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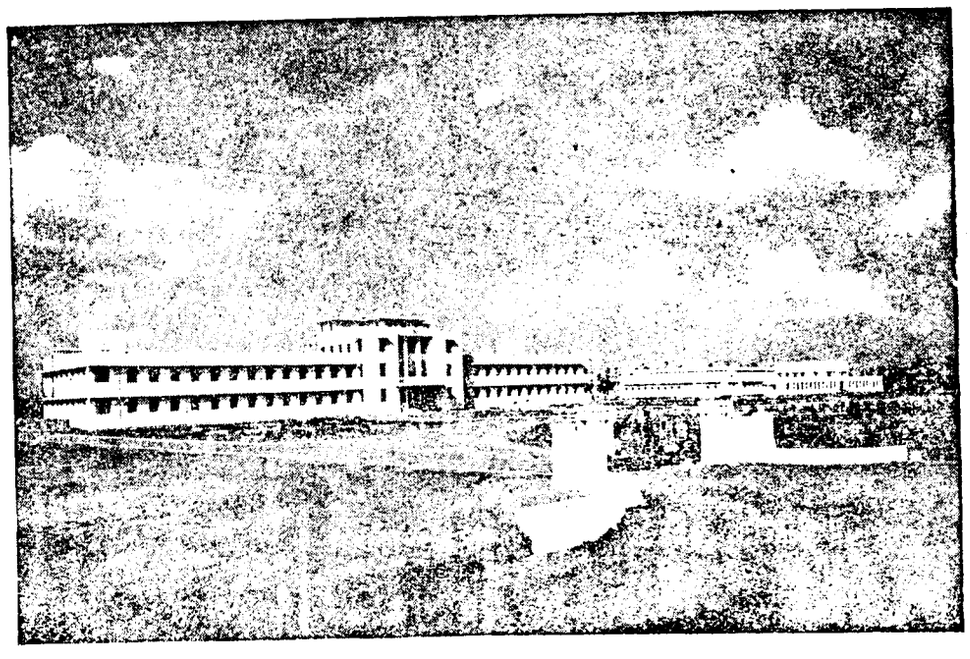

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CONTENTS

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STUDIES ON POST-MORTEM CHANGES—IV.

EFFECT ON LOSS OF WEIGHT DURING CURING OF HIDE

BY

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Received on May 4, 1960

SUMMARY

The effect of post-mortem changes on the loss in weight, shrinkage and dehydration during curing has been studied. Loss in weight has been found to be increasingly delayed with increase in the staling period in salting and in brining, but not in simple drying without using salt. A 24 hours staling has been found to have no appreciable effect on loss of weight, dehydration etc. It would appear that the globular proteins present in the hide and also the products of the bacterial degradation of the other hide proteins during staling are at least partially responsible for the delayed changes. Washing the staled hides before salting would appear to counteract to some extent such an influence.

Introduction

McLaughlin and Theis[1] observed that the ratio of dehydration to salt absorption remained practically constant during salting and brining of hides. But in the previous communication of this series,[2] it was stated that this relation held good only upto a certain period of staling of hides prior to curing and that it differed considerably during further staling. It was also pointed out that a highly staled hide might retain slightly more water and salt and lead to delayed loss in weight. This particular aspect of loss of weight during salt curing does not appear to have been studied systematically. The present communication deals with the study of weight losses during salting, brining and simple drying of hides subjected to post-mortem changes before curing.

Experimental

Freshly slaughtered cow hide from the slaughter house was washed free of blood and manure and fleshed properly to remove

the adipose layer; after sufficient drainage of excess water experimental pieces were cut from the butt portion of the hide. The hide pieces were then allowed to be staled for varying periods in a humid chamber the temperature being controlled at about 30°C. In calculating the weight loss at a particular time after salting, the initial salted weight, in the case of salting and the raw staled weight in the case of brining respectively have been used as the bases.

Loss in weight during wet salting of cow hide:

The hide pieces after different periods of staling were taken and salted on the flesh side with 35 per cent curing common salt calculated on the staled weight of the hides. The per cent loss in weight was recorded for various intervals upto a period of 4 weeks' preservation in a closed moist chamber; the results are given in Table I.

TABLE I

Percent loss in weight during wet salting of cow hide

Period of salting	Period of staling			
	3 hrs.	24 hrs.	48 hrs.	72 hrs.
4 hrs. ..	18·62	17·98	14·52	6·59
10 „ ..	22·15	21·20	15·35	10·12
16 „ ..	23·25	22·11	15·84	11·07
24 „ ..	24·62	22·28	16·39	11·38
48 „ ..	24·03	21·71	16·76	11·94
72 „ ..	24·33	21·44	17·15	12·16
4 days ..	23·59	21·37	17·58	12·8
14 „ ..	23·84	22·12	19·60	15·84
28 „ ..	27·36	26·46	24·00	20·49
Percent 'shrinkage' after 28 days ..	13·33	12·2	10·68	7·58

Loss in weight during brining of cow hides:

To study the loss in weight during brining, the hide pieces were after being staled for various periods, weighed and put in a 30 per cent salt solution (room temperature about 30°C), the hide : brine ratio being 1 : 10. At different intervals, the hide pieces were removed from the brine solution, lightly blotted to

remove excess brine and then weighed. After weighing, the hide pieces were put back in the brine liquor. The results obtained on the basis of the raw staled weight are given in Table II.

TABLE II

Percent loss in weight during brining of cow hide

Period of brining	Period of staling			
	3 hrs.	16 hrs.	40 hrs.	64 hrs.
2 hrs. ..	— 4·45	— 4·09	— 6·695	+ 4·185
4 „ ..	— 8·51	— 7·95	— 4·21	+ 10·11
6 „ ..	— 10·02	— 8·73	— 2·79	+ 12·48
8 „ ..	—	— 6·93	— 0·31	+ 15·28
10 „ ..	— 5·98	— 2·78	+ 0·2	+ 17·65
12 „ ..	— 3·20	— 0·43	+ 2·19	+ 18·56
24 „ ..	— 0·25	+ 2·29	+ 3·55	+ 21·75

Loss in weight during dry salting and simple drying: 345

Whether the high relative humidity that might be present during wet salting and the subsequent preservation, or the salt itself was responsible for any deviation in the trend of loss in weight was next studied. Hide pieces, initially staled as usual, were salted and allowed to be dried at a relative humidity of 50 per cent controlled by a particular concentration of H_2SO_4.[3] In an identical experiment, no salt was applied and the hide pieces were allowed to be simply dried. The weight loss was noted for a period of 24 hours. Tables III and IV represent the results.

TABLE III

Percent loss in weight during simple drying

Period of staling	Observations after		
	4 hrs.	16 hrs.	24 hrs.
3 hrs. ..	6·64	19·75	28·39
24 „ ..	6·54	19·74	28·76
48 „ ..	6·62	20·38	31·21
72 „ ..	7·59	22·31	32·52

TABLE IV

Percent loss in weight during salting

Period of staling	Observations after		
	4 hrs.	16 hrs.	24 hrs.
3 hrs. ..	27·35	33·21	33·96
24 „ ..	27·03	31·96	31·45
48 „ ..	21·40	26·80	27·01
72 „ ..	13·87	18·01	18·26

Moisture content of cured hides:

To verify the results obtained in the previous experiments, the effect of the post-mortem period on the moisture retained by the cured hides was determined, after a storage period of about 4 weeks. The data are given in Table V.

TABLE V

Percent moisture content of cured hides

Period of staling	Wet salted hide	Dry salted hide	Dried hide
3 hrs. ..	40·37	19·91	14·50
24 „ ..	40·54	20·12	15·33
48 „ ..	34·75	21·45	15·40
72 „ ..	46·65	23·08	15·30

Effect of different compounds on the loss in weight:

Now in order to ascertain the possible cause of such delayed loss in weight, some fatty acids and proteinous compounds have been studied.

1·0 per cent and 5·0 per cent solutions (w/v) of both lactic acid and acetic acid (99·5%) were prepared and 5 ml. of these acid solutions were added to 10 g. of sodium chloride and allowed to be dried slowly at 40°C. A control experiment was made with 5 ml. of distilled water added to 10 g. of salt. The results are given in Table VI.

TABLE VI

Effect of fatty acids on percent loss in weight

Compound mixed with sodium chloride	Period of drying		
	5 hrs.	24 hrs.	48 hrs.
Control ..	11·26	31·46	34·11
Lactic acid (1·0%) ..	12·0	30·95	34·66
Lactic acid (5·0%) ..	11·18	30·57	34·21
Acetic acid (1·0%) ..	10·78	31·70	34·64
Acetic acid (5·0%) ..	11·36	21·12	35·06

1·0 and 5·0 per cent solutions (w/v) of albumin and of Bacto peptone (Difco) were prepared and 5 ml. portions of this were added to 10 g. lots of sodium chloride. In the control experiment, 5 ml. of distilled water was added. Table VII indicates the results.

TABLE VII

Effect of proteinous substances on percent loss in weight

Proteins mixed with sodium chloride	Period of drying			
	3 hrs.	28 hrs.	50 hrs.	120 hrs.
Control ..	9·45	27·04	34·18	34·18
Albumin (1·0%) ..	8·61	25·17	31·12	32·11
Albumin (5·0%) ..	10·77	24·59	27·54	29·82
Peptone (1·0%) ..	10·85	24·01	32·55	32·55
Peptone (5·0%) ..	9·75	24·91	29·83	30·15

Effect of washing on the subsequent loss in weight:

A hide piece staled for 72 hours was cut into two portions. One portion was washed with water and then blotted on the surface to remove the excess water; the other one was left unwashed. Both the portions were then salted with common salt on the flesh side. The figures for loss in weight are given in Table VIII.

TABLE VIII

Effect of washing on subsequent percent loss in weight

Treatment	Period of salting		
	3 hrs.	8 hrs.	24 hrs.
Unwashed ..	10·68	16·32	20·47
Washed ..	17·7	18·57	25·95

Discussion

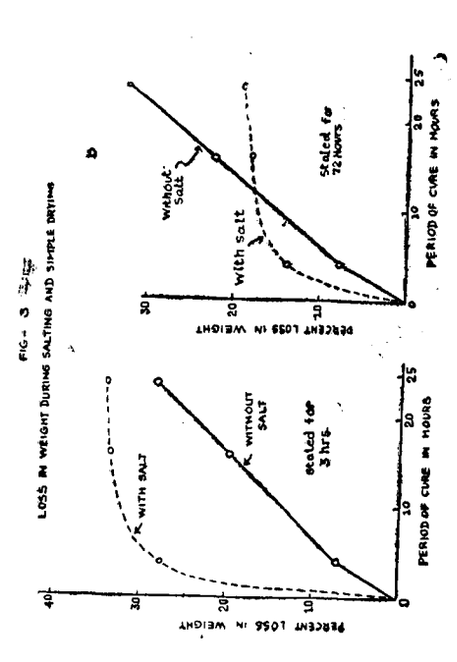
The results of Table I as seen in Fig. 1 point out that in the case of 3 hours staled or rather fresh hide, the per cent loss in weight is very rapid initially upto a period of 24 hours salting and then is nearly constant for a further period of 24 days after which it could rise again to some slight extent. The second curve obtained after 24 hours staling is more or less the same as that for the fresh hide, but with a diminished loss in weight even at the end of 28 days. The 3rd and 4th curves obtained with 48 hours and 72 hours staled hides, clearly show slightly different trends in loss of weight. In both the cases, after an initially rapid loss in weight within 24 hours, there is a less rapid loss in weight with increase in the salting period; but the final weight loss appears to be appreciably less than that of fresh or 24 hours staled hides. Fig. 1 clearly indicates that with the increase in post-mortem period, the per cent loss in weight during wet salting is progressively diminished. With time, however, this retarding influence is partialy relaxed. The percent 'shrinkage' (weight loss after shaking off the excess salt from the salted hide) data, calculated on the staled weight of the hides also support the above finding.

