

CHEMISCH WEEKBLAD

ORGAAN VAN DE NEDERLANDSCHE CHEMISCHE VEREENIGING EN VAN
DE VEREENIGING VAN DE NEDERLANDSCHE CHEMISCHE INDUSTRIE

Hoofdredacteur: Dr. W. P. JORISSEN, Leiden, Hooge Rijndijk 15, telefoon 1449, postrekening 3569.

Redactie-bureau: 's-Gravenhage, Willem Witsenplein 6, telefoon 774520.

Redactie-Commissie: Dr. A. Bloemen (secretaris), Dr. G. C. A. van Dorp, Dr. C. Groeneveld,
Dr. Ir. J. A. M. van Liempt en Dr. T. van der Linden.

N.V. D. B. CENTEN's Uitgevers-Maatschappij, Amsterdam-C., O.Z. Voorburgwal 115, telefoon 48695,
postrekening 39514.

INHOUD: Mededeelingen van het Secretariaat. — Contributie 1939. — Excursie Koninklijk Instituut van Ingenieurs naar Denemarken en-Noorwegen. — Aangeboden betrekkingen, werk, subsidies enz. — Gevraagde betrekkingen. — Plaatsing in werkverschaffing door bemiddeling der Commissie voor Tewerkstelling en Crisisfonds. — Volontairsplaatsen door bemiddeling der Commissie voor Tewerkstelling en Crisisfonds. — Symposium on proteins of the colloid chemistry Section, Amsterdam. II: Prof. Dr. G. C. Heringa, Colloid physics and biophysics of proteins. — Boekaankondigingen. — Chemische kringen. — Personalia, enz. — Ter bespreking ontvangen boeken. — Correspondentie, enz. — Vraag en aanbod. — Economische berichten.

MEDEDEELINGEN VAN HET SECRETARIAAT DER
NEDERLANDSCHE CHEMISCHE VEREENIGING
(Willem Witsenplein 6, 's-Gravenhage, telefoon 774520,
postrekening 7680).

Nieuwe leden.

De in het Chemisch Weekblad van Zaterdag 31 December 1938 onder 87—88 genoemde candidaat-leden zijn thans aangenomen als gewoon, resp. buitengewoon lid.

Veranderingen aan te brengen in de ledenlijst (incl. Supplement) 1937.

- Blz. 35: Commijs (Ir. B. C.), Bussum, H. Zwaardemakerstraat 10 A.
„ 48: Hoeflake (drs. H.), Utrecht, Spoorstraat 10 bis.
„ 47: Hekker (Ir. Th.), Haarlem, Zaanenlaan 27, scheik. a/h.
lab. der centr. mag. v. mil. kleeding en uitrusting te
Amsterdam.
„ 50: Horsting (drs. C. W.), Hoogezand, Fabriekskade 5,
chem. N.V. Scholten's Chem. fabrieken.
„ 57: Kooijman (Ir. P. L.), Haarlem, Cornelis Speelmanlaan 4.
„ 60: Leendertse (Dr. Ir. J. J.), Overveen, Oranje Nassaulaan 155,
scheik. b. d. B. P. M.
„ 68: Niermeyer (Ir. J.), Bilthoven, Strausslaan 13 (tijdelijk adres).
„ 73: Raadsveld (Dr. C. W.), Amstelveen, Floris v. Alkemade-
laan 29, scheik.-bact. b. h. MEBA te Amsterdam.
„ 91: Wal (Dr. M. J. van der), Loosduinen, Haagweg 289,
scheik. b. d. Lak- en Vernisfabriek „Premier“.

* * *

De Secretaris is iederen Maandagmiddag van 1.30 tot 3 uur
aan bovenstaand adres te spreken. Het Bureau is in den regel
geopend iederen werkdag van 9—12 en van 2 tot 4.30, des
Zaterdags van 9—12 uur.

Dr. T. VAN DER LINDEN.
den Haag, telefoon 721636 (na 6 u. n.m.).

Contributie 1939.

De aandacht wordt er op gevestigd, dat volgens art. 5 van
het Huishoudelijk Reglement, de jaarlijksche contributies in-
vorderbaar zijn van 1 Januari af.

Aan gewone leden, die geen reductie op de contributie hebben
aangevraagd, aan buitengewone, geassocieerde en huisgenoot-
leden wordt daarom verzocht, het door ieder verschuldigde
bedrag, n.l.:

- a. f 15.— voor gewone leden in Nederland, N.O.- en W.-Indië;
b. „ 17.— „ „ „ „ het buitenland;
c. „ 10.— „ buitengewone leden;
d. „ 7.50 „ geassocieerde leden;
e. „ 5.— „ huisgenoot-leden,

in de gevallen a, b, d en e eventueel te vermeerderen met
f 6.—, in het geval c met f 4.—, voor een abonnement op het
Recueil, zoo spoedig mogelijk te doen overschrijven op post-
rekening 7680 der Ned. Chem. Vereeniging te 's-Gravenhage.

