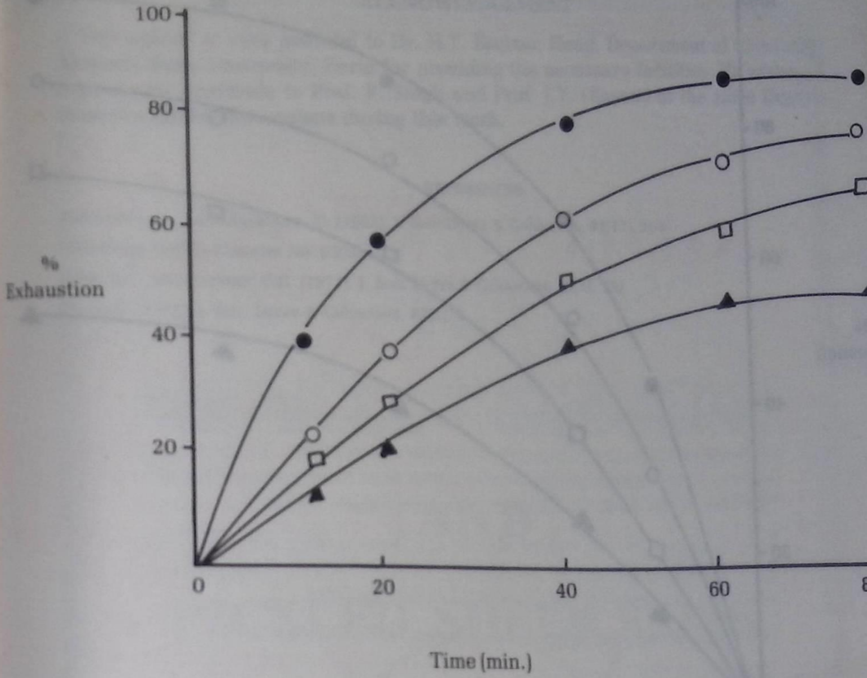


Fig. 1 Effect of concentration of Cibatex PA on the rate of adsorption of C.I. Acid Orange 7.

● Untreated nylon
○ Treated with 2% Cibatex PA
□ Treated with 5% " "
▲ Treated with 10% " "

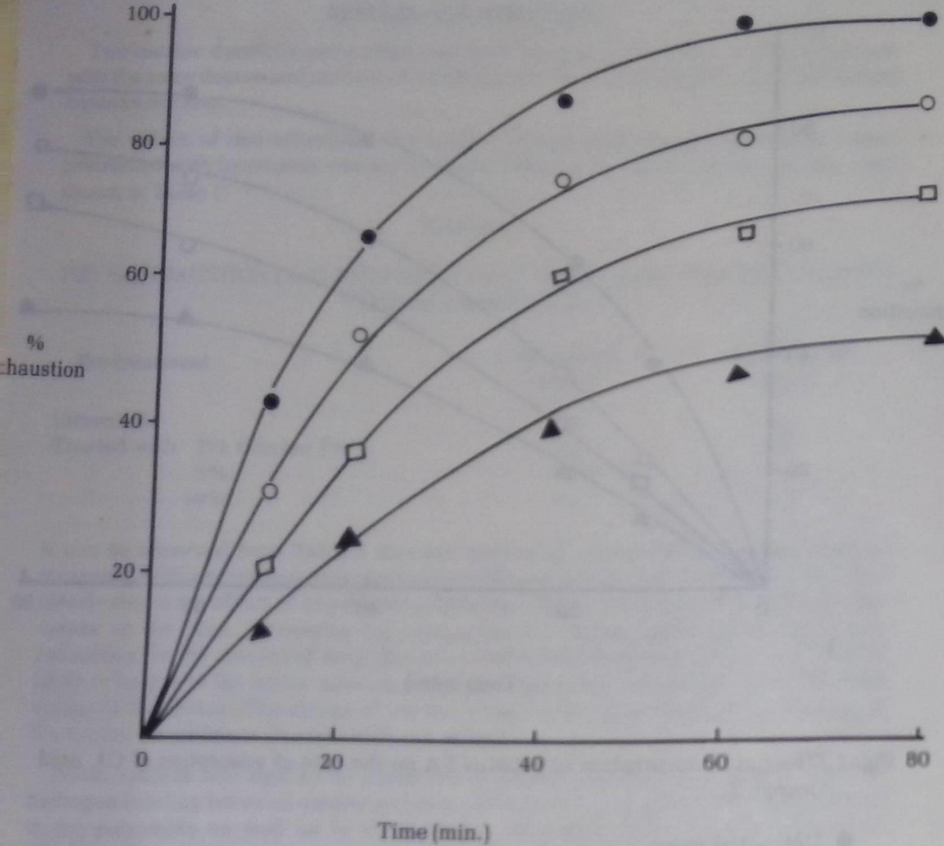


Fig. 2 Effect of concentration of Cibatex PA on the rate of adsorption of C.I. Acid Red 88.

- ● Untreated nylon
- ○ Treated with 2% Cibatex PA
- □ Treated with 5% " "
- ▲ Treated with 10% " "

ACKNOWLEDGEMENT

The author is very grateful to Dr. H.T. Bozimo, Head, Department of Chemistry, Ahmadu Bello University, Zaria for providing the necessary facilities. He wishes to express his gratitude to Prof. K. Singh and Prof. J.Y. Olayemi of the same Department for useful discussions during this work.

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ABSTRACTS
(FROM OTHER PUBLICATIONS)

HIDES AND SKINS

Peters, D.E. and Bavinton, J.H. (1983), "THE CHARACTERISATION OF VERTICAL FIBRE AND HIGH WEAVE STRUCTURES OF HEREFORD CATTLE HIDES," J. Soc. Leath. Tech. Chem., **67** (3), 65.

Using the Hereford and Jersey cattle breeds, methods of separating hide weave types are examined because of the previous difficulties in differentiating the two identical types of vertical fibres. Microscopic methods, observing fresh hides under reflected light and stained sections under transmitted light, aided the differentiation process into a pale zone, below the grain, not entirely penetrating, 90° to the surface-parallel "Vertical fibres", and a full depth-of-the-corium, several long, strong, no-separate-zone "High Weave Fibres". Both produce weak leathers. Under similar conditions, a characterless (similar to "High Weave"), regular three-dimensional 45° interweaving "Normal Weave" fibres, extending through the thickness of corium, forming strong leathers were observed. In the case of split leather, the differentiation between "Vertical fibres" and "High Weave fibres" becomes difficult. These fibre characteristics are breed-dependent, existing almost wholly in Herefords. Horned Herefords have a significant chance of having "Vertical fibres" than Poll Herefords. "High Weave" is merely a high angle end of a continuous spectrum of weave angles in hides. (7 Figs.; 1 Tab.; 16 Refs.)

(GDG)

Dufty, J.H., Peters, D.E. and Bavinton, J.H. (1983), "STUDIES OF THE CAUSE OF THE VERTICAL FIBRE HIDE STRUCTURE IN HEREFORD CATTLE," J. Soc. Leath. Tech. Chem., **67** (3), 70.

The cause of the vertical fibre hide structure and the factors influencing its prevalence were studied in 362 Hereford cattle. The condition was diagnosed in 83 (22.9%) cattle and was not affected by the sex of the animal, the year and season of its birth, gestation period, birthweight, or the presence or absence of horns, nor by the age, parity and weight of the dam. Significant differences in the frequency of the condition were found in animals grouped according to their sires or dams and evidence was obtained that the condition was due to the presence, in a homozygous state, of an autosomal recessive gene. (6 Tabs.; 15 Refs.)

(Authors' summary)

Barrett, J.C. (1983), "BACTERICIDES FOR PRE-TREATMENT IN SUSPENSION DRYING OF HIDES AND SKINS: 1981 FIELD TRIALS IN THE GAMBIA," J. Soc. Leath. Tech. Chem., **67** (3), 74.