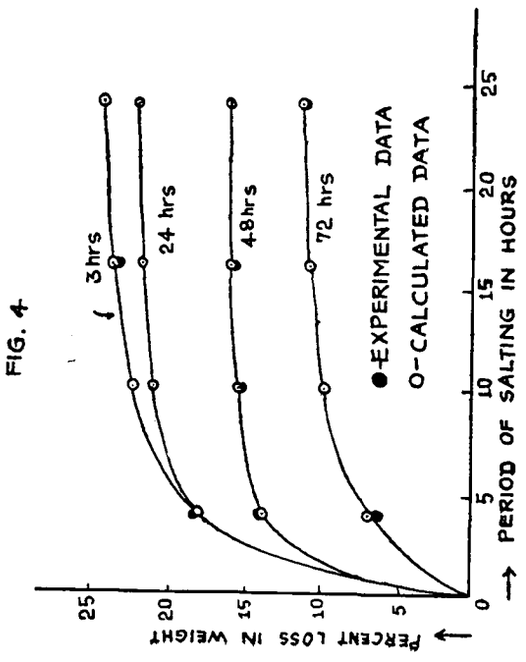
It is interesting to note that the weight loss during brining is quite different from that during salting. A fresh hide, if treated with brine, first loses its weight to reach a minimum and then it gains in weight gradually with increasing period of brine treatment. Such a trend in change of weight was also reported by Stather and Herfeld[4] and other investigators;[5] however, this phenomenon might vary depending upon a number of environmental factors. Fig. 2 reveals that during brining, the minimum weight reached is less and that the gain in weight starts earlier and increases progressively with the increase in staling period. This observation is quite in support of the previous finding.

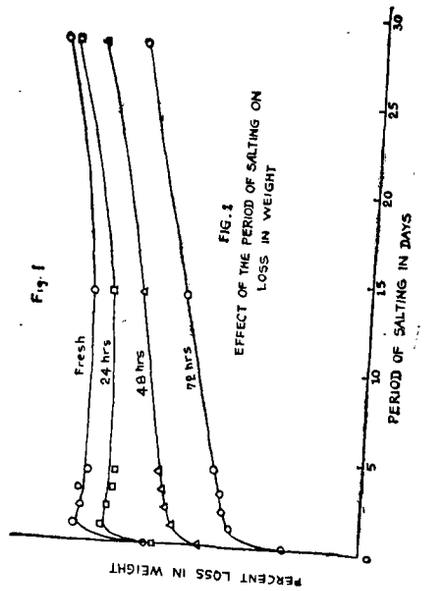
It will be worthwhile to generalise the above results of loss in weight during salting and brining though the limitations of such a procedure are obvious. Attempts have been made to find a mathematical relation between the period of salting and the extent of loss in weight and it is found that this could be put as an equation representing a hyperbolic curve,

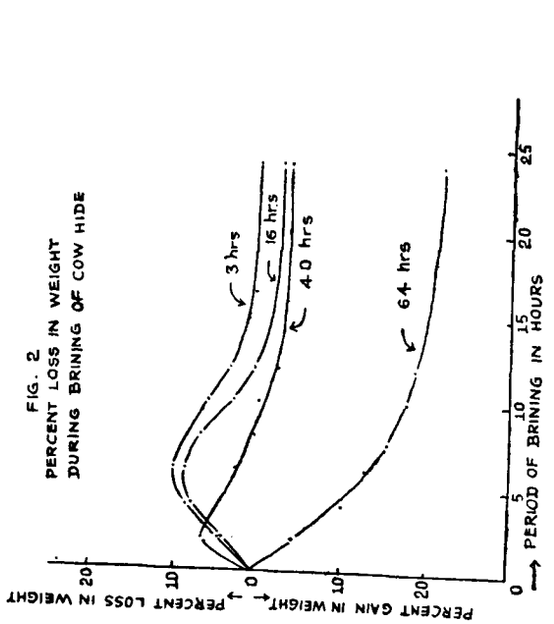
$$Y = \frac{x}{a + bx}$$

where Y = per cent loss in weight
x = period of salting in hours
a & b = calculated constants.









It is found that for different sets of values of a and b this relation holds for all different periods of staling and is valid for the observed data (Fig. 4). The values obtained for a and b are as follows:

TABLE IX

Period of staling	a	b
3 hrs. ..	0·068	0·038
24 „ ..	0·046	0·043
48 „ ..	0·048	0·059
72 „ ..	0·268	0·075

But it may be pointed out that the curves depicting weight loss in case of brining and salting are different. The curve for brining of fresh or 3 hours staled hide appears somewhat parabolic for about the first 12 hours; but after that period, it is rather asymptotic. The period of staling gradually changes the shape of the curves during brining and it is apparent that no single equation would represent the entire period of staling. This was, however, not the case for the curves obtained in the case of salting.

Further interesting evidence is obtained (Tables III and IV and Fig. 3 A and B) as regards the loss in weight in the absence of and in the presence of salt. In the absence of salt, the weight loss is not at all diminished with the increase in staling period prior to drying as is the case in the presence of salt. So, analysing the above results, the following inferences can easily be drawn: (1) that the presence of salt is mainly responsible for such delayed weight loss and (2) that the atmospheric humidity does not influence this delay in weight loss in the case of salting. In explanation to the question why in the absence of salt, the rate of loss of weight is slightly rapid instead of being delayed, the following may be put forward:

(1) With the increase in staling period, the hide structure deteriorates and thereby a loose and empty fibrous structure appears which helps quick passage of water during the process of drying. (2) It is true that a considerable period of time is necessary to dry the hides in order to make them immune to bacterial

attack. So, before drying, if hides are allowed to be staled for a prolonged period permitting harmful bacteria to grow, a further process of putrefaction may take place during drying, leading to a loss in hide substance, i.e., loss in weight. That such an assumption is rational was verified experimentally.

Stather and Herfeld[4] could not find any considerable difference in the final moisture content of the cured staled hides, probably due to the effect of low temperature at the time of staling. But the results of Table V show that salt cured hides do retain more water if allowed to be staled for a considerable period prior to salting. These observations indicate that not only the loss in weight or shrinkage but also the extent of weight loss is being affected or delayed by increased staling.

The problem may be approached in an indirect way bearing in mind the complicated bacterial action on hides and skins and taking into account the following facts:

(1) The presence of adipose tissue or fatty layer on the flesh side.

(2) Formation of free fatty acids due to hydrolysis of the fatty materials of hides and skins by lipolytic enzyme secreted by bacteria.

(3) The presence of proteinous substances on the surface which may be either globular proteins or breakdown products of hide protein due to bacterial action during staling.

Factor (1) has been eliminated by removing mechanically the adipose layer during fleshing. The second supposition that the increase in free fatty acid content may be responsible for such delayed loss in weight is not supported from the results of Table VI. On the other hand, factor (3) is found to be responsible at least partially for such delayed loss in weight. In the presence of albumin or peptone, loss in weight is found to be delayed and this is more so with the increase in percentages of albumin and peptone. It has been further noted that peptone, if decomposed in solution for a period of 48 hours caused much more delay in loss of weight than when it was added fresh.

During the process of salting the concentrated brine that penetrates from the flesh side causes a movement of water from the grain to the flesh layer as diluted brine. It has been reported[6] that while coming out of the hide, the brine carries with it some

small amounts of globular proteins extracted by it. But as the brine inside the hide becomes more saturated, the larger protein particles are gradually salted out.[7] Such proteins, if in sufficient quantity tend to block the interfibrillary spaces and the movement of remaining proteinous substances with brine is interrupted due to precipitation in the region of concentrated brine. It can further be assumed that during the process of staling and bacterial putrefaction, substances like peptone which are intermediary substances between the hide protein and its final breakdown products will be formed and they may cause delayed weight loss. Since the globular and interfibrillary proteins are easily attacked,[8] their presence either in natural or denatured form would be at least partially responsible for such delayed loss in weight.

Acknowledgment

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RESEARCH BEARS FRUIT

MANUFACTURE OF CHROME TANNED LEATHER INTENDED FOR CHARAS*

BY

A. GANESAN & S. P. GHOSH

Introduction

Chrome tanned charas leathers can be prepared in a short time; these leathers are cheaper and more durable than the leather prepared by traditional methods in the villages. The process given below does not require any machine or costly equipment.

Note: All the chemicals are taken on dry raw weight.

Raw material:

Air dried cow hides weighing 15-16 lbs. average (6·80-7·26 kg.) are used.

Soaking:

1st day:—Dry hides (about 1 maund, i.e., 37·2 kg.) are weighed and put in plain water sufficient to immerse the hides. Soda ash is now added in the proportion of 2 lb. (0·907 kg.) per thousand lbs. (453·6 kg.) of water; the hides are kept in the solution overnight. About 2 lb. (0.907 kg.) of lime also may be added to aid soaking. The water so softened will be alkaline and can be used straight for soaking.

2nd day:—The hides are taken out, scraped on the flesh side to remove meat, tissue, etc. and to soften the hide. The well soaked hides are washed in plain water and taken up for liming. If hides do not soak well they are put back in soak liquor after beaming. Soak liquor must be tested every day for alkalinity.

The hides are then painted with the following mixture:

Slaked lime powder	..	22·5% (18 lb. or 8·16 kg.)
Sodium sulphide	..	2·5%-3·5% (2·0-2·8 lb. or 0·907-1·27 kg.)
Water	..	40-45% (7-8 lb. or 3·17-3·63 kg.)

*Process demonstrated at Saradhna (Near Ajmer) in Rajasthan.

Sodium sulphide is dissolved in one-third of water in a pot. When completely dissolved, the sulphide solution is poured over lime and the remaining quantity of water is added to give a thick paint. The paint is applied on the grain and flesh sides of the hides which are then folded and kept covered to prevent aeration.

3rd day:—In the morning, the hides are unhaired after being washed in a small quantity of water in a pit; the unhaired hides are put back in the pit and remain there for the rest of the day; in the evening, they are handled once.

4th day:—The hides are handled in the morning and evening. They are then fleshed and put in plain water to which about 6·25% lime is added, percentage of water being 675%; the hides are left here overnight.

Deliming:

5th day:—The hides are taken out in the morning and washed twice, scudded and then put in a pit containing plain water (225%) to which 1·25% (1 lb. or 0·454 kg.) ammonium sulphate is added.

Pickling:

In the evening, the hides are scudded, washed once in water and pickled in a mud pot or in wooden tubs. The composition of the pickle is as follows:

Sulphuric acid (sp. gravity 1·84)	..	3·75% (3·0 lb. or 1·36 kg.)
Common salt	..	22·5% (20·0 lb. or 9·07 kg.)
Water	..	180% (144 gal. or 654 l.)

Common salt is added to water as mentioned and dissolved completely, acid is then added into the solution with stirring and the hides are put in. The hides are handled for an hour carefully and left in the pickle overnight.

Chrome tanning:

6th day:—22·5% (18 lb. or 8·16 kg.) chrome extract powder (B. & C. Co., Madras) is dissolved in cold water a day prior to use. The chrome liquor thus prepared is added to the pickle liquor in one instalment. The hides are handled in the chrome solution for an hour and then they are taken out and piled in a room. Care is taken to avoid contact with dirty materials like bark, lime, etc. The hides are piled on a mat or a pile of hay without wrinkles or folds and laid straight.

7th day:—The hides are put back in the chrome liquor, handled for 15 minutes and then piled in the original place. Towards

the evening, the hides are taken from the pile and left in the chrome liquor till next day.

8th day:—The hides are taken out and kept piled till evening. 1·25% (1·0 lb. or 0·454 kg.) soda ash dissolved in four times its weight of water is added to the chrome bath.

The hides are put back in this basified chrome liquor the next day.

9th day:—The hides are taken out, piled flat for a day on the floor. A piece is taken from the thickest portion and the boiling test is carried out. Towards evening, the hides are washed thrice to remove acid, chrome, etc. They are then put in another tub containing 225% water and 2·5% (2·0 lb. or 0·907 kg.) sodium bicarbonate and left there overnight.

10th day:—The leathers are washed in water after which they are ready for dyeing.