De penningmeester roept de medewerking van alle leden in
om in het belang der Vereeniging te komen tot een vlotte inning
van de verschillende contributies.

Excursie Koninklijk Instituut van Ingenieurs naar Denemarken en Noorwegen.

(Voorloopige mededeeling).

Het ligt in het voornemen van het Koninklijk Instituut
van Ingenieurs, bij voldoende deelneming van 10 tot 16 Juni
1939 een bootreis te organiseren naar de Scandinavische
wateren en wel met het motorschip „Dempo“ van den Rotter-
damschen Lloyd. Evenals vorig jaar bij de excursie naar
Glasgow, stelt het Koninklijk Instituut de leden der Neder-
landse Chemische Vereeniging met hunne dames en geïntroduceer-
den in de gelegenheid op denzelfden voet als de leden van het
Instituut aan deze excursie deel te nemen.

Het voorloopige programma luidt als volgt:

- Zaterdag 10 Juni, 16 uur: Vertrek uit Rotterdam.
Maandag 12 Juni, 8 uur: Aankomst te Kopenhagen, Bezich-
ting van belangrijke technische werken en
van de stad en omgeving.
Dinsdag 13 Juni: Programma als voor 12 Juni. 14 uur: Ver-
trek naar Oslo.
Woensdag 14 Juni: Aankomst te Oslo ongeveer 8 uur. Bezich-
ting van belangrijke technische werken en
van de stad en omgeving. Vertrek omstreeks
19 uur.
Vrijdag 16 Juni: Aankomst te Rotterdam omstreeks 8 uur.

De prijzen wisselen af voor eenpersoonshutten van f 90.—
tot f 140.—; voor tweepersoonshutten van f 60.— tot f 115.—
per persoon en voor drie- en vierpersoonshutten van f 50.— tot
f 60.— per persoon, welke verhoogd zullen worden met be-
dragen voor administratie, bediening, uitstappen, enz.

Begin April kan een uitvoerig en gedetailleerd programma
worden tegemoet gezien.

Voorloopige opgaven van leden, die geen lid of geassocieerd
lid van het Koninklijk Instituut van Ingenieurs zijn, worden
gaarne bij het Secretariaat der Ned. Chem. Vereeniging, Willem
Witsenplein 6, den Haag, verwacht.

Mogen vele leden onzer Vereeniging aan deze bijzondere
excursie deelnemen!

Aangeboden betrekkingen, werk, subsidies, enz.**)

Een chemische fabriek te Amsterdam zoekt chemicus, in staat de leiding der fabricage op zich te nemen en tevens in laboratorium onderzoekingen te verrichten. Zie verder de adv. in No. 7.

* * *

Contrôle-instelling vraagt jongen scheikundige (Dr. of Ir.). Zie verder de adv. in No. 7.

* * *

Gevraagd voor directe indiensttreding een jonge chemicus, in staat leiding te geven en fabricage te controleren (oliën, vetten, meelproducten). Zie verder de adv. in No. 9.

Gevraagde betrekkingen ¹⁾.

No. 470. Scheik. ing., diploma Delft 1927, met laboratorium- en fabriekspraktijk, 4 jaar i. d. petroleum-industrie, 1½ jaar in het gas- en 1½ jaar in het waterleidingbedrijf. 4 jaar in de olie-, vet- en margarine-industrie, zoekt verandering van betrekking.

No. 475. Scheik. ing., diploma Delft 1934, met ervaring op het gebied van zeepfabricage, wasscherijen, levensmiddelenchemie en wateronderzoek, zoekt werkkring.

No. 477. Dr. in de scheik., anorg. en electro-chemicus, 35 jaar, ook mathem. en phys. goed onderlegd, 2½ jaar praktijk Ver. St. (petroleum), research-werker (kunstzijde, gloeilampen, photographie), alg. bedrijfserv., op de hoogte van octrooizaken, vlot correspondent moderne talen, zoekt verandering van betrekking (binnen- of buitenland).

No. 491. Apotheker-scheikundige, 30 jaar, met ervaring van een veelzijdig handelslaboratorium, goed bekend met de voedingsmiddelenchemie en praktijk in het onderzoek van giftige gassen. zoekt betrekking.