Wet season suspension drying in West Africa (Gambia), with the attendant economic loss and wastes due to delayed drying, prompted the need for a study of preservation by the use of bactericides. After a comprehensive review of possible chemicals, sodium silicofluoride (SSF), boric acid and Vantocil IB were tried at various concentrations and time. Several parameters including the development of staleness during drying, evaluation of quality of cure, gelatin film and tetrazolium chloride (TTC) test methods, chemical analysis, histological examination, evaluation of hides during tannery processing and evaluation of crust leathers, led to the conclusion that immersion of hides in saturated solution of boric acid or sodium silicofluoride for 60 min. immediately after flaying and fleshing effectively protects against decay during the wet season. Both do not adversely affect resultant leathers but SSF is more cost effective. Relative to untreated hides, spraying of a 10% solution of Vantocil IB offered significant improvement in preservation. (8 Figs.; 8 Tabs.; 13 Refs.)

(GDG)

BIO-SCIENCES AND TECHNOLOGY

Kurkinen, M., Foster, L., Barlow, D.P. and Hogan, B.L.M. (1982), "IN VITRO SYNTHESIS OF TYPE IV PROCOLLAGEN," J. Biol. Chem., **257** (24), 15151.

Total RNA was isolated from parietal endoderm cells of 13½-day mouse embryos that synthesize large amounts of type IV procollagen. In vitro translation of this RNA in the reticulocyte lysate supplemented with a ribonuclease inhibitor yielded two equally prominent polypeptides of M_r = 165,000 and 168,000, immunoprecipitable with anti-mouse type IV collagen serum. The M_r = 165,000 polypeptide was shown by one-dimensional peptide mapping to represent an unmodified chain of type IV procollagen. The M_r = 168,000 polypeptide, the in vitro synthesis of which was barely detectable in the absence of a ribonuclease inhibitor, most likely represents the other genetically distinct chain of type IV procollagen. Similar results to those described were also obtained using poly(A) + RNA prepared from murine F9 embryonal carcinoma cells induced to differentiate in vitro into parietal endoderm. (5 Figs.; 22 Refs.)

(Authors' summary)

Tseng, S.C.G., Savion, N., Gospodarowicz, D. and Stern, R. (1981), "CHARACTERIZATION OF COLLAGENS SYNTHESIZED BY CULTURED BOVINE CORNEAL ENDOTHELIAL CELLS," J. Biol. Chem., **256** (7), 3361.

Collagen represents about one percent of the total protein synthesized by *in vitro* cultured bovine corneal endothelial cells and deposited in the extracellular matrix. Collagen is the major protein of the extracellular matrix. The different types of collagen are characterized by a combination of DEAE and CM-cellulose column chromatography using known internal markers. The interstitial type III collagen is the major component found in the extracellular matrix and also secreted into the media. However, basement membrane collagens, types IV and V, are also found in each compartment with type V preferentially associated with the cell matrix. The ratio of types I: III: IV + V collagens synthesized by corneal endothelial cells are 3: 16: 1. The observation that type III collagen is the major collagen synthesized by all cultured endothelial cells clearly distinguishes the latter from fibroblasts which synthesize type I and type III collagens at a ratio of about 3:1. It is suggested that the extracellular matrix by its functions can substitute for exogenous growth factors. (4 Figs.; 2 Tabs.; 39 Refs.)

(GE)

TANNING AGENTS AND MECHANISM OF TANNAGES

Sardar, P.K., Baiswara, R.B., Mani, J.B. and Mathew, T.V. (1984), "THIN LAYER CHROMATOGRAPHIC DETECTION OF GAMBIER IN *ACACIA CATECHU*," Res. and Ind., **29** (3), 202.

Silica gel G TLC offers a simple, rapid and sensitive method of differentiating gambier from *Acacia catechu*. Gambier yields three fluorescent spots at R_f 0.72, 0.95 and 0.98 in long waves of ultraviolet rays while *Acacia catechu* does not give a fluorescent spot. (5 Refs.)

(AAN)

Thampuran, K.R.V., Doraikannu, A., Ramamoorthy, G., Ghosh, D. and Santappa, M. (1981), "INVESTIGATIONS ON THE RATE OF UPTAKE OF VEGETABLE TANNINS WITH RESPECT TO TIME AND CONCENTRATION," Leath. Sc., **28** (9), 333.

In a comparative study of heavy leather tannage on the rate of penetration and fixation of vegetable tannins of various barkometer strengths, full tannage was found to be achieved in shorter time with relatively high tannin concentrations than in low concentrations. It is, however, inadvisable to commence tanning in liquors of concentration greater than 50°Bk. (1 Tab.; 5 Refs.)

(AAN)

Lee, S.W. and Meranger, J.C. (1981), "DETERMINATION OF TOTAL ARESNIC SPECIES BY ANODIC STRIPPING VOLTAMMETRY," Anal. Chem., **53** (1), 130.

Atomic absorption techniques which are commonly applied to the selective determination of arsenic species require more costly instrumentation than electrochemical techniques. A method using high speed anodic stripping voltammetry (ASV) in combination with charge-transfer analyser is reported. Detailed studies of the experimental parameters involved in analytical methodology showed similar findings to those reported by previous workers. Notable improvements in the physical characteristics of the stripping signals were observed. The analyser offered excellent instrument precision in ASV determinations between 10ng and 1μg of arsenic. Results of analyses of some National Bureau of Standards Reference Materials are comparable to those obtained by previous workers and showed good agreement with certified values except for bovine liver. The method has advantages of relatively inexpensive equipment, rapidity and improved accuracy compared to atomic absorption methods. Investigations are currently under way to apply this technique to a wide range of environmental samples for selective determination of arsenic(III), arsenic(V) and total arsenic. (1 Fig.; 2 Tabs.; 1 Ref.)

(FAL)

LEATHER TECHNOLOGY/CHEMISTRY

Adewoye, R.O. and Lollar, R.M. (1984), "USE OF PULPED FRUIT OF ADENOPUS *BREVIFLORUS* (TAGIRI) AS AN UNHAIRING AGENT AND CHARACTERIZATION OF THE ENZYMES EXTRACTED FROM THE FRUIT," J. Amer. Leath. Chem. Assn., **79** (12), 446.

Pulped fruit was evaluated as an unhairing agent for hides and skins when used in the traditional/conventional process in conjunction with wood ashes and in a proposed two step process based on a simulated "ash" composed of calcium chloride and potassium and magnesium hydroxides. The proposed process is more economical of materials. Microscopical examination of hides and skins unhaired using the pulped fruit revealed superior cleaning action on the grain to that obtained in the conventional sulfide-hair pulping technique. The unhairing agent in the fruit of *Adenopus breviflorus* proved to be a neutral protease that could be classified as sulfhydryl. The extracted and purified enzyme, whose homogeneity was assessed and confirmed by SDS-polyacrylamide disc electrophoresis and solubility tests, has an estimated molecular weight of 69,500 and its isoelectric point at pH 5.5. It possesses high stability towards heat, acids and alkalies, freezing and thawing, and organic solvents; but most bactericides were found to be inhibitory to its activity. The enzyme's UV absorption was maximal at 275nm with no noticeable absorption at 260nm. (2 Figs.; 7 Tabs.; 54 Refs.)

(Authors' summary)

Mason, I.G. (1984), "A HAIR RECOVERY PROCESS FOR HIDES," J. Soc. Leath. Tech. Chem., **68** (4), 93.

Development of a procedure enabling the continuous screening of partially degraded cattle hair from a process vessel float is described. Screen evaluation resulted in the selection of a 0.25mm. gap, rotary wedgewire unit. Hair screenability is retained by pre-depilation infusion of a reducing agent into the hair shaft, followed by sequential additions of lime, hydrosulphide and further alkali. A mercaptan-based reducing agent was selected as most appropriate, particularly in terms of avoidance of excessive toxic gas generation during soaking. Effluent quality improvements due to the process averaged: sulphide 96%, settleable solids 94%, suspended solids 59%, COD 42%, BOD_5 36% and nitrogen 31%. Exploratory trials on the utilisation of recovered hair in poultry feeding are reported. Excessive mechanical action in the experimental process resulted in grain abrasion and process conditions require adjustment to avoid this defect. (5 Figs.; 12 Tabs.; 18 Refs.)

(Author's summary)

Taegar, T. and Pfleiderer, E. (1984), "THE ANALYSIS OF ENZYMATIC LEATHER AUXILIARIES," J. Soc. Leath. Tech. Chem., **68** (4), 105.