Note:—It is not always necessary to do the dyeing, but for the sake of the appearance of leather a small quantity of dye is given.

Dyeing:

Acid dye	..	5 oz. % (4 oz. or 113 g.)
Water at 45°C	..	225% (180 lb. or 81·6 kg.)

The dye stuff is dissolved in hot water in a metal vat over fire and added into the bath; the leathers are handled in it for 20 minutes, then a little quantity of chrome liquor is added into bath and the leathers are handled for another 10 minutes; the solution is then thrown out. The tub is then washed with a small quantity of hot water and kept ready for fat-liquoring.

Fat-liquoring:

Sulphated pungam oil	..	12·5% (10 lb. or 4·54 kg.)
Soda ash	..	2·5 oz. % (2·0 oz. or 57 gm.)
Water	..	225% (180 gal. or 818 l.)

Soda ash and the sulphated oil are mixed together and added to the quantity of water mentioned above, to get an emulsion. The dyed leathers are put in and handled for ½ hour in the fat liquor bath after which they are washed in plain waer, dried and folded, covering them well.

11th day:—By applying water to places where the leathers are dry, the leathers are brought to fairly uniform moisture content.

The following mixture is prepared for stuffing:

Tallow	..	24% (19 lb. or 8·61 kg.)
Paraffin wax	..	7·5% (6·0 lb. or 2·72 kg.)
Kerosine oil	..	3·25% (2½ lb. or 1·13 kg.)

The tallow and wax are first melted in an enamel basin over fire. After removal from fire, kerosine oil is added to the mixture of tallow and fat, mixed well and this mixture is then applied uniformly on the grain side of leather by hand; the leathers are kept bundled for a while and given a second application of the stuffing mixture. They are dried in the shade for a while. Towards the evening, the leathers are folded into bundles.

12th day:—The leathers are spread out in the sun; when they become warm, the remaining fat mixture is applied. The fat is applied more on the thicker portions and less on the thinner portions. The leathers are then dried completely.

13th day:—The leathers are kept in the sun for 3 hours by which time the fat becomes evenly distributed.

The leathers are then staked with a slicker and are ready for charas making.

N.B.:—

1. The fat application makes the leather quite strong and durable; it eliminates the necessity for the consumer to apply the fat.

2. Where tallow is objectionable, it can be replaced by mustard or any other oil. But tallow reduces the cost as it is a product from dead animals.

3. The use of baked mud vessels and pots for keeping chrome as well as for tanning purposes is recommended. Wooden tubs are very often too costly in certain parts of the country and beyond the reach of many rural tanners.

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1. Tanning charge of finished leather including cost of fat	..	per lb. Re. 0=59 nP. per kg. Re. 1=30 nP.
2. Tanning charge of finished leather without application of fat	..	per lb. Re. 0=29 nP. per kg. Re. 0=64 nP.
3. Tanning charge of finished leather by traditional method	..	per lb. Re. 0=37 nP. per kg. Re. 0=81 nP.

LETTER TO THE EDITOR

The determination of acid binding capacity of collagen

Collagen contains a number of reactive groups capable of fixing acid or base. These reactive groups apart from binding acid or base, play a vital role in fixing chrome, formaldehyde, vegetable tannins, etc. There are a number of methods for the determination of the acid binding capacity of limed collagen.[1] Gustavson[2] determined the acid bound with the protein by suspending the pickled skin in water, and neutralising the diffused acid to methyl orange, with dilute sodium hydroxide until it ceased to give up any more acid to the external solution. Later he applied this to chrome leather and found that chrome leather gave up all its acid, under similar conditions. Merrill *et al.*[3] slightly modified the above procedure as follows: alkali was added to an end point of pH 5·4, the leather or the pickled skin being agitated with water all the while.

Considerable efforts have been directed towards the differentiation of protein bound acid and the acid combined with chrome complex. Gustavson[4] found that the fixed acid of the pickled skin was completely removed by extraction with 4% pyridine solution. This was made the basis for differentiating between the ionic sulphate and co-ordinately (complexly) held sulphate in chrome leather. Merrill *et al.* (*loc. cit.*) questioned the validity of this method. In all the above methods for neutralisation of protein bound acid in chrome leather only hydrolytic mechanism has been proposed; these methods failed to give exact separation of these two acids because of extensive hydrolysis of the differently held sulphate groups in chrome leather. During the last decade, due to limitations in using water as solvent for titration because of its amphoteric nature, electrometric titration in non-aqueous medium has been proposed.[5, 6] The possibility of application of non-aqueous titration technique for this purpose was indicated a few years ago.[7] Burton and Ma[8] applied this technique for estimating the free mineral acid contained in vegetable tanned leather by titrating the excess of sodium acetate remaining behind, with standard acid in ethylene glycol: isopropanol medium (G. H. Solvent). Hence a suitable method for the separation of two acids is needed and that method should be free from the vitiating influences arising out of different stages of hydrolysis of the differently held

sulphate groups. This can be achieved only by applying the non-aqueous titration technique and such a study has been carried out with untanned hide powder prior to applying it to chrome leather, to find out the protein bound acid; the data obtained from such a study are presented here. Comparative data obtained using the available methods also are presented here. The details of the proposed method are given below:

1 gm. of hide powder was shaken with 10 ml. of 0·2*N* sulphuric acid and 25 ml. of 10% sodium chloride solution for 1-2 hrs., then filtered, washed well with salt solution, the washings being collected and the filtrate titrated against standard sodium hydroxide solution (0·2*N*) using phenolphthalein as indicator. The difference between this and the blank value gives the acid combined with protein. The acid fixed in the hide powder was analysed after washing with acetone and ether to remove moisture, vacuum dried and the sample was treated with 50 ml. of the reagent solution (a 0·4% solution of sodium borate in 1 : 1 ethylene glycol and isopropanol) and kept for 48 hrs. with intermittent shaking. At the end of the 48 hrs., the excess borate remaining behind present in the G. H. solvent mixture was titrated against standard hydrochloric acid in G. H. solvent mixture, using Beckman G pH meter. The acid bound by the above sample was also determined using the method suggested by Merrill[3] which has been accepted as official method of analysis by A.L.C.A. A few typical curves obtained by non-aqueous titration are presented in Fig. 1.

FIG. 1

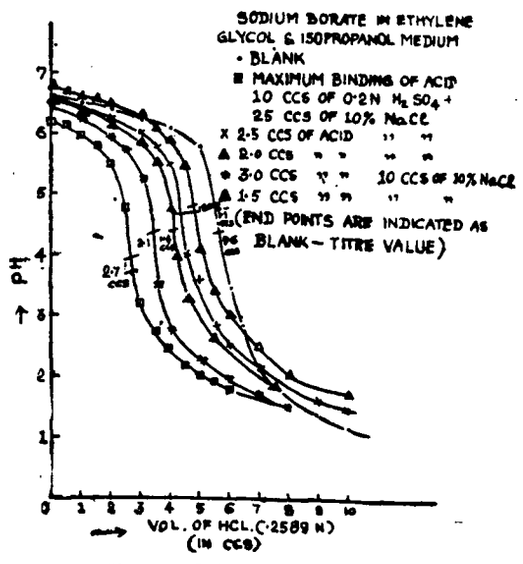

TABLE I

By difference from the titration of the filtrate	0·723	milli eqts. per gm. of of hide powder.
By non-aqueous titration technique (48 hrs.)	0·7508	-do-
By diffusion neutralisation method to pH 5·4	0·742	-do-

As fixation of acid depends upon the neutral salt content and the amount of acid used, lots of hide powder (1 gm.) were shaken with varying amount of acid and salt solutions. After shaking for 1-2 hrs., the samples were analysed as before by non-aqueous titration and diffusion neutralisation method.

TABLE II

	Diffusion neutralisation method to pH 5·4	Non-aqueous titration (in m.eqts. per gm. of hide powder)
1. 10 ml. of 10% sodium chloride solution + 2 ml. of H_2SO_4 (0·2*N*)	0·212 m. eqts.	0·2031 m.eqts.
2. Do. + 2·5 ml.	0·2696 „	0·2847 „
3. 5 ml. of sodium chloride + 1·5 ml. H_2SO_4 (0·2*N*)	0·356 „	0·371 „
4. Do. + 3 ml.	0·525 „	0·5424 „
	By difference from the titration of the filtrate	Non-aqueous titration
5. 25 ml. of 10% sodium chloride + 10 ml. H_2SO_4	0·7696 m. eqts.	0·7767 m.eqts.
6. Do. + 8 ml. of H_2SO_4	0·6996 „	0·6732 „
7. Do. + 6 ml. H_2SO_4	0·6297 „	0·6213 „

The same experiments were repeated using hydrochloric acid in place of H_2SO_4. The results are as follows:

TABLE III

	By difference	Non-aqueous
1. 25 ml. of 0·1*N* hydrochloric acid + 10% sodium chloride solution (25 ml)	0·8170 m.eqts.	0·8026 m.eqts.
2. Do. + 20 ml.	0·6628 „	0·6731 „
3. Do. + 15 ml.	0·5550 „	0·5437 „

A blank titration was also carried out without any salt in the solvent medium and it was found that the solvent system did not consume any acid.

From these data, it may be seen that the values obtained by the non-aqueous titration method are in close agreement with those obtained using the available methods. On the basis of this proposed method, study is being carried out for the differential determination of protein bound and chrome bound acids in chrome leather and the details of the method and results will be reported later.

The author's sincere thanks are due to Dr. Y. Nayudamma, Director for his kind permission to publish this note and to Dr. T. S. Ranganathan for useful discussion.

C.L.R.I. S. ANANTHANARAYANAN,
Sept. 26, 1960. D. RAMASWAMI.

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TECHNICAL SEMINAR

Requirements for belts and belting leather*

BY

DR. ING. KURT WOLF

The manufacture of a high quality belting leather presupposes an intimate knowledge of the requirements to be fulfilled by the belt itself. Therefore, one has to know the forces and influences which are acting during the life-time of a belt.

The total stress of a belt is the summation of different forces, namely —

the tangential force	T
the initial tension	T_i
the centrifugal force	C

The tangential force T can be calculated from $T = \frac{75 \cdot HP}{v}$ where HP is the horse power transmitted and v, the velocity of the belt in m/s. (All formulae are based on the metric system.)

The speed of the belt plays an important role in this equation. For a given HP—this is the normal case, because the prime mover has always a definite capacity—the higher the speed, the lower the T. v can be found from —

$$v = \frac{D_1 \pi n_1}{60} = \frac{D_2 \pi n_2}{60}$$

D_1 and D_2 are the diameters of the two pulleys in m (meter) and n_1 and n_2 respectively are the corresponding numbers of revolutions per minute.

The initial tension T_i is necessary in order to ensure the contact between pulley and belt and to increase the friction by tightening the belt. When the belt is at rest, this initial tension is

* Summary of talk given on November 4, 1960.

equally divided between the pulling and the slack sides of the belt, $T_1 = T_2$ and $T_i = T_1 + T_2$. As soon as the belt begins to run, T_1 becomes greater than T_2. This difference between T_1 and T_2 is greater the greater the power transmitted. The tension due to the power transmitted therefore is $T_1 - T_2$ in kg. The value of $T_1 - T_2$ is dependent on the ratio T_1/T_2, which is determined by Eytelwein's equation $T_1 = T_2 e^{\mu\alpha}$.

In this equation are —

e = basis of natural logarithm

μ = coefficient of friction

α = angle of grip resp. arc of contact.

From this equation, it can be learnt that T_1/T_2 is increasing with the increase of both the coefficient of friction and the angle of grip. That means that the efficiency of drive depends very much on high values of μ and α.

The centrifugal force C can be ignored with speeds of less than 15 m/s; with higher speeds the value of C increases rapidly according to the formula $\frac{\text{mass} \times (\text{velocity})^2}{\text{acceleration due to gravity}}$ consuming a considerable portion of the entire tension and so reducing the tangential force to which the power capacity of a belt is due.