No. 540. Scheik. ing., diploma Delft 1930. research-ervaring op verf- en kunstharsgebied, praktische ervaring in de fabricage van persmengsels, kennis van kunstzijde en viscosefoliën (cellophaan) moderne talen, zoekt werkkring in binnen- of buitenland. Financieele deelneming niet uitgesloten.

No. 551. Scheik. ing., ass. T. H., zoekt bezigheid voor de avonduren, literatuurrecherche, e. d.

No. 554. Scheik. ing., dipl. Delft 1938, 25 jaar, zoekt plaatsing bij chemisch bedrijf.

No. 556. Dr. chemie, Dipl. Techn. Hochschule, 10 jaar praktijk in org. chem. grootindustrie in Duitsland, 2 jaar zelfstandig werkzaam geweest op het gebied der kunstharsen, heeft tijd beschikbaar voor adviezen op het gebied van oplosmiddelen, Vinyl- en andere kunstharsen, nitro- en kunstharslakken, kunstleder, kleefmiddelen en literatuur recherche.

Plaatsing in werkverschaffing door bemiddeling der Commissie voor Tewerkstelling en Crisisfonds.

Zie blz. 94 van dezen jaargang.

VOLONTAIRSPLAATSEN DOOR BEMIDDELING DER COMMISSIE VOOR TEWERKSTELLING EN CRISISFONDS.

De Commissie voor Tewerkstelling en Crisisfonds, Willem Witsenplein 6, den Haag (sprekuur: iederen Donderdag van 1.30 tot 3 uur) maakt afstudeerende chemici opmerkzaam op de gelegenheid tot overleg met haar voor het vinden van een volontairsplaats in werk op door hen gewenscht gebied.

Verscheidene bestuurders van laboratoria hebben zich bereid verklaard volontairsplaatsen beschikbaar te stellen, vele andere zullen dit vermoedelijk doen, wanneer de Commissie daarom ten behoeve van een werklozen chemicus zou verzoeken. Zoo noodig kan de Commissie in de door volontairs gemaakte onkosten bijdragen of zelfs een bescheiden tegemoetkoming in levensonderhoud geven.

***) Men raadplege ook steeds de advertenties.

1) Plaatsing gratis voor leden.

Brieven te richten tot de Chem. Arbeidsbeurs, 's-Gravenhage, Willem Witsenplein 6 (met ingesloten porto voor doorzending).

Men wordt verzocht dadelijk bericht te zenden indien de plaatsing niet meer noodig is.

A. Microbiologisch Laboratorium der Landbouwhoogeschool te Wageningen; directeur Prof. Dr. Jan Smit: Onderwerp: in overleg te kiezen. Aanmelding bij Prof. Dr. Jan Smit en bij de Commissie T. & C.

B. Anorg.-chem. lab. der Universiteit, Hugo de Grootstraat 27, Leiden. Directeur: Prof. Dr. A. E. van Arkel. Onderwerp: algemeene problemen der ionentheorie, speciaal niet-waterige oplossingen. Afdeling Dr. W. P. Jorissen: onderwerpen: explosieve reacties, autoxydatie, geïnduceerde (gekoppelde) oxydatie, biochemische katalyse. Schriftelijke aanmelding bij Prof. van Arkel, resp. Dr. Jorissen en bij de Commissie T. & C.

C. Koloniaal Etablissement. Westerdoksdijk 2, Amsterdam-C. Onderzoek op het gebied van vezelstoffen en vezelproducten. Aanmelding bij Ir. H. A. J. Hietink en bij de Commissie T. & C.

D. Bureau van de Vereeniging voor de Nederlandsche Chemische Industrie. Onderwerp: Economische studiën. Aanmelding bij Ir. D. J. Akkerman, Secretaris van het Bureau en bij de Commissie T. & C.

E. Histologisch lab. der Gemeentelijke Universiteit van Amsterdam, Sarphatistraat 108, Directeur: Prof. Dr. G. C. Heringa. Onderwerp: gedrag van kleurstoffen aan weefseloppervlakken en grensvlakken. Schriftelijke aanmelding bij Prof. Heringa en bij de Commissie T. & C.

F. Afdeling Handelsmuseum van het Koloniaal Instituut, Mauritskade 64, Amsterdam (O.), directeur: Prof. Dr. L. P. de Bussy. Onderwerp: Onderzoek op het gebied van tropische producten. Schriftelijke aanmelding bij den directeur en bij de Commissie T. & C.

G. Pathologisch Laboratorium der Rijksuniversiteit te Leiden; Dir. Prof. Dr. G. O. E. de Lignac; Onderwerp op medisch-chemisch gebied. Aanmelding bij Prof. de Lignac en bij de Commissie T. & C.