Some selected analytical methods of enzymatic leather auxiliaries are discussed especially as regards their advantages and disadvantages. These include the Lohlein-Volhard (original and modified forms), TEGEWA, Fuld-Gross, Kubelka-Wagner and Anson methods. These methods make it possible to compare the enzymatic activity of products made from the same enzyme base. The result of enzymatic activity may however, not necessarily be the indication of effective activity in working practice. Some important factors to be considered in the choice of enzyme assay method are the enzyme sources, method of sampling, choice of substrate, working pH and temperature, time factor, cost of apparatus and reproducibility of results. The TEGEWA/Lohlein-Volhard method seems to satisfy most of these parameters. However, there is still need for a world-wide collaboration to arrive at a universally acceptable method. (2 Figs.; 4 Tabs.; 12 Refs.)

(GE)

(1982), "HAIR-RECOVERY PROCESS LOOKS PROMISING," Leather, **184** (4488), 37.

The chemical hair-loosening systems which have been investigated by CSIRO in Australia and a two-stage hair-recovery process which has commercial potential are presented. The first stage which involves the initial soaking of the hides in a short float with sodium hydrosulphide before drumming is described. A measure to avoid excessive 'immunisation' of the hair is also indicated and the process liquor can be re-used if required, after certain treatment. The second stage involving lime and sulphide similar to conventional process is then discussed. Several successful trials at various scales are reported. Outlets must be sought for the recovered hair which is said to retain its physical and chemical properties.

(ETO)

Wali, B.K., Raina, R. and Sharma, T. (1981), "STUDIES ON LEATHER PRODUCED BY A TYPICAL CHAMOISING PROCESS," Leath. Sec. **28** (9), 317.

A comparative study of the characteristics of chamois leathers produced by the conventional method and a newly developed chemical oxidation method has been made. The results reveal the following: The leathers compare favourably in respect of chemical, physical and structural characteristics; the new method reduces the oxidation time from 7—10 days to 4 hours; the quantity of fish oil needed for tanning can be reduced by 25%, thus effecting economy in production. These leathers can be used for garments as seen from the drape coefficient values. The looseness of the leather structure makes it quite suitable for cleaning purposes. (7 Figs.; 4 Tabs.; 21 Refs.)

(Authors' summary)

Pitchumani, S., Rami Reddy, C., Rajadurai, S., Joseph, K.T., Parthasarathy, K. and Santappa, M. (1981), "STUDIES ON THE BLENDS OF N-BUTYL METHACRYLATE-ETHYL ACRYLATE COPOLYMERS WITH CHLORINATED RUBBER AS TOP COAT," Leath. Sc., **28** (9), 326.

The copolymers of n-butylmethacrylate-ethylacrylate were blended with chlorinated rubber in solution. The lacquers were formulated based on each blend and their utility as top coats on leather substrates were assessed. It was concluded that the blends resulted out of the above two polymer systems serve as the source for the formulation of top coats on leather substrate. (4 Tabs.; 8 Refs.)

(Authors' summary)

CONTROL AND TREATMENT OF EFFLUENTS/ENVIRON. SC. AND TECH.

Bankmann, E., Hotz, R., Prandi, C., Sharples, W.G., Steuerle, H., Stori, M. and Weis, H. (1984), "ECOLOGICAL AND TOXICOLOGICAL ASSESSMENT OF COLORANTS — ANALYTICAL ASPECTS," J. Soc. Dyers and Colourists, **100** (4), 118.

This paper describes some of the areas of activity of the Analytical Subcommittee of the Ecological and Toxicological Association of the Dyestuffs Manufacturing Industry (ETAD). The various topics covered by the ETAD included the determinations of (a) metal content in dyes and pigments using X-ray spectrometry, Polarography, Atomic Adsorption Spectrophotometry and Atomic Emission Spectrometry; (b) unsulphonated amines in dyes, pigments, intermediates and environmental samples; (c) accumulation of dyes in fish; (d) partition coefficient of dyes in n-octanol/water; (e) polychlorinated biphenyls in dyes, pigments and the ecosphere; and (f) human exposure levels to dyestuffs and pigments. These determinations, even in trace quantities, are very vital to the toxicologists in evaluating the risks caused by them. (1 Tab.; 11 Refs.)

(JBG)

Uchrin, C.G. and Caspe, R.L. (1983), "OPERATIONAL CHARACTERISTICS OF FEDERALLY FUNDED WASTEWATER TREATMENT PLANTS," J. Water Poll. Cont. Fed., **55** (7), 935.

An analysis of the performance characteristics of federally funded wastewater treatment plants in New Jersey and New York was carried out in this study. Treatment performances were compared and the effectiveness of process types examined. From the study it was shown that 41% of the plants in New Jersey and 17% of those in New York met all of their permit limitations in 1980. It was also shown that the Advanced Wastewater Treatment (AWT) plants in New Jersey achieved median removals of 94 and 93% for BOD and TSS respectively, slightly higher than obtained with other plant types. The trickling filters were found to perform more consistently than any other secondary plants. The results of removals generally indicated that there should be overall improvements in the receiving water quality (8 Figs.; 6 Tabs.; 1 Ref.)

(JBG)

Narkis, N. and Rebhun, M. (1983), "INHIBITION OF FLOCCULATION PROCESSES IN SYSTEMS CONTAINING ORGANIC MATTER," J. Water Poll. Cont. Fed., **55** (7), 947.

In this article, the effect of organic impurities on flocculation processes and the effect of flocculation on their removal were studied. Humic and fulvic acids were the organic matters monitored. The study showed that the main interference caused by the presence of organic matter is the inhibition of the reaction of the flocculant with the suspended solids. There is competition between the SS and the organic matter for the flocculant. Thus, large doses of flocculants are required for effective flocculation of turbid waters such as surface waters, which contain organic matter like humic and fulvic acids. The high flocculant demand for treating secondary effluents are similarly explained. (13 Figs.; 20 Refs.)

(JBG)

Deland, M.R. (1981), "COST-BENEFIT ANALYSIS AND ENVIRONMENTAL REGULATIONS," Environ. Sc. and Tech., **15** (9), 997.

Recently, the U.S. President made an order that "to the extent permitted by law," no regulatory action should be taken unless the potential societal benefits outweigh the potential societal costs. But in a case involving regulation of toxic substances, the Supreme Court ruled that Occupational Safety and Health Administration (OSHA) and EPA were not required to balance costs and benefits in setting standards. Certain legislations indicate that cost-benefit analysis is needed, while in others the analysis seems not required and would even not be permitted. The conflict or confusion is for the Congress to resolve, by determining that the benefits of clean air, clean water or safe working environments outweigh the costs of achieving those benefits.

(JBG)

Kastens, M.L. (1982), "WHAT GOOD IS MARKET RESEARCH?" Chemtech, Nov., 659.

A market researcher, while carrying out a research, must define what he is looking for and the objective of such a research. The author stresses certain strategic considerations which should agitate the mind of a market researcher while conducting his research. These considerations include the rate of growth of the market segment, the share of the market, possession of proprietory rights or patents and the degree of profitability of the business. The author however cautions that in respect of profitability, an excessive profit margin can serve as an inducement for competitors to flood the industry or business. (3 Figs.)

(AAI)

DISSEMINATION

Line, M.B. (1983), "RESEARCHING INTO THE AVAILABILITY OF PUBLICATIONS," Library Quarterly, **53** (3), 292.

Research for the Universal Availability of Publications program was needed to demonstrate the need for improvement and to suggest ways of achieving it. Money, man power and time were all in short supply. The approach adopted was to conduct an extensive literature review, supplemented by questionnaires and personal knowledge and contacts, then to carry out a detailed analysis of requirements, criteria, obstacles, and so on, and finally to construct conceptual models of possible systems that might be applicable in different types of countries. The study of national interlending systems, which is summarized, illustrates this approach; three of the other five studies (of national acquisition systems, national retention systems, and international provision and supply), which are more briefly outlined, followed a similar pattern. The research approach used might be appropriate for other very broad topics where little hard information is available. (19 Refs.)

(Author's summary)

Hayes, R.M. (1983), "MANAGERIAL ACCOUNTING IN LIBRARY AND INFORMATION SCIENCE EDUCATION," Library Quarterly, **53** (3), 340.