The power capacity: The most interesting figure for practical use is given by the equation —

$$T = T_i - C$$

On using the previous formulae

$$\frac{HP.75}{v} = T_1 - T_2 - C \text{ and}$$

$$HP = \frac{(T_1 - T_2 - C)\,v}{75}$$

It has been pointed out earlier that the coefficient of friction (μ) and the angle of grip (α) are determining factors. Now we see that the speed and the mass of the belt are two other important influences especially with modern high speed drives. Of them, v and α are related to the design of the drive; the others depend more or less on the materials used in the manufacture of belts.

The coefficient of friction can be regarded as peculiar to the concerning material and as nearly constant in contact with the material of which the pulley is made. The mass changes with the dimensions and the density of the belts.

As far as leather is concerned, there are only a few data available about the coefficients of friction of various types of leather. It seems that this coefficient can be altered with the components which form the belting leather (first of all, the nature and quantity of fats and oils used) and with the age of the leather belt. But it is quite certain that leather has a higher coefficient of friction than rubber and that from this point of view leather should be preferred as belting material. Among the different types of leathers, chrome leather has the highest coefficient reaching about 0·8 (instead of 0·3 to 0·4 of rubber).

The dimensions for a leather belt can be derived from the loading capacity of the cross section. By agreement this capacity has been fixed to be 250 kg/sq. cm. From this, the effective tension per inch (25·4 mm) of width of the belt which is allowable for the usual thicknesses of the belts can be calculated as follows—

Thickness in mm	Loading capacity kg/inch	Effective tension fixed by agreement
4½ to 5	285 to 318	49 lb = 22·2 kg
5 to 6	318 to 380	55 lb = 24·9 kg
7	446	70 lb = 31·8 kg
8 to 8½	510 to 540	79 lb = 35·8 kg
9 to 10	570 to 635	88 lb = 39·8 kg (per inch)

That means that only about 18 kg/sq. cm. are claimed out of the entire 250 kg/sq. cm at the breaking point.

The main reason for this very low demand of load is the rate of elongation of belting leather at higher loads. The belt has to work within the range of permanent elasticity so that the grip on the pulleys is maintained. As a matter of fact, the elongation corresponding to an applied load becomes irreversible if the limit of elasticity is exceeded.

Therefore, it has been postulated that in a stationary experiment (loading a testpiece by 53 kg/sq. cm.) the temporary elongation during 15 minutes of applying of the load shall not be higher than 6% of the original length and that the permanent elongation after 4 hours of recovery shall not exceed 2%.

All these specifications are rather crude and approximate and should be replaced one day by dynamic testing methods.

Experiments are being conducted at the Central Leather Research Institute, to develop processes for the manufacture of belting leather from Indian raw hides using indigenous Indian tanning agents and auxiliaries, which are very promising in the light of the above mentioned requirements for belting leathers.

Dr. K. Wolf was born at Frankfurt/Main (Germany) on September 21, 1902. He had his primary and secondary education at Latin College, Mainz, higher education at the University of Technology, Darmstadt. He obtained Dipl. Ing. in 1926 and the degree of Dr. Ing. in 1927. The last 18 months of the studies at the University of Darmstadt were spent as student and assistant of Professor Dr. E. Stiasny. From 1926-1932, he was in charge of the laboratory of Messrs. Sigmund Hirsch, Weinheim, biggest horse-hide tannery in Europe. From 1932-1949, he was Senior Scientific Officer at "Institut für Gerbereichemie, University of Technology, Darmstadt; three years as assistant of Professor Stiasny; then in charge of the tannery of the Institute. He was also a lecturer in technology of leather manufacture. Till 1945, he was Editor of "Collegium". Dr. Wolf also held the position of Secretary-General of the International Association of Leather Trades' Chemists (I.V.L.I.C.). From 1949-1958, he was in charge of the tanneries of Leder & Co., Rapperswil (Switzerland) and Origin Rapp, Gozzano (Italy), manufacturers of industrial leathers. In 1958, he set up an Advice and Research Bureau, for the Leather Industry, Rapperswil (Switzerland).

From July 1, 1960, he joined the Central Leather Research Institute, as the UNESCO Expert. During his stay at the Institute, Dr. Wolf has planned (1) developing commercial processes for the manufacture of industrial (belting) leathers from Indian raw hides and indigenous materials, (2) training staff in this special field and (3) advising the Indian leather industry.

CLASSIFIED ABSTRACTS

RAW MATERIALS

The processing of New Zealand sheepskins: Some observations.

H. G. Turley, Ph.D., (Research Associate, Rohm & Haas Company, Philadelphia, Pa.). *J.A.L.C.A.* **55**, 426 (1960). This paper describes some observations of the New Zealand methods of producing pickled sheepskins and lambskins. The methods by which excessive "mottle" can be overcome are discussed. Two important areas of sheepskins processing are discussed and criticized, namely, (1) bating and (2) the drum processing method. The text is illustrated by six photographs.

VEGETABLE TANNING

New method for measuring the sludginess of vegetable tanning extracts.

G. Vago and A. Lenart, *Bor es cipotechnika*, **5**, 129 (1960). For measuring the extent of sludginess of vegetable tanning liquors, besides more exact methods based on sedimentation, the determination of the transparency of the solution may be advised, with the application of a Buhler or Pulfrich photometer. This method is also suitable for the characterisation of the dispergating effect of the syntan used in the mixture. Practical examples are exposed.

OTHER TANNAGES

Zirconium tannage: VIII. The stratigraphic distribution of zirconium in leather.*

I. C. Somerville, J. Wendkos, L. V. Hetzel, and H. R. Franecke, (Rohm & Haas Company), Philadelphia, Pa.). *J.A.L.C.A.*, **55**, 670 (1960). A problem in practical tanning utilizing insoluble sodium zirconium silicate as described previously led to work on the distribution of zirconium and silica throughout the skin. This culminated in stratigraphic analyses of unsplit cowhide leathers tanned with a number of commercially available zirconium salts in comparison with chrome. These results are reported, and some significant aspects are discussed.

Potentiometric titration studies on solutions of zirconium oxychloride and zirconium sulphate in the presence of some organic reagents.

D. A. Williams-Wynn, *J.S.L.T.C.*, **44**, 405 (1960.) Potentiometric titration curves and precipitation point estimations have been carried out on solutions of zirconium oxychloride and zirconium sulphate in the presence of a wide variety of organic reagents. Particular emphasis has been placed on the reaction with the amino acids glycine, α-, β-, and γ-amino-n-butyric acids and with acetic acid. In the case of zirconium oxychloride co-ordination with carboxyl groups is found to occur over the pH range 1·0 to 3·7, but there is no evidence from this work of a co-ordination reaction with amino groups. Zirconium sulphate solutions behave quite differently with these acids; little or no co-ordination was found with either the carboxyl or the amino groups.

Estimations of the amounts of organic acid co-ordinated show no evidence of specific combining proportions, but the pattern is typical of a mass action relationship. There is no simple relationship between stability of the complexes and the pK_1 values of the acids investigated.

Problems of the construction of aromatic sulphons.

G. Tamasovits, *Bor es cipotechnika.* **4**, 107. (1960). Some properties and advantages of certain sulphonic syntans are exposed. The divergency of the 4,4′ -dioxydiphenylsulphon and of the 4,4′-dioxyphenylmethane— related to structural properties—, is expounded on the basis of theoretical organic chemistry.

Resin tannage with homemade resinic tanning materials.

K. Fekete, *Bor es cipotechnika.* **4**, 120 (1960). The home made anionactive resp. cationactive synthetic resins have similar properties to the resinic tanning materials of the same type. Our resitans are also suitable for filling the pelt; in this case they should be added before pickling. The oppositely charged resitans A and K can be mixed without diluting with water and can be used for filling leathers in this way too. In such a case the character of the leather depends on the proportion of the components. By following the fixation of the different materials it has been stated that the resin with an opposite charge is taken up by leather in a greater extent.

Some present-day requirements of shoe manufacturers and wearers for insole and upper leathers.

L. P. Huggett, *J.S.L.T.C.* **44**, 241, (1960). Competition from non-leather materials in the shoe industry has stimulated research to improve the quality of various leathers for different purposes. The desirable properties of insole and upper leathers are discussed from the wearer's and the manufacturer's point of view, and these are linked with the various chemical and physical tests performed on these leathers at S.A.T.R.A. New processes have demanded new standards (e.g. the moulding-on process needs leather possessing much better heat resistance). Perspiration resistance for insoles is being found in combination chrome tannages, while users of upper leathers have become much more critical of its finish—hence the spate of fastness tests (for finish) devised during the last three years.

TESTING

A note describing a test method for determining "tacky feel" of gloving leather.

R. G. Mitton and F. R. Morgan, *J.S.L.T.C.* **44**, 392 (1960). The note describes a test capable of differentiating between normal and tacky leathers. Recently it was required to measure in the laboratory the property of gloving leather known as "tacky feel." The test that was developed for this purpose seemed to be of sufficient interest to warrant a brief description.

Adsorption of methylene blue in the determination of surface areas.

J. J. Kipling and R. B. Wilson. *J.appl. Chem.* **10**, 109 (1960). Data are presented for adsorption of methylene blue from aqueous solutions on two non-porous carbons and on a porous activated charcoal. From the specific surface areas of the non-porous carbons (determined by low-temperature adsorption of nitrogen) it is calculated that the adsorbed methylene blue occupies an area of between 102 and 108 sq. A/molecule. These values are compared with those derived from a structural model and with those reported in the literature. It is concluded that this type of adsorption cannot yet be used for accurate determination of surface areas of carbons nor can it give more than semi-quantitative information when used as a 'molecular probe' to investigate the pore structure of porous charcoals.

Indirect polarographic determination of amino acids by the copper phosphate method.

W. J. Blaedel and J. W. Todd, (Chemistry Department, University of Wisconsin, Madison, Wis.). *Anal. Chem.* **32**, 1018, (1960). The polarographic determination of α-amino acids utilizes their stoichiometric reaction at controlled pH with an excess of insoluble copper phosphate by centrifugation, the 1 to 2 copper chelate is converted with excess (ethylenedinitrilo) tetraacetate (EDTA) to the 1 to 1 copper-EDTA chelate, which is determined polarographically. Limiting current is linear with amino acid concentration and is compared to that produced by a standard copper-EDTA solution. Proportional response up to $10^{-3}M$ permits use of a single calibration for any amino acid and accurate determination of total amino acid concentration in mixtures. The error of the method is less than 4 at an amino acid concentration of $10^{-3}M$, and the lowest detectable concentration is about $2 \times 10^{-6}M$.

Conductometric titration of very weak bases in aqueous medium.

Franco Gaslini and Lucio Zion Nahum (Research Division, Cartiera, Vita Mayler & Co., Milan, Italy). *Anal. Chem.* **32**, 1027 (1960). Twenty-five weak bases with ionization constants between 10^{-8} and 10^{-12} have been conductometrically titrated. The determinations are carried out by dissolving the samples in an excess of aqueous acetic acid and titrating with trichloroacetic acid. Sharp angles are obtained at the equivalence point and results are accurate. The method has been applied to the differential titration of diacid bases and mixtures of monoacid bases which have been resolved in the presence of ethyl alcohol.

Colorimetric microdetermination of sexivalent chromium.

Geoffrey Halliwell, (Rowett Research Institute, Bucksburn, Aberdeen, Scotland). *Anal. Chem.* **32**, 1041 (1960). Chromium (VI) is usually determined by reaction with diphenylcarbazide reagent. An alternative procedure is reported here using a stable, colorless cadmium iodide-starch reagent which is oxidized by chromium (VI) to the blue starch-iodide complex. The cadmium iodide-starch reagent is highly sensitive for chromium (VI) and is free from the difficulties associated with the preparation and storage of the diphenylcarbazide reagent. The method presented here covers the range 0·05 to 0·5 μg. of chromium per ml. in a final volume of 10 ml.

A polarographic study of organic peroxides.