K. Militaire Bedrijven (o. a. Wasscherij) te Woerden. Directeur Centrale Militaire Bedrijven, Amsterdam. Onderwerp: leertijd in het bedrijf en medewerken aan proefnemingen. Schriftelijke aanmelding bij den Kapitein J. T. Smeets, Sarphatistraat 110, Amsterdam en bij de Commissie T. & C.

Q. Scheikundig laboratorium der Vrije Universiteit, de Lairessestraat 174, Amsterdam. Leider: Prof. Dr. Ir. J. Coops. 1e onderwerp: organisch-preparatief werk, 2e onderwerp: anorganisch-chemisch onderzoek. Schriftelijke aanmelding bij Prof. Coops en bij de Commissie T. & C.

V. Lab. voor fysische chemie en colloidchemie der Landbouwhoogeschool, Heerenstr. 16, Wageningen, Dir.: Prof. Dr. H. J. C. Tendeloo. Onderwerp in overleg met den practisant te kiezen, hetzij algemeen fysisch- of colloïd-chemisch of op het gebied der bodem-colloïden. Schriftelijke aanmelding bij Prof. Tendeloo en bij de Commissie T. & C.

W. Keuringsdienst van Waren te Zutphen. Onderwerp, verband houdend met het onderzoek van levensmiddelen (één of twee volontairsplaatsen). Schriftelijke aanmelding bij den Directeur van den Keuringsdienst en bij de Commissie T. & C.

X. Instituut voor Tropische Hygiëne, Mauritskade 57, Amsterdam. Onderzoek naar de samenstelling van de koolhydraten der kapselbacteriën. Aanmelding bij Prof. Dr. E. P. Snijders en bij de Commissie T. & C.

IJ. Keuringsdienst van Waren, Keizersgracht 732, Amsterdam. Onderwerp: in overleg met den practisant te kiezen op het gebied der biochemie of levensmiddelenchemie. Schriftelijke aanmelding bij den Directeur Ir. J. Straub, Keizersgracht 732, Amsterdam-C. en bij de Commissie T. & C.

Z. Keuringsdienst van Waren, Utrecht, Rijnkade 2. Onderwerp, verband houdend met de dagelijksche onderzoekingen, in overleg met den directeur vast te stellen. (Aanmelding bij den Directeur en bij de Commissie T. & C.)

Aan leiders van laboratoria, die plaatsen voor practicanten beschikbaar hebben, wordt verzocht dit aan de Commissie te melden onder inzending van een bericht ter opneming in deze rubriek.

In totaal waren in Jan. onder de auspiciën der Commissie werkzaam 5 personen, waarvan 2 in universiteits- of hoogschoollaboratoria en 2 in praktijk- of fabriekslaboratoria.

541.18 : 547.96(08)

SYMPOSIUM ON PROTEINS OF THE
COLLOID CHEMISTRY SECTION,
AMSTERDAM, NOV. 4 AND 5, 1938.

II.

Then the chairman requested Prof. Dr. G. C. Heringa (Amsterdam) to deliver his lecture:

Colloid Physics and Biophysics of Proteins.

The combination of ideas — colloid physics and biophysics — given in the title of this report and the choice of a morphologically oriented biologist as reporter are both undoubtedly the consequence of the special results which the investigation of the biological fibrous substance has yielded for the study of the proteins. From the moment that Herzog¹⁾ found in the X-ray spectrograms of tendons and other fibrous tissues the undeniable indication of a construction by regularly arranged micelles, it has been understood that the study of these specialized protein building stones of living nature might serve as a bridge to the understanding of the protein molecule in general. A key to the deciphering of the X-ray spectrograms had not been given until Meyer and Mark²⁾ suggested to apply the method of analysis which had been proved useful for cellulose, to one of the simplest representatives of the protein fibrous substances, fibroin. With the hypothesis which presently has been conclusively corroborated also from other sides, viz. that in fibrous substances the proteins occur as long-stretched molecular chains oriented parallel to the direction of the fibre axis, the way was open for deeper investigations.

We all are acquainted with the publications in which Astbury³⁾ put down the results of his work on keratin, myosin and other proteins. They give us atomic models which, it is true, have no further pretention than the indication of some main features and where the side chains have for the present been marked only as R, but nevertheless they impress us by the idea of all the new insights which could be acquired by combining the results of the X-ray spectrography with knowledge obtained from other observations.