This article explores the meaning and potential usefulness of managerial accounting in libraries and discusses a program of instruction for students of library and information science based on experience in the School of Library and Information Science at the University of California in Los Angeles. (1 Ref.)

(Author's summary)

Walgate, R. (1982), "FRENCH RESEARCH AND DEVELOPMENT: CAN THE GOOD TIMES LAST?" Nature, **300** (5890), 308.

In spite of France's heavy foreign debt and balance of trade deficit leading to austere budget for research and industry, a special consideration is being given in the proposed civil research budget for the next year. While a general budget freeze of about thirty percent has been proposed, research budget will enjoy an increase of about seventeen percent. The principal beneficiaries of this increase are selected applied research programmes in areas such as biotechnology, new energies, electronics, space and research and innovation for Third World. Basic science is not a major beneficiary of this proposal although it is not neglected. (2 Tabs.)

(GE)

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The scope for the papers intended for publication in the JLR could project the research and development work conducted on science and technology of leather and leather-products such as footwear and all types of leathergoods, chemistry, biochemistry, physics, biophysics, biology, microbiology, environmental engineering, by-product utilisation, quality control and standardisation, machinery and equipment, industrial chemicals, management, technical education and training, economics, marketing and dissemination as applicable to leather and leather-products industries.

As regards the methodology of publication of articles, please go through the papers appearing in JLR. The format and arrangement of various Sections of the article shall be:- Abstract, Introduction, Materials and Methods, Results along with Figure(s)/ Table(s) if any, Discussion, Acknowledgement(s) if any and Reference(s). The names of Sections of the paper "Abstract" etc., shall be at the middle of the line and in block letters. Sub-sections (sub-headings) can start at the margin and normal-typed and underlined or italicised. References shall be given within brackets in the running line eg., (Author's name, year); in case, there are only two authors, the names of both the authors be given eg., (—and—, year); references to articles contributed by more than two authors be indicated as follows: (Name of the first author et al., year); references to more than one article by the same author/s in the same year are to be indicated as follows: (first reference, year a); (second reference, year b) and so on. Reference to books shall indicate the name(s) of the author(s), (year of edition/publication), "title of the book", (name of the editor), name of the Press and page number (p.--). The "References" shall contain the names of all the authors who have contributed the article, arranged in alphabetical order, (year), name of the journal, **Vol. No.** (Issue No.) or **Month**, Page Number.

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JOURNAL OF LEATHER RESEARCH
LEATHER RESEARCH INSTITUTE OF NIGERIA
P.M.B. 1052 ZARIA NIGERIA

CONTENTS

SOURCING FOR RAW MATERIALS: A CASE FOR LOCAL MANUFACTURE OF LIME FOR THE LEATHER INDUSTRY

A.A. Nduji and A.N. Opara*
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P.M.B. 1052, Zaria, Nigeria

ABSTRACT

Local sources of limestone suitable for the production of good quality lime for the leather industry have been identified. The assessment of leathers produced using the lime resulting from limestone from these sources shows that the local lime compares favourably with the imported lime. Entrepreneurs within the country are encouraged to get themselves involved in the production of lime from local sources to check importation.

INTRODUCTION

Nigeria has vast deposits of limestone (Geological Survey of Nigeria, 1930 — 1967) at Ashaka, Abakaliki, Burum, Ewekoro, Gboko/Yandev, Igbetti, Jakura, Kwakutti, Mfamosing, Mopa, Nkalagu, Sokoto, Ubo and Ukpilla, to name but a few. It is estimated that a reserve of over 140 million metric tonnes is present in seven States of the federation. Limestone constitutes a major raw material for cement manufacture and the construction industry. Other industries that utilize limestone and products of lime include beverages and confectioneries, glass, tanneries, water boards, steel plants and sugar factories. The use to which any limestone is put depends to a large extent on its chemical composition. Whereas most limestone deposits satisfy the needs of the construction industry, various other industrial purposes require lime with little or none of the other impurities associated with it. It is therefore necessary not only to identify the sources of limestone in the country but also to assess its quality so that its users are better informed. This approach of finding local substitutes for imported raw materials is important now, more than ever before, in view of the need to conserve foreign exchange.

MATERIALS AND METHODS

An extensive countrywide survey was done to locate limestone deposits and collect samples. The sample from each location was analysed and subsequently calcined in a Gallenkamp muffle furnace at the maximum temperature of 1000°C; the resulting lime was slaked with minimum amount of water and analysed further (Vogel, 1961; Young, 1971). Comparative liming trials using the lime produced from limestone from three locations and imported lime as the control were carried out with goat and sheep skins which were subsequently chrome tanned. The physical and chemical characteristics of the resultant leathers were then determined.

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* Ashaka Cement Company Ltd., Ashaka, Bauchi State of Nigeria.

RESULTS AND DISCUSSION

The chemical composition of limestone from eleven locations in Nigeria is given in Table I. The deposits are found to possess high $CaCO_3$ content (above 70%) except that from Igbetti. The high $CaCO_3$ content shows that large quantity of lime can be produced from locally available limestone. The analytical data on lime from these limestone deposits are presented in Table II. Lime from five sources (Jakura, Kwakutti J. Bros. Ltd., Mopa, Ubo and Ukpilla) were found to be white, like the imported lime used by the tanning industry. They were found to be fast-slaking and slow-settling as expected of any good quality lime. They were also found to possess low silica, low combined oxides (Al + Fe oxides) but high CaO content, satisfactory solubility and suitable alkalinity.

The comparative physical and chemical characteristics of leathers processed with lime from Mopa, Ubo and Ukpilla limestone deposits and imported lime are given in Table III. The results are comparable and confirm that lime from these limestone deposits is good for leather processing and can effectively become a substitute for imported lime currently in use in Nigerian tanneries.

CONCLUSION

The utilization of locally available limestone as a base material for the construction and other industries is very high in this country but it is virtually unexploited as lime since the requirements of lime have been totally met from imports (nearly 60,000 tonnes per annum). With only one lime plant functioning at the Delta Steel Company Limited, Aladja (Bendel State of Nigeria), the increasing demand for lime in the country would be acute when the major steel mill at Ajaokuta comes on stream. Now that the local sources of limestone suitable for good quality lime have been identified and since the technology of production of lime is simple and well-known, private investment in lime production is required to stem imports and sustain industries that utilize lime in their processes.

ACKNOWLEDGEMENT

The authors are grateful to Messrs. M. Bello and Patrick Bobai of Leather Research Institute of Nigeria (LERIN), Zaria for their assistance in conducting the tannery trials and physical testing of the leathers; Messrs. A.A. Ihuoma, J.B. Gabriel and I.U. Etuk of LERIN for their help during the surveys; and also the Director, LERIN for permission to publish this article.

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TABLE I

CHEMICAL CHARACTERISTICS OF SOME LIMESTONE DEPOSITS IN NIGERIA

Location	Loss on Ignition %	Silica %	Al + Fe Oxides %	CaO %	$CaCO_3$ %	MgO %	$MgCO_3$ %
AS	39.61	8.29	5.12	39.80	71.61	0.98	1.94
GB	42.70	2.48	1.83	51.58	92.81	0.53	0.77
IG	18.30	56.78	4.36	17.77	31.97	2.34	4.27
JA	43.36	0.49	2.33	53.32	95.93	0.47	0.68
KC	40.38	8.40	2.97	46.39	83.45	1.76	3.67
KJ	43.56	1.85	0.96	51.95	93.47	1.28	2.68
MF	43.52	2.42	2.71	50.49	90.34	0.35	0.74
MO	43.65	1.00	2.47	52.14	93.81	0.35	0.58
SO	40.01	8.69	3.87	44.94	80.85	1.02	1.87
UB	43.28	0.43	0.88	53.38	96.03	0.74	1.55
UK	43.33	1.17	2.30	51.85	93.10	0.71	1.49

AS — Ashaka; GB — Gboko; IG — Igbetti; JA — Jakura; KC — Kwakutti C.C.C. Ltd.; KJ — Kwakutii J. Brothers Ltd.; MF — Mfamosing; MO — Mopa; SO — Sokoto; UB — Ubo; UK — Ukpilla