E. J. Kuta and F. W. Quackenbush (Department of Biochemistry, Purdue University, Lafayette, Ind.). *Anal Chem.* **32**, 1069 (1960). An improved procedure is outlined for the polarographic study of organic peroxides in a nonaqueous electrolyte solution. Polarograms were observed for 23 commercial organic peroxide compounds having the following functional peroxide groups: hydroperoxides, peroxy acids, peroxyesters, six-membered bicyclic peroxides, diacyl peroxides, other diacyl peroxides, and ketone peroxides. Twenty-one of the compounds showed one or more characteristic reduction waves; they were placed in five groups based on different half-wave potentials. A linear relationship existed between diffusion current and concentration for all of the peroxides investigated except peroxyacetic and peroxybenzoic acids. Two of the peroxides failed to show evidence of reduction under the conditions used (0·0 to −2·0 volts).

Indicator for the titration of calcium plus magnesium with (ethylenedinitrilo) tetraacetate.

Frederick Lindstrom, (Department of chemistry, Clemson College, Clemson) and S. C. Harvey Diehl, (Department of Chemistry, Iowa State University, Ames, Iowa). *Anal. Chem.* **32**, 1123 (1960). A new o, o′—dihydroxyazo indicator, 1—(1-hydroxy -4-methyl-2-phenylazo)-2-naphthol-4-sulfonic acid, is recommended for the titration of calcium plus magnesium with EDTA. The new indicator has the same color change as Eriochrome Black T but the color change is clearer and sharper, and aqueous solutions of the indicator are stable indefinitely. It may be substituted for the older indicator without change in the procedure. It has been given the common name Calmagite.

Least-squares treatment of spectrometric data.

H. A. Barnett, and A. Bartoli (U.S. Steel Applied Research Laboratory, Minroeville, Pa) *Anal. Chem.* **32**, 1153 (1960). A least-squares treatment of spectrometric data yields equations for calculating concentrations of each of n components in a mixture from absorbances measured at n wave lengths. Absorption co-efficients can be derived by this treatment, if desired, and be used in the conventional manner to derive the final equations. However, when numerical values for the co-efficients are unnecessary, the final equations can be derived directly. Correction terms for deviations from linearity in the absorbance-concentration relationships can be derived directly. This treatment of data has been

applied in the development of methods for the analysis of several coal-chemical systems. Corrections for deviations from linearity in the absorbance-concentration relationships were derived for certain compounds.

Determination of glyoxals and their sodium bisulfite addition products by potentiometric titration.

Joseph G. Baldinus and Irvin Rothberg (Smith Kline and French Laboratories, Philadelphia 1, Pa) *Anal. Chem.* **32**, 1176, (1960). Aromatic glyoxals may be assayed by the Cannizzaro reaction. The glyoxals are quantitatively converted to the corresponding mandelic acids, and the alkali consumed is titrated potentiometrically with acid. Because sodium bisulfite reacts with sodium hydroxide to form sodium sulfite, the method may be extended to the bisulfite addition products. With the addition products, the potentiometric breaks obtained are very small; however, these can be greatly magnified by oxidizing the sulfite to sulfate with hydrogen peroxide just before the end point is reached.

THEORIES

Influence of additives on the properties of surfactant solutions.

Arun K. Biswas and B. K. Mukerji. *J. appl. Chem.* **10**, 73 (1960). Surface tension, interfacial tension and wetting, emulsifying, foaming, and suspension characteristics of ionic and non-ionic surfactant solutions have been determined and evaluated in absence, and in presence, of electrolytes and non-ionogenic additives. Considerable insight has been gained about the factors governing the surface and bulk properties of surfactant solutions and as regards how these are influenced by additives.

Successive-extraction of collagen from hide powder.

Harry R. Elden and Robert J. Boucek, (Howard Hughes Medical Institute, Miami, Florida), *J. Coll. Sci.* **15**, 97 (1960). Numerous attempts have been made to purify collagen on the basis of its solubility, and various fractionation schemes have been proposed to achieve this end. In this paper a method is presented for the successive extraction of American Standard Hide Powder using dilute acetic acid. It is shown (1) an equilibrium concentration of solubilized collagen was reached in 15 minutes, (2) the amount dissolved was related linearly to the amount added to a given volume of solvent, (3) the concentration C_n achieved

obeyed the empirically observed equation, $\log C_n = \log C_1 - (n-1) B$, where n is the extraction number and B is the slope of the log-plot, and (4) the slope B was not influenced by temperature but it did depend upon pH.

Sedimentation and intrinsic viscosity measurements were done and showed the presence in acetic acid solutions of large asymmetric molecules typical of native collagen.

Characterization of denatured proteins by adsorption indicators.

Ira Blei and Benjamin Carroll, (Rutgets University, Newark, New Jersey), *J. Coll. Sci.* **15**, 209 (1960). The interaction between crystal violet, a cationic dye, and native and denatured forms of bovine serum albumin has been investigated using spectrophotometry and equilibrium dialysis. Changes in the extent of binding as a function of pH indicate that the sites of binding of crystal violet by bovine serum albumin may be the carboxylate groups. The complex formation was used to characterize the proteins through thermodynamic quantities derived from an analysis of binding data, and by the unique spectral properties of the dye bound to the different substrates.

The solubilizing properties of the protein-detergent complex.

Ira Blei (Lever Brothers Company, Research & Development Division, Edgewater, New Jersey) *J. Coll. Sci.* **15**, 370 (1960). Solubilization of oil-soluble substances not observed in sodium alkyl sulphate solutions below the critical micelle concentration, does occur if protein is present in the detergent solutions. The extent of solubilization was studied as a function of detergent concentration, pH, salt concentration, carbon chain length of detergent, and the structure of the dyes used. The protein detergent complex, and not an altered protein, was responsible for the solubilization of oil-soluble dyes in alkyl sulfate solutions below the critical micelle concentrations of these detergents. These experiments suggested that the form of the detergent on the protein was that of a small aggregate which had properties similar to micelles that exist above the critical micelle concentrations of pure detergent solutions.

Polyelectrolyte expansion of a lignin sulfonate microgel.

A. Rezanowish and D.A.I. Goring, (The Physical Chemistry Division, Pulp and Paper Research Institute of Canada, McGill University Montreal, Qubec) *J. Coll. Sci.* **15**, 452 (1960). The polyelectrolyte expansion of selected fractions of sodium lignin

sulfonate has been measured viscometrically and by light scattering. Isionic dilution techniques were used. The light-scattering radius of gyration, S, and the intrinsic viscosity, η, increased with decrease in ionic strength I_E and with S proportional to $\eta^{1/3}$ These results supported a microgel model for the macromolecule. The increase of η with decreases in I_E was not in quantitative accord with the theories of Flory or with those of Hermans and Overbeek. A new theory was developed in which the molecule was assumed to have free charges only on the surface. The elastic energy of the expanding network was equated to the electrostatic energy in the double layer. The resulting equation was found to apply to the first part of the expansion, but at very low values of I_E the expansion was less than predicted theoretically.

Spontaneous ignition of wool. III Calorimetry of slow oxidation réactions in materials of low thermal conductivity.

I. K. Walker and W. J. Harrison, *J. Appl. Chem.* **10**, 266 (1960). A method is described for calorimetry of oxidation reactions in porous materials of low thermal conductivity. The generated heat is allowed to flow through a thermal resistance composed of the sample itself, and measurement is made of the resulting temperature drop. If the thermal conductivity of the sample material is known, the reaction rate can be calculated. This method has advantages over conventional techniques of calorimetry since errors tend to be a proportional part of the quantity being measured rather than a fixed error due to drift. This provides experimental simplicity at low rates of heat output, and the ability to operate over a range of temperatures. The reactant atmosphere can be replenished continuously. The method was used to measure the temperature coefficient of the reaction between dry pie wool and dry air, using calculated values of thermal conductivity. Measurements were made at reaction rates as low as 7×10^{-6} cal./sec./g. Even if the thermal conductivity of the material is not known, this method measures the ratio of reaction rate to thermal conductivity; and this ratio is of more fundamental importance in the spontaneous ignition of large piles of material than is the reaction rate itself.

The temperature dependence of the breaking of hydrogen bonds of collagen by urea and some of its implications.

K. H. Gustavson, (Garverinaringens Forskningsinstitut, Stockholm, Sweden) *J.A.L.C.A.* **55**, 564-84 (1960). The solubilization of hide collagen by concentrated solutions of urea (4-8*M*) is highly temperature-dependent. These solutions do not degrade collagen appreciably at temperature less than 30°C. At temperatures above 30°C-35°C, marked destruction of the skin structure by urea is suddenly induced. The chemical alterations of the protein which are produced by the treatment are evaluated by data from (a) the fixation of cationic chromium complexes, specifically reacting with the carboxyl ions of collagen as a measure of changes in these groups, and (b) the fixation of cationic chromium complexes, specifically reacting with the carboxyl ions of collagen as a measure of changes in these groups, and (c) the affinity of the treated specimens for extremely basic chromium chlorides and sulphitochromiates for indicating any changes in the reactivity of nonionic protein groups, primarily the hydrogen bonding on the keto-imide groups. The data prove the rupture of the hydrogen bond bridges on the last mentioned groups to be the dominating reaction in the interaction of the resonating molecule of urea with collagen in 4-8*M* solution at 28°C. Another most effective hydrogen bond breaker of collagen, sodium perchlorate, is highly dependent on concentration. Thus, solutions weaker than 2*M* attack collagen only slightly at room temperature. Destruction of the protein sets in most suddenly on treatment with solutions of 2*M* strength or greater, which causes losses of collagen of the order of 30-80% within a few days. The bearings of the findings on the temperature dependency of the hydrogen-bonding interactions and on the concepts of the mechanisms of the major tannages are outlined.

The depolymerization of collagen fibres.

Arthur Veis, Joan Anesey, and Jerome Cohen, (Armour Leather Company, Chicago, Illinois) *J.A.L.C.A.* **55**, 548-63 (1960). Native bovine corium collagen was partially solubilized at the shrinkage temperature. The soluble portion was fractionated by an ethanol-sodium chloride coacervation technique. The fractions were characterized by a variety of physical techniques including ultracentrifugation and light scattering. The ultracentrifuge studies clearly showed that the depolymerization of the intact fiber did not yield a gaussian weight distribution of gelatin. Several discrete molecular weight species were obtained. Since the depolymerization was carried out with minimal hydrolysis, the molecular species distributions can be related to the state of aggregation of collagen in the intact fiber. The distinction between a "collagen molecule" and the functional entity "a collagen fiber" is discussed.

Pancreatic Elastase: Differentiation from other Pancreatic Proteinases.

U. J. Lewis, Donald E. Williams, and Norman G. Brink. (The Merck Sharp & Dohme Research Laboratories, Merck & Co., Inc., Rahway, New Jersey.) *J. Biol. Chem.* **234**, 2304 (1959). Additional data on the individuality of the enzyme elastase are presented. Electrophoretic and ultracentrifugal data are reported which indicate that purified elastase has a high degree of homogeneity. Elastase is shown to be enzymatically distinct from trypsin and the known chymotrypsins. Trypsin could be distinguished electrophoretically from elastase and α-chymotrypsin at all pH values tested. Elastase and α-chymotrypsin could be separated only under alkaline conditions.

Condensing enzyme in Garcinia leaves (Xanthochymus guttiferae).

W. M. Deshpande and C. V. Ramakrishnan. (The Biochemistry Department, Maharaja Sayajirao University of Baroda, Baroda, India.) *J. Biol. Chem.* **234**, 1929 (1959). Extracts of Garcinia leaves have been shown to contain condensing enzyme through the formation of citrate from acetyl phosphate and oxaloacetate in the presence of coenzyme A and an *Escherichia coli* fraction as a source of transacetylase. A procedure is described for the partial purification of the enzyme. The formation of citrate, which is accompanied by the disappearance of a stoichiometric amount of acetyl phosphate, is inhibited by alcoholic extracts of Garcinia latex.

The action of an Amyloglucosidase of Aspergillus niger on starch and malto-oligosaccharides.