To these other observations which produced considerable material for the conception of the atomic model of protein structure, belong in the first place, the research work done on the physical properties of the proteins. Concerning the advantages derived from this study, a rich experience with other high-molecular substances (rubber, chitin) was at our disposal. Usually the first indication of the course to be taken came from the very combination of physical properties characteristic for these substances and it is obvious that this state of affairs is more or less the same in proteins. Astbury's brilliantly conceived structural hypothesis of the "supercontraction" of keratin, for example, the thought which via

myosin led him to build a bridge between fibrous and globular proteins, has been composed, not owing to, but in spite of the X-ray spectrogram, viz exclusively on the ground of macroscopically measured contraction. The subsidiary hypothesis, that — even in the strongly anisotropic hair — amorphous or semi-amorphous components prevail over the crystalline ones, is necessary to make it plausible that such great physical changes may take place without modification of the X-ray spectrogram.

For the histologist the rise of colloid physics as counterpart of colloid chemistry is an interesting phenomenon. It shows him not only the corroboration of the old truth, that there is nothing new under the sun, but also how dangerous it is ever to consider anything as definitely settled. The colloid physics of the fibrous substances, namely, raise in him many associations concerned with the discussion between von Ebner⁴⁾ and von Nägeli⁵⁾, which had long been considered as concluded. As it is generally known, the former defended against von Nägeli's micelle theory the conception that the fibrous structures in the living tissues were the manifestation of anisotropy brought about on a mechanical way. Between the two views — then apparently antagonistic — we find now as a reconciling idea Katz and Gerngross⁶⁾ observations that by stretching the fibre a diagram characteristic of collagen may be forced upon gelatin.

The question in how far external polar forces exert their influence on the formation of the natural fibrous substances or whether — as in Freundlich, Zocher and Szegvari's thread sols — the latter are formed by spontaneous arrangement of micelles, due to the action of molecular or other forces, can not yet be answered in general. On the one hand there are examples in biology where — also experimentally — parallel orientation of the fibres appeared to be definitely dependent on external forces (observations of Roux⁷⁾ on "functional structures"; experiments by Levy⁸⁾ on regenerating tendons, by Benninghoff⁹⁾ on artificially formed fibrous structures); on the other hand it appears that in tissue cultures, in which the collagen fibres are flocculated in a homogeneous mother substance, a perfectly typical bundle formation may arise, without any influence from outside.

In biology the mechanical interpretation of the orientation of the micellar chains, even there where at first sight it seemed to be conclusive, appears to be insufficient as soon as the finer structure is studied more in detail. Benninghoff remarked that in stretched tissues apparently composed of parallel fibres, such as bands and tendons, the fibre bundles actually show on both side a spreading of considerable angle from the direction of stretching. Further there is a complete lack of understanding of the wonderfully beautiful natural tissues, in which — in a three-dimensional pattern — fibre bundles with alternating

¹⁾ R. O. Herzog, Festschr. d. Kaiser Wilhelm Ges. Berlin, 1921; Z. angew. Chem. 34, 385 (1921).

²⁾ K. H. Meyer and H. Mark, Der Aufbau der hochpolymeren Naturstoffe, Leipzig 1930.

³⁾ W. T. Astbury and H. J. Woods, Phil. Trans. Roy. Soc. A 232, 333 (1933); W. T. Astbury and W. A. Sisson, Proc. Roy. Soc. A 150, 533 (1935).

⁴⁾ von Ebner, Z. Zool. 62, (1896); Sitz. ber. Akad. Wiss. Wien, Math. naturw. Klasse Abt. III, 115 (1906).

⁵⁾ C. von Nägeli, Die Stärkekörner, Zürich, 1858.

⁶⁾ J. R. Katz and O. Gerngross, Naturwissenschaften 13, 900 (1925); Kolloid-Z. 39, 180, 181 (1926).

⁷⁾ W. Roux, Ges. Abhandl. 1, 690, 763 (1895).

⁸⁾ O. Levy, Arch. Entwicklungsmech. Organ. 18, (1904).

⁹⁾ A. Benninghoff, Verhandl. nat. Gesellsch. 72, 95 (1931).

orientation in layers, are woven together (fig. 1 and 2).

Generally the colloid physicist will be inclined to refer to the biologist for the interpretation of these structures. The latter, however, will return this obligation to the physicist on the ground of the fact that equally well-developed structures occur in

natural products which, independently from direct vital influences, are formed in liquid secretions (chitin, fibre structures in chicken egg shell and egg albumin, fig. 3 and 4). It may be remarked that in these cases a rough-mechanical explanation is not satisfactory either. May be future biocolloid physics will succeed in interpreting the

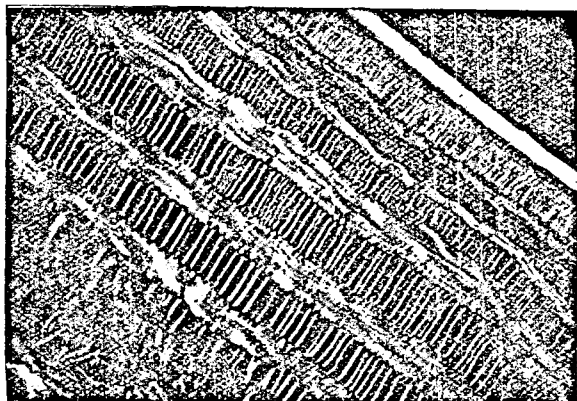


Fig. 1.
Tortoise skin (*Emyda*). (W. J. Schmidt).