TABLE II

CHEMICAL CHARACTERISTICS OF LIME FROM SOME LIMESTONE DEPOSITS IN NIGERIA

Location of Limestone	Colour of Lime	Silica %	Al + Fe Oxides %	CaO %	$Ca(OH)_2$ %	MgO %	$Mg(OH)_2$ %	Solubility mg/100ml	pH of Saturated solution
AS	Brown	8.67	11.25	53.38	70.78	1.05	1.50	140.25	11.40
GB	Light-Brown	3.05	2.88	65.69	86.78	0.80	1.15	168.09	11.40
IG	Light-Brown	16.29	24.65	38.83	51.36	3.61	5.22	119.40	11.60
JA	White	0.91	1.84	71.72	94.74	0.81	1.16	172.30	11.80
KC	Bone-White	14.14	4.17	59.98	79.24	1.62	2.34	165.60	11.45
KJ	White	2.14	2.78	70.69	93.38	0.97	1.40	171.20	11.70
MF	Brown-Grey	2.28	6.60	68.66	90.69	1.20	1.74	165.60	11.70
MO	White	0.54	1.70	72.92	96.32	0.77	1.11	162.60	11.60
SO	Brown	2.44	4.02	66.26	87.79	1.23	1.77	152.88	11.50
UB	White	1.31	1.72	71.75	94.77	1.35	1.95	171.80	11.75
UK	White	0.29	2.13	73.38	96.93	0.46	0.66	164.00	11.50

TABLE III

PHYSICAL AND CHEMICAL CHARACTERISTICS OF LEATHERS

Characteristics	Goat		Sheep	
	Experimental	Control	Experimental	Control
Mopa Lime				
Tensile strength, N/mm^2	28.50	26.90	20.60	18.85
Elongation at break, %	50.00	45.11	49.71	54.30
Bursting strength, N/mm. thickness	476.20	471.90	480.40	581.20
Moisture, %	8.85	7.70	—	—
Petroleum ether solubles, %	4.71	4.45	—	—
Water solubles, %	1.43	1.38	—	—
pH of water solubles	3.20	3.30	—	—
Total ash, %	7.67	7.84	—	—
Ubo Lime				
Tensile strength, N/mm^2	23.75	21.40	27.90	23.95
Elongation at break, %	45.68	44.45	46.85	46.13
Bursting strength, N/mm. thickness	535.00	426.60	530.10	490.00
Moisture, %	8.91	8.95	9.06	9.01
Petroleum ether solubles, %	3.91	3.40	4.55	4.44
Water solubles, %	1.56	1.58	2.06	1.96
pH of water solubles	4.35	4.50	5.30	5.24
Total ash, %	6.71	6.74	7.87	7.66
Ukpilla Lime				
Tensile strength, N/mm^2	20.34	20.80	23.60	22.20
Elongation at break, %	42.55	48.35	60.76	55.32
Bursting strength, N/mm. thickness	535.40	443.10	557.40	516.70
Moisture, %	8.92	8.93	8.94	8.87
Petroleum ether solubles, %	2.37	2.23	3.76	3.36
Water solubles, %	2.39	2.32	3.43	2.92
pH of water solubles	3.00	3.10	3.10	3.20
Total ash, %	8.80	9.42	11.44	11.23

AZO METAL COMPLEXES FROM RED ONION SKIN *(ALLIUM CEPA)* TANNIN EXTRACT CONDENSATION PRODUCTS

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ABSTRACT

Condensation of the red onion skin tannin extract with formaldehyde was carried out to yield resins which were then coupled with a diazonium salt to give tannin-formaldehyde azo compounds. The azo compounds formed metal complexes with aqueous ions of copper, nickel and cobalt. Evaluation of the azo metal complexes as colouring pigments alongside a commercial pigment gave promising results.

INTRODUCTION

The use of vegetable tannins as substitutes for synthetic phenols in chemical industries is well established (Floyd and Shell, 1969; Berger, 1973). Tannins being phenolic in nature undergo the well known reactions of phenols with aldehydes (Pizzi and Scharfetter, 1978; Kumar and Dara, 1981) and diazonium salts (Lindstedt, 1950). It has been reported (Odozi *et al.*, 1984) that the red onion skin extract consists of polyphenols of the flavonoid type. The extract has been used for the preparation of phenol-formaldehyde (PF) type resins for use in wood varnishes (Odozi *et al.*, 1985). No work has been done on the metal complex forming properties of the natural tannins, particularly onion skin tannin and its azo derivatives. Although the importance of organic pigments has increased, the organo-metallic complex type of pigments are widely used in surface coatings and related industries owing to their good thermal stabilities.

The study reported here is aimed at finding out the possibility of using the red onion skin tannin extract as a substitute for phenols in the preparation of azo metal complexes having pigmentary properties.

MATERIALS AND METHODS

Materials

Dry red onion skin was obtained from an onions trader at the Port Harcourt main market in March, 1985. The commercial pigment, (Ultramarine blue 29, CI 77007), a product of Reckitt and Colman Ltd., U.K. was obtained from a paint company. All other chemicals and solvents used were of technical grade unless otherwise specified.

Onion Skin Tannin Extract

Air dried red onion skin was extracted with acetone (Odozi *et al.*, 1985). Solid extract was obtained by evaporating the solvent using a rotor evaporator.

Tannin — Formaldehyde Condensate

A mixture of aqueous solution of onion skin tannin extract (60.5g), aqueous formaldehyde (37% w/v:8 cm^3) and 2M NaOH solution (10 cm^3) was placed in a 250ml three-necked polymerisation flask fitted with a mechanical stirrer. The mixture was heated at reflux for 2 hours. The reaction product (resin) was then cooled to room temperature, filtered, washed and dried at 50°C *in vacuo*. The resin was dissolved in methanol to form 20% resin solution.

Coupling of Condensate (Resin)

The resin solution (30 cm^3) was added to 2M NaOH solution (10 cm^3). The mixture was stirred and poured into a solution of the diazonium salt of 2-aminobenzoic acid prepared by a standard method (Vogel, 1956). The precipitated azo compound was filtered, washed and dried *in vacuo*.

Azo Metal Complex Formation

The azo compound (10g) was dissolved in 1,4 dioxan (150 cm^3) and added dropwise to 0.1M aqueous solution of the metal salts viz., copper sulphate, nickel nitrate and cobalt chloride (Ramadan *et al.*, 1983). The pH of the solution was then increased to about 4 and the mixture heated at reflux for 1 hour. The highly coloured complexes formed with the metal ions were filtered, washed and dried in *vacuo*. It was then ground to a fine powder. Attempts to recrystallize the products were not successful. The characteristics of the azo metal complexes are given in Table I.

IR Analysis of the Azo Compounds

The IR spectra of the azo compound and its metal complexes were taken in paraffin oil using a Shimadzu IR-408 spectrophotometer.

Evaluation of the Azo Metal Complexes as Pigments

Pigmented linseed oil was prepared with the commercial pigment according to the following formulations (parts by weight): Blown linseed oil (25 parts), commercial pigment (0.5 part) and bentonite (5 parts) were mixed and stirred thoroughly to achieve homogeneity. It was thereafter thinned down with white spirit; metal drier mix (0.1 per cent with respect to the total oil used) was finally added. Similarly, the azo compound and its metal complexes were, in turn used to pigment linseed oil using the same procedure and proportions stated above.

Films of the pigmented linseed oil were made on glass slides by dip coating. The water, acid and alkaline resistance, as well as gloss (Sheen glossmeter) were determined. Drying characteristics of the films were also determined by standard methods (Gardner and Sward, 1946).

RESULTS AND DISCUSSION

Various azo compounds were prepared but only that of 2-aminobenzoic acid formed reasonable quantities of the metal complexes and suitable colours.

Characteristics of the Azo Metal Complexes

The mass-tone, tint-tone colours, relative density, oil absorption, critical pigment volume concentration, hiding power and melting point of the azo compound and its metal complexes are shown in Table I. The complexes are characterised by moderate to high values of hiding power. Those with high hiding power showed excellent tinctorial strength. From the oil absorption values, it appears that the azo metal complexes have good wettability. The melting points of the complexes were above 300°C. This could be attributed to the presence of metal ions in the complexes.