John H. Pazur and Tadahiko Ando. (The Department of Biochemistry and Nutrition, University of Nebraska, Lincoln, Nebraska.) *J. Biol. Chem.* **234**, 1966 (1959). An amyloglucosidase of *Aspergillus niger* has been obtained in a highly purified state by a chromatographic procedure with the use of cellulose ion exchange materials. The enzyme converts starch, amylose, amylopectin, and amylodextrin to glucose in yields approximating complete conversion. Evidence from experiments in which malto-oligosaccharides labeled in position 1 with C^{14} were used as substrates indicates that the amyloglucosidase hydrolyzes at the nonreducing end of the molecules.

Carbon dioxide fixation by cell-free extracts of Aspergillus niger.

Charles L. Woronick and Marvin J. Johnson. (The Department of Biochemistry, College of Agriculture, University of Wisconsin Madison 6, Wisconsin.) *J. Biol. Chem.* **235**, 9 (1960). Cell-free extracts of *Aspergillus niger* 72-4 probably contain two different systems for synthesizing C_4-dicarboxylic acids by condensing CO_2 with 3-carbon units. One of these systems appears to be identical with the phosphoenol pyruvate carboxylase kinase system found in plants and yeast. The system requires phosphoenol pyruvate, adenosine diphosphate, Mg^{++} or Mn^{++} and K^+ or NH_4^+. Inosine diphosphate was much less effective than adenosine diphosphate, and Na^+ or Li^+ could not replace K^+. The Michaelis constant for K^+ was 0·037 molar. The reaction was measured by determining the amount of $C^{14}O_2$ fixed. The major radioactive products were identified by paper chromatography as aspartic, malic, and fumaric acids. Oxaloacetate accounted for only 0·47% of the radioactivity. By indirect methods, it was possible to show that oxaloacetate probably was the initial radioactive product. The oxaloacetate appears to be reduced to malate by malic dehydrogenase, while the malate is in equilibrium with fumarate. The aspartate appears to arise from oxaloacetate by transamination. The second CO_2-fixing system involves pyruvate and adenosine triphosphate, and probably yields oxaloacetate as the initial radioactive product. The major radioactive products were aspartate, malate, and fumarate, and were found to be present in the same ratios as in the phosphoenol pyruvate plus adenosine diphosphate system. Glucose 6-phosphate dehydrogenase was present in the extract, but no malic enzyme activity was detected. The enzymatic fixation of CO_2 onto phosphoenol pyruvate to form oxaloacetate and inorganic phosphate could not be detected.

Studies on bacterial amylase. II. Amino-terminal amino acid of bacterial amylase.

Kin-ichi Sugae (The Laboratory of Biochemistry, Faculty of Science, Osaka University, Osaka). *J. Biochem.* (Japan) **47**, 170 (1960). (1) The identification and quantitative determination of N-terminal amino acid of bacterial amylase (*B. subtilis* N) were performed by FDNB-method. It was shown that valine was a sole amino-terminal amino acid.

Studies on Bacterial Amylase III. On the amino-terminal peptide of bacterial amylase.

Kin-ichi Sugae and Yoshihide Honda, (The Laboratory of Biochemistry, Faculty of Science, Osaka University, Osaka). *J. Bio-*

chem. (Japan) **47**, 307 (1960). The N-terminal peptides of DNP-bacterial amylase were obtained by partial hydrolysis with concentrated hydrochloric acid and *Streptomyces* protease G. The amino acid sequence of the N-terminal DNP-peptide is proposed to be Val.-Asp. [or Asp (NH_2)]-Gly-Glu. [or Glu. (NH_2)]-Ser-(Ala, Val, Leu or Ileu)....This result was discussed in comparison with that of Taka-amylase A.

Amino acid composition of α-amylase from Bacillus subtilis.

Josephine M. Junge, Eric A. Stein, Hans Neurath, and Edmond H. Fischer (The Department of Biochemistry, University of Washington, Seattle, Washington.) *J. Biol. Chem.* **234**, 556 (1959). The amino acid composition of six hydrolysates of α-amylase (recrystallized several times) from *Bacillus subtilis* has been determined by chromatography on columns of Dowex 50-X8. No consistent variation in the amount of the various amino acids in the acid hydrolysates could be detected over periods of 24, 48, and 72 hours of hydrolysis, except for tryptophan, serine, and threonine. An assessment of the extent of variation has been made by determination of a 95 per cent confidence interval from the standard deviation of the mean. Separate determinations have been made for tyrosine and tryptophan by spectrophotometric analysis. The absence of sulfhydryl groups and of disulfide linkages has been confirmed by analysis for cysteic acid in the hydrolysates, obtained from performic acid-oxidized protein samples, with the use of high voltage paper electrophoresis. The analyses indicate that the *B. subtilis* α-amylase molecule (molecular weight 48,700) is constituted of the following 406 amino acid residues: Asp_{58} Thr_{23} Ser_{24} Glu_{43} Pro_{14} Gly_{39} Ala_{29} Val_{25} Met_5 $Ileu_{17}$ Leu_{28} Tyr_{24} Phe_{18} His_{12} Lys_{25} Arg_{17} Try_{15}. With the possible exception of a discrepancy in the value for serine, no significant difference could be detected between a protein sample that had been purified according to conventional procedures and one that had been prepared in the presence of diisopropylphosphorofluoridate.

Glutamic acid decarboxylase. I. Isolation procedures and properties of the enzyme.

Ryoiti Shukuya and George W. Schwert. (The Department of Biochemistry, Duke University School of Medicine, Durham, North Carolina.) *J. Biol. Chem.* **235**, 1649 (1960). An isolation procedure for glutamic decarboxylase from an acetone power of *Escherichia coli*, strain 26, has been described. From ultracentrifugal and electrophoretic analyses the preparation appears to be approximately 90% homogeneous. The molecular weight, estimated from sedimentation velocity and diffusion measurements, is 300,000. The pH optimum is 3·8. The Michaelis constant for glutamate is $8{\cdot}2 \times 10^4\,M$ in pyridine-pyridine hydrochloride buffer, pH 4·60 at 36°. The enzyme is activated by pyridoxal phosphate and by chloride ion and is inhibited by acetate.

Glutamic acid decarboxylase. II. The spectrum of the enzyme.

Ryoiti Shukuya and George W. Schwert. (The Department of Biochemistry, Duke University School of Medicine, Durham, North Carolina.) *J. Biol. Chem.* **235**, 1653 (1960). The spectrum of purified glutamic decarboxylase has been investigated as a function of pH. It is concluded that several protons are involved in the changes observed in the absorption spectra and that the form of the enzyme which absorbs at 415 mμ is the active form of the enzyme. The reaction of the enzyme with carbonyl reagents has been investigated by spectral measurements. It has been observed that the addition of glutamate to the enzyme, in the pH range in which the enzyme is active, results in a diminution of absorbancy at 415 mμ and an increase at 330 mμ. These changes are reversed with time. Changes in the fluorescence emission spectra, when the enzyme is activated by 330 mμ or 415 mμ light, are consistent with the absorbancy changes observed upon the addition of glutamate but provide a much more sensitive means of detecting the spectral changes. The possible meanings of these observations have been discussed.

Glutamic acid decarboxylase. III. The inactivation of the enzyme at low temperatures.

Ryoiti Shukuya and George W. Schwert. (The Department of Biochemistry, Duke University School of Medicine, Durham, North Carolina.) *J. Biol. Chem.* **235**, 1658 (1960). Dilute solutions of purified glutamic decarboxylase have been observed to lose activity more rapidly at 0° than at 25°. The difference in stability of enzymatic activity at 0° and at 25° can be demonstrated only in the pH region of neutrality. The loss of activity at 0° is decreased or prevented in solutions of high ionic strength or high dielectric constant or by the addition of bovine serum albumin or pyridoxal phosphate. Enzyme which has been exposed to 0° reacts more extensively with *p*-chloromercuribenzoate than does enzyme which has been maintained at 25°. The mechanistic implications of these observations have been considered.

BYE-PRODUCTS

Organic constituents of gelatins and glues. I—Heatcoagulable mucoprotein components from gelatins.

A. A. Leach, *J. Appl. Chem.* **10**, 367 (1960). Components isolated from acid and lime processed gelatins by a heat denaturation and coagulation technique are shown to be mucoproteins contaminated with smaller amounts of gelatin and lipid, and probably having their origin in the alkali-soluble mucoproteins of the connective tissues used for the manufacture of the gelatins. Differences in amino-acid composition of the isolated materials are noted. From comparisons of these with materials isolated by other techniques it is concluded that at least two types of mucoproteins are found in gelatins; one of these originates from the alkali-soluble mucoproteins of the connective tissues and the other from materials similar to the acetic acid-soluble fraction from connective tissue not precipitated by NaCl.

Composition of an atypical gelatin prepared from calf skin.

J. E. Eastoe, *J. Appl. Chem.* **10**, 393 (1960). An analysis is reported which accounts for substantially all the weight and nitrogen as amino acids on an atypical gelatin, prepared from lime-processed calf skin. Discrepancies between the early classical work on titration curves, believed to have been carried out on gelatin of this type, and more recent studies are explained by abnormalities in the content of basic amino-acids. The low tyrosine and high hydroxyproline contents suggest that a lower level of protein impurities is present than in most commercial gelatins.

GENERAL

Application of radioisotopes in leather research.

I. Kerese, *Bor es cipotechnika*, 5, 139, (1960). A list of experiments is given, which can be performed with closed and open isotope sources in the field of leather research. The small number of studies made until now is explained by the difficulties of application. In spite of this, the experiments with isotopes will have a growing importance in the future also in the leather industry.

The spiral drum and the perspective of its application.

I. Feher, *Bor es cipotechnika*, 5, 136 (1960). The present situation of the problems in connection with the spiral drum, the principle of its operation, its advantages and drawbacks and the direction of its development are treated. The elaboration of the most suitable technology with spiral drum is a very important task, because it can greatly promote the full automatization of the leather industry.

SEMINAR ON COLLAGEN

The seminar on collagen was inaugurated by Prof. M. S. Thacker, Director-General, Scientific and Industrial Research (India) and Secretary, the Ministry of Cultural Affairs and Scientific Research, Government of India, at a function presided over by Dr. A. Lakshmanaswamy Mudaliar, Vice-Chancellor of the University of Madras and Chairman of the Executive Council of the Central Leather Research Institute.

Welcoming the delegates to the seminar, Dr. Y. Nayudamma, Director of the Central Leather Research Institute, told the audience that the collagen field was a meeting ground for a large number of sciences and that research on this important substance got enriched by the application of knowledge obtained in various branches of scientific endeavour.

Dr. Mudaliar elucidated the role played by collagen in our daily life and explained the importance of investigations in this field to science, technology, medicine and the common man. Because of this, scientists and technologists from many countries including the U.S.A., U.K., Russia, Germany, France, Austria, Hungary, Sweden, South Africa and India had contributed some thirty-five papers to the seminar.

Prof. Thacker wished the seminar all success and hoped that a good deal of further knowledge on the subject would come out from the deliberations of the seminar. He further stressed the importance of research in industry and exhorted the industrialists to make full use of the research centres.

The inauguration was followed by a Conference Lecture on the structure of proteins and polypeptides by Prof. G. N. Ramachandran, Professor of Physics, University of Madras. This talk was an excellent introduction to the seminar.

In the first session on "Structural Studies", ten papers were presented and discussed. Stereochemical criteria useful for formulating structures for proteins and polypeptides in general were described. A 9 residue per turn model was proposed by Huggins. The highlight of the session was Ramachandran's formulation of a structure containing two bonds for every three residues, which explained many observed facts about collagen. The residue

height in the normal state in collagen was shown to be 2·95 A and not 2·86 A as hitherto assumed. An interesting observation was that the structure of feather keratin was, like collagen, based on the triple helix, although the helix parameters were different. It was further shown that the α-helix with L-type residues was right-handed while the data obtained on L-proline and its derivatives supported the hypothesis of a *cis-trans* isomerisation of the peptide group. The X-ray data of Kratky describing the effect of age on human tendon showed the possibility of a method for characterising age at least to a first approximation. The phenomenon of growth of inorganic crystals in living tissues was also described.