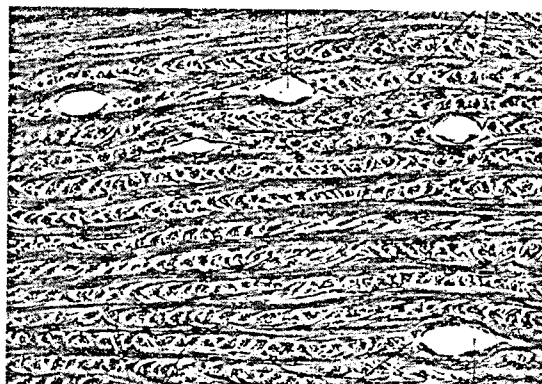


Fig. 2.
Bone with fibre structure in layers. (Petersen).



Fig. 3.
Chitin lamella in dark field with azimuth diaphragm, illuminated in 2 perpendicular directions.

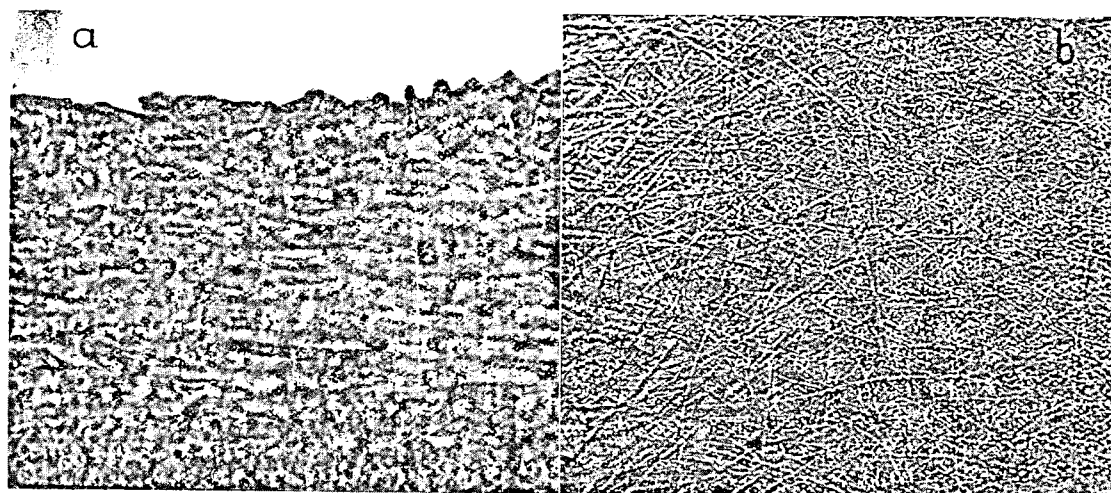


Fig. 4.
Membrane of chicken egg shell a) cross section b) longitudinal section.

formation of such tissues as the result of intermicellary interaction. In any case it is of importance to the colloid chemist to be acquainted with the tendency, which apparently is characteristic of fibrous substances, to form two- or three-dimensional interlaced structures. Neglect of these may expose him to gross errors. In the X-ray spectrogram namely a tissue, the fibres of which are interlaced in all directions, produces the same effect as an isotropic gel. The X-ray spectrogram of a cornea exposed to the beam in for-backward direction, for example, is completely similar to that of unstretched gelatin, in spite of the fact that its connective tissue is built of beautifully fibrillar collagen. Mutatis mutandis the same applies to every natural fibre substance. In the fibre substance par excellence, the hair, by means of the microscope a pattern may be seen of fibrils crossing each other at a sharp angle, which are responsible for anisotropy and X-ray spectrogram. It is by no means impossible that much of what is considered not fibrillar by the X-ray spectrogram on the ground of the absence of a so-called fibre diagram, actually consists of a system of micelles spread in all directions.

The remark of the histologist given here will probably be accepted the sooner by the chemist, since the latter also in his own domain nowadays frequently has to face the interpretation of the diffuse, so-called "amorphous" blackening in the X-ray spectrograms as a problem of present interest.