IR Analysis of the Azo Metal Complexes

The IR spectra (Fig. 1) of the azo compound and its copper azo complex show the presence of common bands in the region 3200 — 2500 cm^{-1} which correspond to hydrogen bonded OH absorption of phenols. However, the band is less prominent in the copper azo complex because some of the hydroxyl groups of the polyphenols have been used in the complex formation. The presence of carbonyl group ($>C=O$) conjugated with an aromatic ring appeared at 1720 cm^{-1}, while the C-O stretching of a vinyl ether appeared at 1215 cm^{-1} for the azo compond. These peaks were absent in the spectrum of the metal azo compound. This also suggests the participation of oxygen containing groups in the formation of the complexes. The $C=C$ stretching of an aromatic ring appeared at 1600 cm^{-1}. The spectra showed very weak peaks at 1420 cm^{-1} for the azo group ($-N=N-$) and C-N stretching at 1300 — 1180 cm^{-1}. Similar observations have been reported with azo dyes (LeFevre and Werner, 1957). The peaks in the region 830 — 750 cm^{-1} are for multiple benzene ring substitution.

Evaluation of the Azo Metal Complexes as Pigments

From the results shown in Table II, it is clear that air dried films of the pigmented linseed oil showed good water but poor alkaline resistance after 8 days, and 16 hours of immersion respectively. The poor alkaline resistance suggests some kind of ion exchange between the sodium ions of sodium hydroxide solution and the hydrogen ions of the hydroxyl groups of the tannin molecules. This leads to film solubilization. Immersion of the dry films in the acid solution resulted in a slight loss in gloss.

A critical examination of the gloss values (Table II) shows that the presence of the azo metal complexes in linseed oil does not affect the glossiness of dry films as much as it does for the azo compound. Similar observation has been reported (Naser *et al.*, 1980) on the metal complexes of polybasic acids. The relatively poor gloss values of unmetallized azo compound films may be due to the interaction of the metal ions (Co^{2+} and Pb^{2+}) of the drier mix with the complex forming groups ($-N=N-$, and $-COO-$) in the azo molecules, leading to poor film formation and ultimately to low gloss value. The relatively high gloss value observed for the nickel — azo complex cannot be explained now. The commercial pigment, though not an azo compound gave very low gloss value. Similar reason can be adduced for this as in the case of metallized azo compound films.

Dry Characteristics of the Films

It appears the drying characteristics of the films followed the trend observed for the gloss. The interaction of the metal drier mix with complex forming groups in the azo molecules leaves very little amount of the metal drier to catalyse the oxidation of the oil to form film (Stewart, 1954). This resulted to an increase in the drying times as observed for the azo compound. The film formed from linseed oil pigmented with the commercial pigment gave the shortest hard dry time. Although the commercial pigment is not an azo metal complex, it contains aluminium ions (Al^{+++}) which may have further catalysed the oxidation of the oil to form film of retarded hard dry time. This suggests that metal ion interaction played a significant role in the drying of the films.

CONCLUSION

From the above data, the tannin-azo metal complexes have promising properties as pigments in surface coatings. However, further investigations are required with the aim of separating the various polyphenols in the tannin extract before coupling and improving the alkaline resistance of the azo metal complexes.

TABLE I

CHARACTERISTICS OF THE AZO METAL COMPLEXES

Azo Type Properties	Azo Compound	Metal Azo Complexes: Nickel	Copper	Cobalt	Commercial Pigment (Ultramarine blue)
M. Pt., °C	157	>300	>300	>300	—
Rel. Density	1.39	1.58	2.12	3.03	—
Oil Absorption (%)	45	40	50	40	30
CPVC*	2.20	2.40	1.96	2.40	3.23
Mass tone	Brown	Quinacridone Violet	Quinacridone Maroon	Deep Violet	Blue
Tint tone	Pink	Quinacridone Scarlet	Quinacridone Maroon	Violet	Greenish-blue
Hiding Power	Moderate	Moderate	High	High	Moderate

*CPVC is the critical pigment volume concentration.

TABLE II

FILM PROPERTIES OF PIGMENTED LINSEED OIL

Pigment type	Drying time (mins)			Gloss at 60°	Condition of Film		
	Surface dry	Dust free time	Hard dry		After 8 days immersion in H_2O	After 16 hrs. immersion in 20% HCl	After 6 days immersion in 20% NaOH
Control (no pigment)	65	180	1600	68	3	2	1
Azo Compound	105	235	1845	42	3	2	1
Ni-Azo	100	205	1610	72	3	2	1
Cu-Azo	90	200	1725	50	3	2	1
Co-Azo	105	115	1770	46	3	2	1
Commercial pigment (Ultra-marine blue)	78	195	1530	22	3	2	1

3 = Film unaffected; 2 = Slight loss in film gloss; 1 = Film cracked and partially removed.

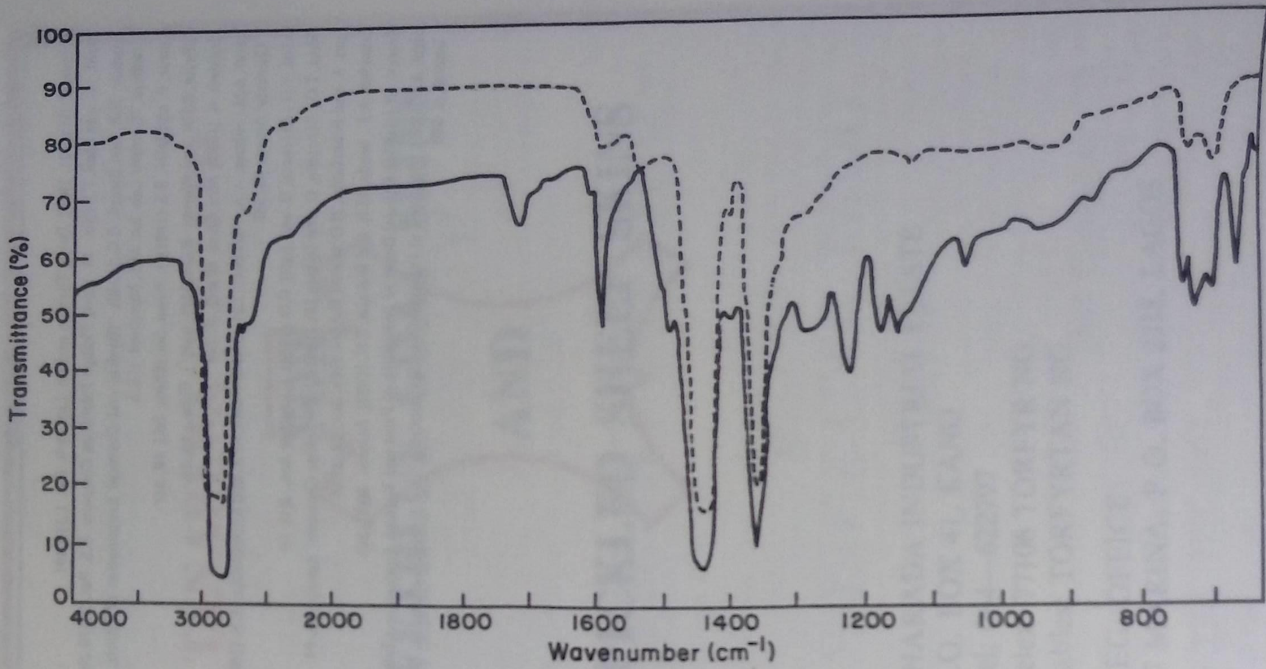

Fig. 1 IR Spectra: Onion Skin Tannin Azo Compound (—) and its Copper Complex (--)

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ABSTRACTS
(FROM OTHER PUBLICATIONS)

HIDES AND SKINS

Peters, D.E. and Dufty, J.H. (1985), "THE EFFECTIVENESS OF SELECTIVE BREEDING FOR REDUCING THE INCIDENCE OF THE VERTICAL FIBRE HIDE CONDITION IN HEREFORD CATTLE," J. Amer. Leath. Chem. Assn., **80**(2), 42.