In the second session on "Medical and Biochemical Studies", a variety of topics was dealt with in thirteen papers. Several papers were concerned with the structure of collagen, as deduced from analysis of the products obtained from it by enzymatic cleavage. Unusual linkages in collagen were described by Gallop. Grassmann postulated that the sequence P-R-Gly-P (where P stands for proline or hydroxyproline and R for an amino acid) was attacked by collagenase; the amino acid sequence in collagen was discussed. The stability of collagen was attributed by Banga, to the existence of 'para-collagen' as, by removing this component, collagen fibres lost their strength. This removal was effected by an enzyme isolated from elastase. Biological ageing was said to increase the shrinkage temperature, ester-like linkages and the binding of carbohydrates in collagen and to improve the fibrous texture of the skin.

Orekhovich showed that the macromolecules of citrate-soluble procollagen consisted of two particles of the α-component and one of the β-component whereas in neutral salt-soluble procollagen, the β-component was present in small amounts. Different types of procollagen and synthetic substrates were used to study the specificity of collagenase.

Turning next to the biosynthesis of collagen, the occurrence of a proline-rich precursor, which was then converted by hydroxylation of the proline to collagen, was mentioned by Gould. An adequate supply of ascorbic acid was necessary for collagen maintenance in so far as newly formed collagen was concerned. Collagen resorption occurred by some yet unclarified mechanism of collagenolysis. On the medical aspect of collagen research, it was reported that protein deficiency either inhibited the formation of

fibrous tissue or promoted the disappearance of formed fibrous tissue in the liver. Sirsat discussed the changes in collagen structure found in some of the diseased states in relation to the molecular disarrangement in the structure of the fibril and its associated acid mucopolysaccharides. The metabolism of mucopolysaccharides during connective tissue formation was also detailed. The presence of a new mucosubstance in skin collagen was reported.

Gustavson described the reaction of teleost and bovine skin collagen to specific agents and postulated the presence of covalent cross-linkages in bovine skin collagen. The different technological processes of curing, liming and bating were shown to change the composition of interfibrillar proteins; the type of liming and bating had important effects on the removal of the proteins. An analysis of gelatins (obtained from hides and bones) by Pouradier and Accary showed that nucleic acids were bound to collagen.

In the third session on the physical and morphological aspects, comprising twelve papers, Witnauer described the shrinkage of collagen and leather as a melting phenomenon; the shrinkage temperature was shown to depend on the diluent action of substances which associated in some way with collagen. The dimensional changes in leather, brought about by hydrothermal shrinkage, were correlated with the appearance of the fibrils in the electron microscope. A twisting of the fibrils and a removal of the twist on recovery was reported to occur in tannages in which the leathers showed a recovery in dimensions on cooling in water. Changes in the optical birefringence of collagen and tanned fibres were attributed to modifications in the shape of the fibrils observed in the electron microscope. Basu discussed the effect of non-tans and lyotropic agents on the optical birefringence of these fibres. A study on the relation between shrinkage and birefringence in the case of elastoidin was reported.

On the morphological aspects, a detailed analysis, by Nemetschek, of the cross-striations observed on collagen fibrils, treated in various ways, confirmed the accepted ideas on the evolution of collagen from tropocollagen particles. There was also a view that the cross-striations were ring-like structures surrounding the fibrils and these joined together in the form of a sheath to prevent the "Füllsubstanz" (filling substance) from flowing out of the fibrils. According to Kuhnke, such an outflow would deprive the collagen fibrils of their flexibility so necessary for the

fulfilment of their role in the mechanical functioning of tissues. Treatment of collagen with high concentrations of calcium chloride yielded fibrils resembling elastin.

After a detailed study on the kinetic equilibrium properties of tendon-water interaction, Elden derived relationships between constants associated with swelling, drying and weight of the tendon. A study, by Yeddanapalli and Rao, on the interaction between collagen and hydrochloric acid gas showed that the amount of firmly bound HCl increased above 80°C due possibly to structural changes.

Eucollagen reconstituted from bone was shown not to have the cross-striations exhibited by collagen fibrils reconstituted from other sources. A twisted appearance of the fibrils was recorded by Reed in some cases. The important point arose that the twisted appearance might be a reflection of the helical nature of the protofibrils. There were many other substances in nature which yielded twisted or helical fibrils in the electron microscope. Potassium palmitate, steroids, bile acids and preparations from certain bacteria were instances.

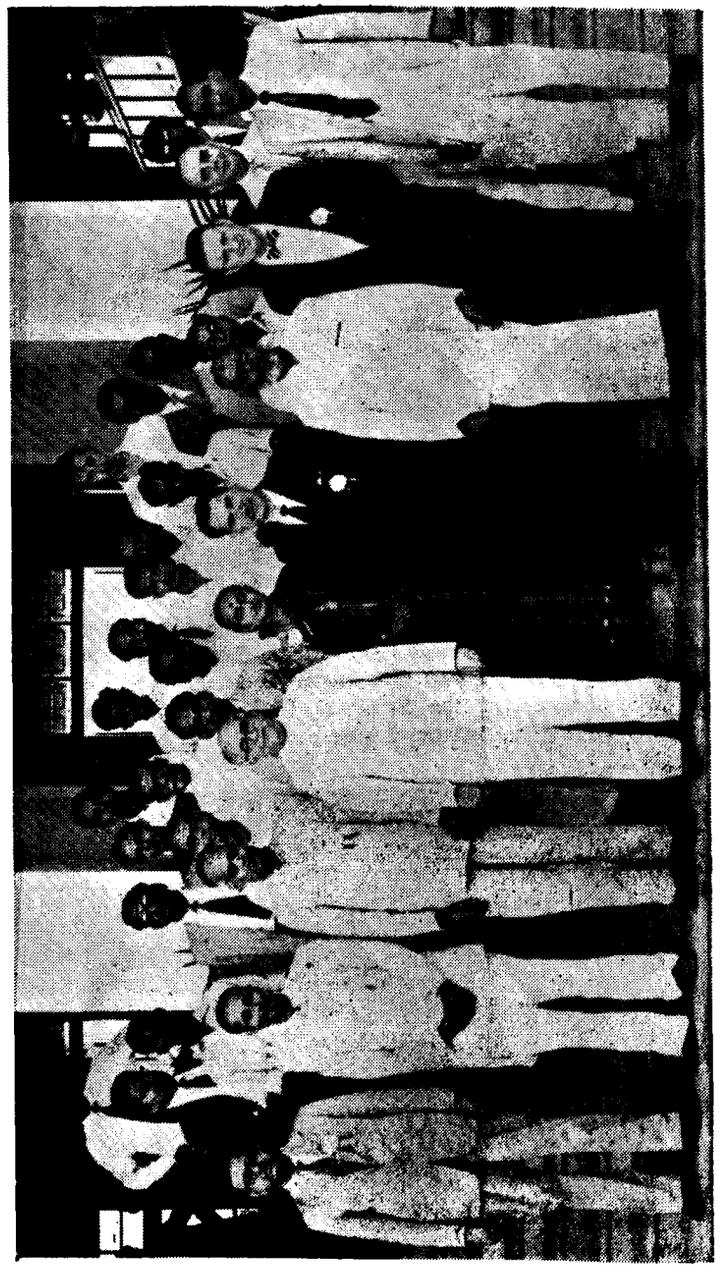
Data on substances related to collagen were also presented at the seminar. Elastoidin was shown to contain at least three protein components. It was demonstrated by Hall that the reaction between elastase and elastin obeyed an unusual empirical relationship. The factors governing elastolysis were also discussed.

Summarising the proceedings of the seminar, Dr. N. Ramanathan, Convener of the Seminar Committee, pointed out that the seminar had brought out, more than ever, the potentialities of research on collagen and emphasised that the number of sciences useful for investigations in this field was limitless.

Prof. G. N. Ramachandran, Chairman of the Seminar Committee, expressed his gratitude to the Director of the Central Leather Research Institute, for the facilities provided for the seminar.

Dr. Y. Nayudamma proposed a vote of thanks to delegates from home and abroad, who included Prof. B. S. Gould of the Massachusetts Institute of Technology, U.S.A. and Prof. P. M. Gallop of the Albert Einstein College of Medicine, New York, who had come to India for taking part in the seminar and who had also delivered popular lectures on this occasion, and all others who had contributed to the success of the seminar.

Seminar on Collagen: (*Above*) Dr. Y. Nayudamma, welcoming the delegates. To his right are Prof G. N. Ramachandran, Chairman, Seminar Committee, Dr. A. L. Mudaliar, who presided over the inaugural function, and Prof. M. S. Thacker, who inaugurated the Seminar. (*Below*) Prof. Thacker delivering the inaugural address.



Delegates to the Seminar. In the lowest row (*L. to R.*) : Dr. N. Ramanathan, Convener, Seminar Committee; Dr. S. Ramaseshan, Chairman, I Session; Prof. Ramachandran, Prof. Thacker; Prof. B. S. Gould, Chairman, II Session; Janab M. J. Jamal Mohideen; Prof. P. M. Gallop, Chairman, III Session, and Dr. Nayudamma. Dr. K. Wolf, the UNESCO Expert, is between Prof. Gallop and Dr. Nayudamma.

NOTES & NEWS

Manufacture of cattle food

Factory to be set up in Anand

Mr. Verghese Kurien, General Manager of the Kaira District Co-operative Milk Producers' Union, Anand, stated that a cattle feed compounding factory would be set up at Anand at a cost of Rs. 15 lakhs. The foreign exchange component of this plant would be Rs. 5 lakhs.

The plant would manufacture scientific food for cattle in the Kaira district by mixing a proportion of cotton seed cake, groundnut oil cake, rice husk and a few vitamins.

Mr. Kurien said that the Government of India had proposals to set up eight such factories all over the country and the first plant would be at Anand.

The Hindu: November 3, 1960.

Exports to U. K. in October

The following are the details (figures in bales) of exports of hides and skins to the U.K. during October, 1960: cow hides 2,905, cow calf 143, buff hides 37, buff calf 152, goat skins 402 and sheep skins 302.

The Hindu: November 14, 1960.

Leather goods manufacture

Industrial Estate for Madras

Functional industrial estates were proposed to be set up in Agra and Madras exclusively for the manufacture of leather goods including footwear during the first year of the Third Plan, Mr. Manubhai Shah, Minister for Industries, told Mrs. Ila Palchoudhuri in a written answer in the Lok Sabha.

The scheme for the estate in Madras was being formulated by the State Government and the land required would be acquired during the current financial year. Details of the scheme for the estate in Agra were awaited from the U.P. Government.

The Hindu: November 18, 1960.

Madras State's Third Plan provisions

Development of Forests

A total sum of Rs. 2·12 crores has been allotted for Development of Forestry under Third Plan. The most important scheme under this head is the Programme of Farm Forestry at a cost of Rs. 75 lakhs to cover an area of 2,62,000 acres in various selected villages. For economic plantations, a sum of Rs. 27 lakhs has been included. Rs. 30 lakhs has been provided for planting trees alongside rivers, lakes and canals.

The Hindu: November 27, 1960.

Bellies....shoulders?

The bend supply position in South Africa continues to be dominated by the problem of disposal of the offal. Radical changes in footwear manufacture have seen a gradual decrease in demand for bellies and shoulders, leaving the question of what to do with this offal every time the demands of the footwear industry for bends makes itself evident.

Footwear manufacturers continue to use synthetic materials in increasing volume to replace leather outsoles, insoles, runners, heel-lifting and top-piece material. Ease in handling and stocking and ready availability devoid of sudden price fluctuations, and also favourable price comparison with leather offer big inducements to the expanding use of leather substitutes. The uniform nature of substitute materials is a considerable aid to rationalising manufacturing processes and the march of time is continuously in this direction.

Newly developed methods of tannage offer many opportunities for a new approach to production of low-priced leather from offal.

Shoes and Views: June, 1960.