In the course of time various explanations have been given for the lack of sharpness, which — in spite of considerably improved technique — still disfigures the X-ray spectrograms of many high-molecular substances, and most of all those of the proteins. The first explanation, already given by Herzog and by Meyer and Mark and actually being part of von Nägeli's hypothesis, was this that the interstices of the crystalline micelles are filled with an amorphous substance — at any rate with a medium without fibrillar orientation, which fuses the micelles together. This hypothesis was used at the same time to provide for the amino acids, which — although present according to chemical analysis — could not be placed in the atomic models calculated from the X-ray spectrogram.

Another way out was tried by Gerngrosz and Katz¹⁰⁾, starting from their observations on variously swollen and stretched gelatin. After making the observation that in the X-ray spectrogram of this substance crystalline and "amorphous" interferences may be distinguished side by side, Gerngrosz suggests the hypothesis, closely resembling Katz' interpretation, that the amorphous component is not a substance sui generis combined with "proper" gelatin, but one and the same protein in a less oriented condition, which as such would have its share in the determination of the typical properties of gelatin. Particularly the physical properties of the gels would be determined by this peculiar mixture of amorphous and crystalline phases. That is the reason why these properties resemble each other to such an extent in different substances of a widely deviating chemical composition (rubber-like elasticity in proteins).

Gerngrosz and Katz consequently give up Herzog's and Meyer and Mark's representation of the micelles as crystallites bounded by flat faces. They assume crystals which at their extremities are split into fringelike off-shoots. The substance responsible for the fusing together of the micelles, the amorphous component of the X-ray spectrogram would then consist of similar fringes, polypeptide chains which, lying at random, may be hooked into one another by means of more or less labile bonds.

Independently of this hypothesis, Astbury¹¹⁾, likewise by combining the study of the X-ray spectrogram with that of the physical properties, comes to the conclusion that in the horny substance keratin must occur in three different phases, which may be distinguished by their resistance against mechanical deformation (stretching) and one of which would be non-crystalline. This "amorphous" phase K_1 must exceed the crystalline one considerably in bulk because of the part it takes in the physical properties of the fibre substance. In the load extension diagram an elastic and a non-elastic component follow each other; the amorphous phase corresponds to the former and is deformed most easily viz. also in dry condition (fig. 5). The crystalline phases K_2 and K_3 — except for a slight reversible spring action in the beginning

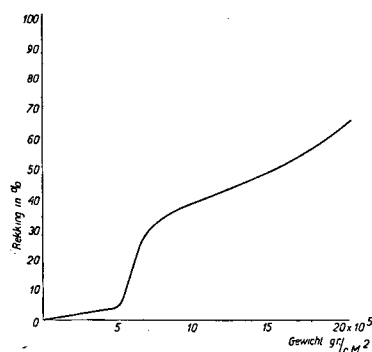


Fig. 5.
Load-extension curve of wool (Astbury).
Ordinate: extension. Abscissa: load.

of the stretching — only yield (get "freed") after lubrication by water, the X-ray spectrogram in the meantime showing the transition from α - to β -keratin. According to Astbury the last part of the load extension diagram is dominated by a still more resistant, evidently also crystalline phase, whose yielding to deformation does not take place until by a long action of steam or NaOH the crystal bonds have been to a great extent broken down. The X-ray spectrogram betrays this decomposition by a broadening of the side-chain interference ("spreading along the hyperbole"). The two last parts of the extension of the hair are accompanied by a retarded recovery (temporary set), partly even by a lasting elongation (permanent set), which are explained by Astbury by supposing the micelles in stretched condition to form new bonds replacing the broken old ones. To this exposition Astbury adds the remark that it is incorrect to assume a difference in essence between crystalline and amorphous or micellar and intermicellar keratin.

Originally he assumed that these different phases,

¹⁰⁾ J. R. Katz, Röntgenspektrographie als Untersuchungsmethode 1934.

¹¹⁾ l.c.

which in the phenomenology of stretching not only become manifest *after* each other but also together — as he says lie both in series and parallel — occur separated from each other in and between the cells which build up the hair. When later, according to Astbury's collaborator Woods¹²⁾ this spatial separation is abandoned, we feel — though it is not pronounced — that Astbury's view as a whole fits in Gerngross's fringe hypothesis.