Work on the vertical fibre hide condition in Hereford cattle has indicated that this condition is not controlled by genes at a number of separately segregating loci but is due to the presence, in a homozygous state, of either an autosomal recessive gene or a number of genes at tightly linked loci. As a result of this finding, the effect of various breeding programs on the frequency of the vertical fibre hide condition in a herd over a period of ten generations have been examined to determine if this is a practical method of reducing the incidence of the condition. The best method of reducing the effect of the vertical fibre condition on the properties of split leather lies in the tannery. Careful sorting can help identify many affected sides which do not lie flat but tend to bulge upward on the sorting table and are often very veiny on the flesh side after splitting. It is still not believed that the problem caused by the vertical fibre condition lies in selective breeding alone until an easily applied test is developed for identifying heterozygous animals. (3 Figs.; 6 Refs.)

(MDI)

Barrett, J.C., Leach, I.B. and Ascough, M.R. (1984), "THE RECYCLING OF SILICOFLUORIDE AND BORIC ACID LIQUORS FOR HIDE PRESERVATION," J. Soc. Leath. Tech. Chem., **68**(5), 146.

Because of adverse climatic conditions during the wet season in W. Africa, there is delay in suspension drying of hides/skins resulting in putrefaction. To check this problem, the use of bactericidal chemicals for treatment of hides and skins prior to drying were reviewed. The immersion of cattle hides in a saturated solution of either sodium silicofluoride (0.65% w/v) or boric acid (4.5% w/v) for 60min. after flaying and fleshing prior to conventional suspension drying was found to give effective protection against putrefaction during drying periods of up to six days with no adverse effects on leather-making qualities of the raw stock. Experiments were carried out on recycling of dip liquors containing sodium silicofluoride and boric acid for preservation with a view to cutting down on chemical cost. Also investigation on the effect of reducing the period of immersion of hides while retaining effective preservation was also carried out. With both sodium silicofluoride and boric acid the results were very satisfactory and the grain quality was very good while recycling cut down the cost of treatment considerably. The investigation also showed that with an initial liquor to hide ratio of 4:1, saturated solutions of sodium silicofluoride can be re-used without replenishment up to 14 times before effectiveness against development of putrefaction diminishes significantly and that unlimited recycling of sodium silicofluoride is not advisable; exhaustion of the recycled sodium silicofluoride liquors is not only by chemical depletion but also by build up of contamination. (3 Tabs.; 5 Refs.)

(BBD)

Ruiz, J.E.F. and Leon Paz, G.E. (1985). "CANAIGRE, *RUMEX HYMENOSEPALUS TORR.* A NEW VIABLE PROCESS FOR THE EXTRACTION OF CANAIGRE TANNINS," J. Amer. Leath. Chem. Assn., **80** (1). 1.

In order to obtain starch free tanning extracts from canaigre roots, several experiments were conducted at the laboratory level. The results of these experiments were utilized to design the process at the pilot plant level. The tanning extract yield in the laboratory tests was 50% containing 70% of tannins. The process used at the laboratory level was also used at the pilot plant level obtaining maximum yields of 47% of extract. In the experimental trials run in the pilot plant it was found that the temperature has a very important effect on the extraction as well as on the quality of the extracts. The other two variables tested, residence time and solvents to solids ratio, did not show any significant effect on the results of the extraction at the experimental levels tested. (2 Figs.; 6 Tabs.; 6 Refs.)

(Authors' summary)

ANALYTICAL CHEMISTRY

Clifford, D.A. and McGaughey, L.M. (1982). "SIMULTANEOUS DETERMINATION OF TOTAL NITROGEN AND TOTAL OXYGEN DEMAND IN AQUEOUS SAMPLES," Anal. Chem., **54** (8). 1345.

An instrumental method based on adding a chemiluminescent NO detector to the flow system of a total oxygen demand (TOD) analyzer is described for measurement of the sum of all nitrogen forms other than N_2 in water. Typical analysis time is 2 min with a precision of 1% relative standard deviation (RSD) at 10 mg/L total nitrogen (TN) and a detection limit of 0.1 mg/L TN. Conversion of reduced nitrogen forms to NO is affected by the chemical form of the nitrogen, competition from carbonaceous oxygen demand (CTOD), and carrier gas oxygen concentration. At a temperature of 900°C, 1800 ppm O_2 in the N_2 carrier gas, and 9.0 g of Pt gauze catalyst, the conversion to NO for 0-10 mg/L TN is apparently complete for all forms of nitrogen in the presence of up to 350 mg/L CTOD. Limited comparisons between wet-chemical and instrumental TN measurements on a tested wastewater showed excellent agreement. (9 Figs.; 3 Tabs.; 15 Refs.)

(Authors' summary)

Sharphouse, J.H. (1985), "THEORY AND PRACTICE OF MODERN CHAMOIS LEATHER PRODUCTION," J. Soc. Leath. Tech. Chem., **69** (2), 29.

The traditional method of making chamois leather was to impregnate the damp flesh splits of sheepskins with cod liver oil in fulling stocks and then hang them up in warm stoves to allow oxidation of the oil to occur, the products of which reaction had a tanning action. These two processes might be repeated two or three times until a satisfactory leathering was achieved. Surplus oil will then be removed by hydraulic pressing (to yield a by - product known as Dégras or Moellon) followed by a final wash in warm alkaline water; the skins are then hung to dry and finished. The modern system consists in loading the damp flesh splits into a large rotating drum along with the cod oil; whilst this is rotating, a controlled blast of warm air is blown in, which effects some drying of the skins and suitable oxidation of the cod oil, so that complete tannage may be achieved in 12 hours. Subsequently, surplus oil is removed by a solvent degreasing plant to yield a dry tanned chamois leather. The merits of this system are a reduction to nine man hours only, elimination of the warm stoves, a big improvement in cleanliness of working conditions, a yield of superior anhydrous Dégras, and the elimination of effluent problems incidental to the use of alkaline, aqueous wash liquors. (14 Figs.; 60 Refs.)

(MDI)

Swamy, M.P., Bangaruswamy, S., Chatterjea, J.N. and Rao, J.B. (1985), "STUDIES ON THE FIXATION OF TITANIUM: STRAIGHT AND COMBINATION TANNING SYSTEMS - PART V," J. Soc. Leath. Tech. Chem., **69** (2), 44.

The tanning potency of titanium in comparison with other conventional mineral tanning agents, viz. chromium and aluminium as well as vegetable tannins (wattle extract) and syntan (syntan DLE) is assessed. This article deals with experiments conducted on straight as well as different combination tanning systems (pretannage, retannage and simultaneous tannage) involving titanium and these tanning agents. Among the straight mineral tannages, the fixation of titanium is found to be greater than that of chromium and much greater than that of aluminium. In combination tannages involving titanium and chromium as well as titanium and aluminium, titanium could well be used for pretannage as well as simultaneous tannage rather than for retannage. With vegetable tannin and syntan, pretannage by titanium is found to be more suitable than retannage and simultaneous tannage. (10 Figs.; 5 Refs.)

(Authors' summary)

Abuelhassan, I.E., Ward, A.G. and Wolstenholme, S. (1984). "A SIMPLE APPROACH TO LEATHER PROCESS INVESTIGATION. PART 3 — THE DEVELOPMENT OF THE MODIFIED STANDARD PROCESS FOR SIDE LEATHER," J. Soc. Leath. Tech. Chem., **68** (5), 125.

A standard process for the production of segments of chrome side leather, in a controlled manner, has been reported in J. Soc. Leather Technol. Chem., (1974), **58**, 88. This process has been further developed to give a modified standard process in which the three main changes are (i) the use of whole sides in place of segments, (ii) a drum liming procedure to replace the circulatory system employed previously for liming stationary segments, and (iii) the transfer of the operation of splitting from the stage after liming to after chrome tanning. The course of development of the modified standard process is described, including details of consequential changes to deliming, pickling, tanning, basifying and neutralisation. It was also necessary to modify drying and conditioning, to enable whole sides to be handled. The properties of leather made by the modified process have been compared with those of standard process leathers. Although minor differences can be detected between the subjective properties (break, temper and grain quality) of leathers made by the two processes and also between a minority of the physical properties measured at corresponding locations on a side or segment, the similarities are sufficient to regard the new process as a near equivalent of the original process. Leathers made by the modified standard process on different occasions have highly reproducible properties and so the process is suitable for the study of the effect of variants in the leather-making operations on properties of the final leather. (2 Figs.; 7 Tabs.; 18 Refs.)