New leather product made in laboratory

Plans for joint development and pilot plant production of an entirely new kind of leather (so new that it hasn't been named) were announced on June 20 by Armour Leather Company, of Chicago, and United Shoe Machinery Corporation, of Boston.

The product, which has been made in the laboratory, is derived from cattle hides and is said to possess the qualities of leather

made by ordinary tanning methods. The new process involves converting collagen, which constitutes 85 per cent. of the hide protein solids, to a solution and then producing a contiuous sheet of any desired shape or thickness from a combination of the solution and hide fibres.

Through further research the two companies expect to develop a wide range of leathers for the shoe and other industries. It may even be possible to mould the material for shoes, hand-bags, luggage, and other uses.

At the same time, it is claimed, the product will have the comfort, permeability, pliability and elasticity characteristic of leather tanned by present methods. The product could be embossed with any "grain" desired and dyed in any colour.

Uniformity in size and thickness of the new product would be a distinct advantage. Hides are irregular in shape and vary in thickness between animals and at different locations on the individual hide.

In present leather-tanning processes, also, extensive trimming of the hide is necessary and the trimmings have little value. The new material would use the whole hide. Tanning of some leathers requires weeks of soaking in the tanning solutions, but the process under consideration would be much faster.

Australasian Leather Trades Review: July, 1960.

New shoe material popular

The new zirconium tanned leather from France seems likely to establish itself as a permanent shoe material, states, a UK report.

The leather, which is being imported from France, is being sold in the UK as fast as it is flown over. Repairers are said to be particularly interested, and the agents confidently predict that soon the sales in the British Isles will equal those in France, Belgium and Germany combined.

The zirconium method of tanning heavy leathers has been known and understood for many years, but there has always been one main disadvantage—it absorbs water rapidly. In "Supracuir", the zirconium tannage introduced by R. H. Dangerfield, this problem is said to have been completely overcome. In addition the leather has many other advantages.

It is both air and water-vapour permeable, yet it is practically waterproof. The water absorption figure (Kubelka method) for one hour is 3 to 7 per cent., after three hours, 10 to 12 per cent., and even after 24 hours only 22 to 28 per cent.

It costs more than vegetable tanned leather, but this can be misleading as its main characteristic is great wear resistance. Some two and a half to three times longer wear, on test, than ordinary sole leather, is claimed. The advantage here is not the fact that substance for substance it wears so much, but that a much lighter substance sole can be used with reasonable certainty of satisfactory wear. This is exactly the need in modern footwear.

Another modern need in soling is flexibility. "Supracuir" is certainly very flexible, but not quite so flexible as it was when first introduced, when, it is now considered, flexibility had been carried too far.

There is no need to condition or mellow the leather and it has been found equally suitable for sewing, stitching or cement attachment with neoprene cements. The bends, and equally, of course, the cut stock, are level substance and surface finished in either black or tan, with a distinctive trade mark.

Australasian Leather Trades Review: August, 1960.

New silicone lubricant has wide versatility

A new silicone lubricant which provides excellent versatility in many important shoemaking operations has been developed by Master Chemical Co., Inc., of Boston.

The new product, called Master Silicone Wonderlube, is available in a 16-oz. spray can and may be used wherever a lubricator is desired without leaving a sticky or greasy residue.

Among its many applications are raceways of tacking and nailing machines, skip stitch machine, form folders, toe lasting (when applied directly to the upper), wipers of heel seat lasting machines, shields on heel scourers, shields on edge trimmer machines and as an ideal spray last slip where no spray equipment is available.

Wonderlube may also be used in bow factories or wood heel plants as an anti-stick on mesh wire where an accumulation of cement has been formed. It will prevent the upper from sticking to the mesh wire.

In addition, it is recommended by the manufacturer as a valuable addition to the general maintenance department of any plant. It can be used in spray booths and on conveyor belts to prevent cement build-ups, as a general lubricant on wooden windows or drawers and as an all-around lubricant for aluminum products requiring a smooth movable surface. It also leaves a permanent colorless film on aluminum to retard rust and oxidation.

Leather and Shoes: August 13, 1960.

Coming soon

The Armour Leather Company, of America, one of six companies associated with the Armour Chemical Industries group, recently announced the remarkable development of a new product which has all leather qualities but is not an animal's hide or skin.

Blocks of leather a foot thick and a mile long, if you like, are presented as possibilities for the immediate future.

Leather so thin and soft it drapes like silk, leather moulded into seamless shoes, these are some of the fantastic dreams of the shoeman now brought to realisation. These have been made possible by an Armour Leather Company discovery.

Leather in sizes and shapes no animal can grow, with uses never before conceived possible. The discovery is a process to reconstitute leather. Armour's scientists have broken down raw hide into a clear solution and brought this solution back into fibre form.

With this discovery none of the hide will be wasted. Uniformly high-quality leather can be made from any hide, from all parts of the hide. Reconstituted leather will look the same as any fine leather, only it will be stronger, because the Armour process controls the density and alignment of the fibres, and the more densely intertwined the fibres the stronger the leather.

It will be cheaper and will wear better than today's leather, it is claimed by the inventors. Slow, expensive tanning is eliminated; the natural beauty of leather will last longer; scratches won't show as much; dyes penetrate every fibre instead of just colouring the surface.

The leather reconstituting process will have the same manufacturing flexibility that man-made materials have, yet will offer a product with all the advantages of leather!

Shoes and Views: September, 1960.

Frog skin tannery planned in Cuba

A frog skin tannery is the newest thing in Cuba. A tannery is reported under construction in San Antonio do los Banos, near Lake Ariguanabo, where a frog farm is located.

Tanning of the frog skins already is employing 100 women and six men, and is expected to contribute importantly to leather output. Their report has reached the leather, shoes and allied products division of the U.S. Department of Commerce.

Leather and Shoes: September 3, 1960.

First E. I. hide sales in W. Germany since war

The first Indian small hide auction in West Germany since World War II was held at Hausen near Offenbach on Sepember 5.

About 10,000 pre-tanned sheepskins and about 30,000 pre-tanned goatskins were on offer. In "not very lively bidding", approximately 30 per cent of the offering was sold. Prices were around the levels ruling in London at the last auction on 17 August.

The offering was smaller than anticipated due to the non-arrival of a ship held up in Britain by the seamen's strike. Deutsch-Indische Lederhandelsgesellschaft m.b.h. is organising the auctions, which are to be repeated at intervals of seven to eight weeks.

Leather Trades Review: September 14, 1960.

Big drop in Indian raw goatskins exports

Robert Mills and Co. (London) Ltd. advise that during July approximately 179,000 pieces Indian goatskins were exported from Calcutta (compared with about 1,180,000 for the same period last year).

Drysalted: About 113,000; to the U. K. about 15,000, Continent about 69,000, U.S.A. about 29,000.

Wetsalted: About 66,000; to the U. K. about 24,000, Continent about 13,000, U.S.A. about 29,000.

Kidskins: nil.

Of the over-all total about 35,000 pieces were for Eastern European countries.

Leather Trades Review: September 14, 1960.

EJ unveils new polyurethane finish

Endicott-Johnson Corp. of New York this week announced a tough new leather finish of polyurethane material which tightens the leather surface without sacrificing softness. The result: leather so treated will offer "at least eight times more resistance to scuffing and abrasion," said a company official.

Leather and Shoes: September 17, 1960.

New synthetic (Japanese) substitute for upper leather

Several tests have now been carried out on two samples of plastic coated fabric and the results give quite a fair idea of how the material is likely to behave.

The strength of the black material is good and usefully better than that of most of the conventional plastic coated upper fabrics.

One of the marked differences between the black sample and conventional plastic coated fabrics is the relatively high breaking stretch in the warp.

With a breaking stretch of 20 per cent this black material has stretch characteristics nearer to those of leather (although it does not stretch as much as the average upper leather).

The tear strength of the black material is better than average for conventional plastic coated fabrics in one direction, but poorer in the other.

The white sample with a knitted base has a very good stretch indeed and it does not need much force to last it.

Leather Trades Review: September 21, 1960.

Hides and skin shipments from Madras, June 1960

Destination	Td. Cow Hides	Td. Cow Calf	Td. Buff Hides	Td. Buff Calf	Td. Goat	Td. Sheep
U.K.	2,690	199	67	203	547	352
U.S.A.	—	—	66	96	152	—
Continent	96	94	—	65	460	289
Japan	—	—	—	—	1	68

Shoe and Leather Record: July 8, 1960.

Hide and skin shipments from Madras, July, 1960

Destination	Td. Cow Hides	Td. Cow Calf	Td. Buff Hides	Td. Buff Calf	Td. Goat	Td. Sheep
U.K.	2,223	157	28	150	286	403
U.S.A.	—	—	57	—	178	—
Continent	5	47	—	50	564	204
Japan	—	—	—	—	6	195

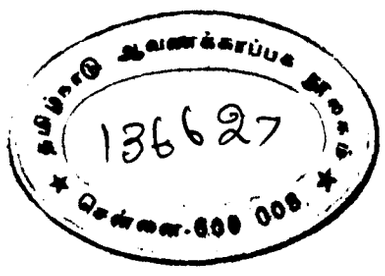
Shoe and Leather Record: August 5, 1960.

C. L. R. I. NEWS

Dr. Y. Nayudamma, Director, Central Leather Research Institute, attended the meeting of the Board of Directors of the Mysore Chrome Tanning Co. Ltd., Bangalore, on November 24, 1960.

Dr. S. K. Barat, Assistant Director, attended the 8th meeting of the Research Committee of the Khadi and Village Industries Commission, Wardha on November 12, 1960; attended the Vegetable Tanning Material Sub-Committee meeting at New Delhi on November 23, 1960.

Shri N. N. Guha joined the Central Leather Research Institute, as a CSIR Senior Research Fellow from November, 17, 1960.



Editor Y. Nayudamma. Published by N. Subramaniam, on behalf of the Central Leather Research Institute, Adyar, Madras-20. Printed by G. Srinivasachari, B.A., at The G. S. Press, 21, Narasingapuram Street, Mount Road, Madras.

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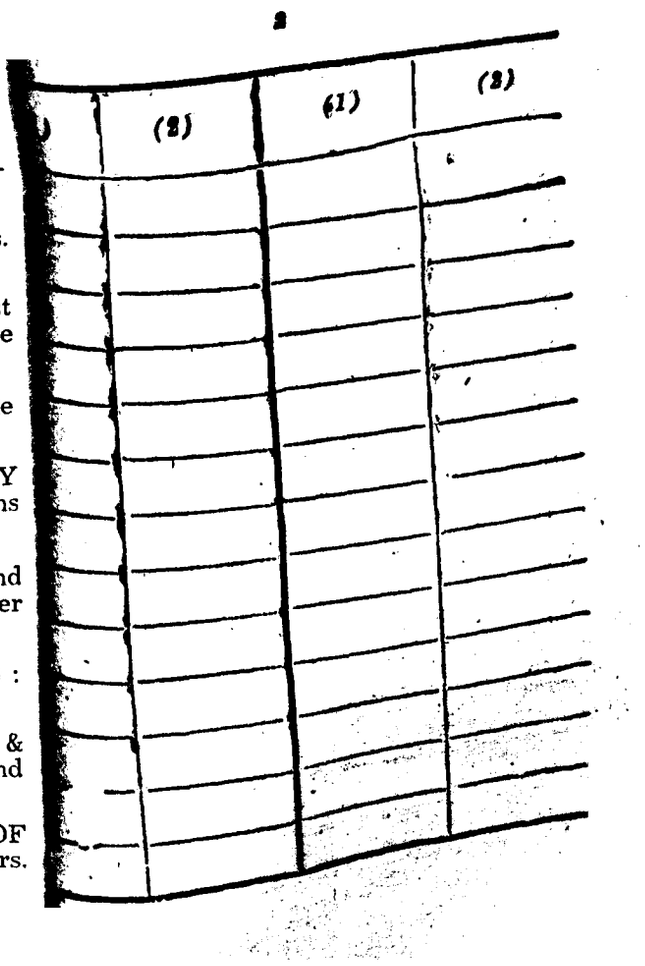

For further information please contact
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