(Authors' summary)

CONTROL AND TREATMENT OF EFFLUENTS/ENVIRON. SC. AND TECH.

Padmini, R. and Krishnamurthi, V.S. (1981). "TANNERY EFFLUENT CONTAMINANTS ON SOIL MICROORGANISMS," Leath. Sc., **28** (11), 403.

The effect of tannery effluent contaminants on soil microbial population was studied. The results showed that the bacterial population was inversely proportional to the chloride content while halophiles were directly proportional. The presence of phenols had offset the inhibitory effect of sodium chloride on both bacterial and fungal population. (6 Figs.; 2 Tabs.; 15 Refs.)

(Authors' summary)

Schroeder, S.H. (1981), "POLLUTION CONTROL: CHANGING APPROACHES," Environ. Sc. and Tech., **15** (11), 1286.

There is a dichotomy between administrative efficiency (the ease of implementing a regulatory program) and economic efficiency (the degree of cleanup achieved for a given cost). Before 1972, water pollution control efforts were based on achievement of ambient water quality standards. This was found difficult to administer because it was hard to translate ambient standards to end-of-pipe effluent limits for individual dischargers. In 1972, the Clean Water Act was made, which required pollution control based on "best available technology" (BAT). But BAT could permit serious contamination. So, in 1976, the Resource Conservation and Recovery Act (RCRA) was enacted based on both ambient environmental quality and BAT, wherein most of the needed regulations were to be determined by EPA. The tasks thus assigned to EPA were soon found to be complex, formidable and overwhelming. In 1980, "Superfund", the Comprehensive Environmental Response, Compensation and Liability Act came into being. While previous laws set standards and compel compliance, Superfund sought to affect behaviour by adjusting the rules of liability, not by commanding particular action. The law, which is remedial in nature enables the government to cleanup harmful discharges, and makes several parties liable for cleanup costs and damage to natural resources. Industry taxes are used to partly finance the government cleanup. Because of its economic efficiency and ease of implementation, Superfund has been described as the ultimate pollution control law. But certain flaws still exist in the law. For instance, the liability concept allows harm as long as the polluter pays. (1 Fig.)

(JBG)

Leadbetter, M.R. and Tucker, W.G. (1981), "ENVIRONMENTAL ASSESSMENT OF INDUSTRIAL DISCHARGES BASED ON MULTIPLICATIVE MODELS," Environ. Sc. and Tech., **15** (11), 1355.

The severity, S, of a substance in a discharge from an industrial source is defined as the ratio of substance concentration, either at the source or at some ambient point of interest, to a maximum specified "safe" concentration level. The source is considered "clean" unless S is expected to exceed unity on more than a given acceptably small proportion of time. Otherwise, it is "dirty". The classification of a source as clean or dirty is made from (a) measurements of factors such as stack emission characteristics and (b) possible knowledge of the statistical properties of other factors (such as meteorology). Standard statistical decision techniques are used, with some novelty to take account of the forms of variation present (time fluctuations, measurement errors, etc.) and to best incorporate existing prior knowledge of the statistical parameters involved. Log normal distributional assumptions are used, coupled with multiplicative transport models in ambient cases. (1 Fig.; 1 Tab.; 6 Refs.)

(Authors' summary)

Ayal, I. (1982), "INDUSTRY EXPORT PERFORMANCE: ASSESSMENT AND PREDICTION," J. Marketing, **46** (3), 54.

This paper is concerned with the problems of assessing and predicting industry export performance. Assessment and prediction of industry export performance are important because of the need to identify possible export industries. The problem of identifying promising export industries becomes very necessary in view of the great desire by countries to acquire foreign exchange. The data base for the study consists mainly of the export data from 65 Israeli export industries for the years 1971 and 1975 and the trade data for the developed countries for the same periods (1971 and 1975) and industries. Regression analytical technique is the major tool of analysis used; through this technique, the determinants of export success in Israeli industries and the determinants of gross industry imports to the developed countries were obtained and subsequently compared. Two findings emerge from the study. First, it is found that a linear regression equation employing certain inherent industry characteristics is a good predictor of success in exports of Israeli industries. Second, the study finds that there is a partial association between the determinants of success in Israeli exports and the determinants of heavy imports to the developed countries. (2 Tabs.; 28 Refs.)

(AAI)

Krapfel, Jr., R.E. (1982), "MARKETING BY MANDATE," J. Marketing, **46** (3), 79.

Acceptance of a broadened concept of marketing implies willingness to use nonmarket as well as marketplace strategies to promote organizational welfare. This article explores the role of government mandates as a component of the overall business strategy. While fundamental marketing processes remian valid, the circumstances and manner of their application require acquisition of new skills and raise macromarketing issues not previously considered. (1 Fig.; 26 Refs.)

(Author's summary)

Epstein, S.B. (1983), "PROCUREMENT WITHOUT PROBLEMS: PREPARING THE RFP," Lib. Journal, **108** (11), 1109.

This is an informative report about some of the factors which contribute to the successful procurement of an automated system. It is emphasized that there is no ideal system and that the purchasing library should acknowledge this fact. The preparation of the Request for Proposal (RFP) is described in detail. Two other types of documents used in the procurement of automated system viz., the Request for Information (RFI) and the Request for Quotation (RFQ) are briefly explained. The benefits derived by the library in the process of writing the RFP itself are pointed out; the wordings of the library's requirements should be in a specific fashion in a good Request for Proposal (RFP).

(EOAF)

Odi, A. (1982), "CREATIVE RESEARCH AND THEORY BUILDING IN LIBRARY AND INFORMATION SCIENCES," College & Research Libraries, **43** (4), 312.

This paper is a critique of the prevalent conceptual methodologies in research in library administration. It examines the current research methodologies found mostly in Dissertation Abstracts International (University Microfilms International), relates them to the positivistic orientation of some social scientists, indicates why they are inappropriate, and suggests how research in library administration can be made more meaningful and relevant. (24 Refs.)

(Author's summary)

Butler, M. and Gratch, B. (1982), "PLANNING A USER STUDY — THE PROCESS DEFINED," College & Research Libraries, **43** (4), 320.

Library literature is replete with articles describing library user studies. However, little has been written about the planning process necessary to undertake a task as complex as a user study that measures the effectiveness of an academic library's services. This article focuses on the planning process that was used by the staff of a college library to develop and implement a user study. Outlined here are the planning steps necessary to coordinate disparate staff concerns and interests to undertake a complex study and accomplish stated objectives in a specified time. (2 Figs.; 21 Refs.)

(Autnors' summary)

Hodgson, M. (1980). "HOW BEST TO ENCOURAGE THE INDUSTRIAL APPLICATION OF SCIENCE AND TECHNOLOGY," Chem. and Ind. **16 Aug.** (16), 658.

Rather than engaging on a broad survey of the British industrial scene, an intentional concentration on the specific progress of the chemical industry, especially as regards ICI has been portrayed. A science based industry and a market imperative - essentials for improving science and technology - are presently available at ICI. In addition are the availability of steady supply of new knowledge and young talents, along with a reasonable sense of purpose among the workers, which stems from personal contacts of the management with employees and trade union leaders. And finally available, is the ability to generate enough wealth for research and development, latest technology and maintenance of new talents. These are not without problems especially as regards the creation of wealth for survival and attraction of young talents - not mere intellectuals, but leaders as well. Government controlled businesses do not, as of record, have the market imperative. Hence low economic growth despite the high quality of technology and availability of the know-how. As for the need for a cross-fertilization between government funded research and industry, the difficulty of sustaining such practice makes the concept irrelevant. Small businesses with an advantageous tax structure may be thought of. Trade with developed and developing countries, facilitated by a transfer of technology, with the majority shareholding favouring the UK, is an important face-saver. While historical issues are irrelevant to Britain's industrial decline, lack of cohesiveness and shared values about objects of industry are relevant; the preparedness of the young people is also irrelevant; rather, the allocation of adequate resources, as an attraction for them, is the key. (3 Refs.)

(GDC)

AUTHOR INDEX

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