Closely connected with Astbury's experimental work are the results of Kolpak¹³⁾ and of Meyer and Ferri¹⁴⁾ concerning deformation by stretching of tendon and elastin (fig. 6 and 7). In both we find, as in the hair, elastic deformations, caused by

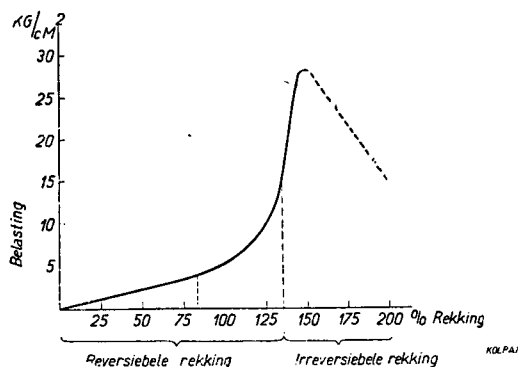


Fig. 6.

Load-extension curve of elastic tissue (Kolpak).

Ordinate: load.

Abscissa: extension.

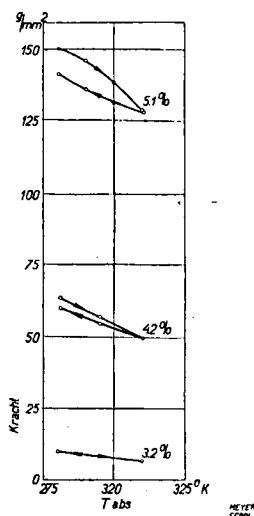


Fig. 7.

Tendon.

Load-temperature curves at different extensions (K. H. Meyer).

small degrees of stretching (reversible displacement or parallel orientation of molecular chains without loss of energy), while on stronger stretching the oriented and packed together (eventually crystalline) complexes change their position with regard to each other as appears from liberated heat, under friction and breaking of bonds (thus unelastically). The change of position may involve either gliding of the chains

along each other (elastin, collagen in tendon) or their rotation (keratin).

The investigation by Kolpak on elastic tissue is particularly interesting for the possible connection between degree of orientation and elasticity, since elastin in unstretched condition — when the elasticity is at full force — is almost completely unoriented, "amorphous". Besides four weak points in the inner ring, the X-ray spectrogram shows two amorphous rings. Not until there is a stretching of over 75 %, the fibre diagram appears. This is closely resembling to that of keratin and points to stretched main valency chains in the fibre axis with a period of 3.0 Å and with two equatorial interferences, corresponding to back-bone and side-chain spacing of 4.6 and 11.5 Å respectively. On further stretching Kolpak finds a further extension in the main chain, exactly like the α - β -transition in keratin. Individual double refraction is found simultaneously with the fibre diagram, double refraction of small rods is found before that. On comparing the load extension diagram of elastin with that of keratin we find a great similarity, at any rate if for elastin we consider only the second (oriented) part of the curve of fig. 6. The decrease in extensibility, which — see also Meyer and Ferri — is accompanied by decrease in elasticity, sets in after stretching of 75 %, thus after the crystal interferences have become manifest. Considering how much this agrees with what happens in Astbury's second and third keratin phase, the conclusion is forced upon us that deformability and elasticity belong to the amorphous condition, tensile strength and, if this has reached its limit flow (plasticity) belong to the parallel oriented micellary state.

A striking resemblance to the load extension diagrams discussed so far is found in the curves obtained by Jordan¹⁵⁾ on loading invertebrate muscles (fig. 8). Here also we find that peculiar

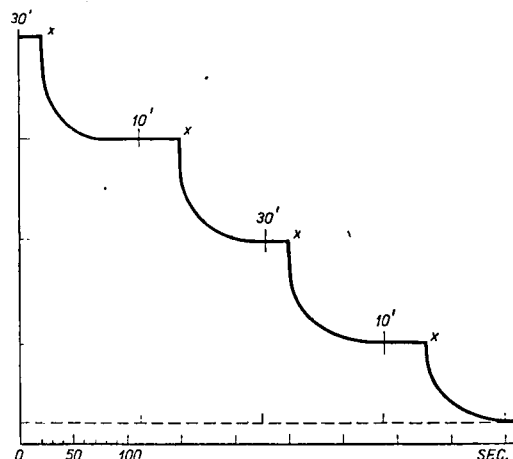


Fig. 8.

Extension curve of metridium (Jordan).

Ordinate: extension ("height of fall").

Abscissa: time.

rubberlike extensibility, containing elastic and plastic components. The great resistance with increasing deformation, pointing to inertia, friction, and called by Jordan by the characteristic term "snowplough"

¹²⁾ H. J. Woods, Proc. Roy. Soc. A 166, 1924 (1938).

¹³⁾ H. Kolpak, Kolloid-Z. 73, 129 (1935).

¹⁴⁾ K. H. Meyer and C. Ferri, Pflügers Arch. ges. Physiol. 238, 78 (1936).

¹⁵⁾ H. J. Jordan Arch. Néerl. Zool. 1, 1 (1934).

effect"; agrees with the conclusion reached from the curves of the discussed substances above. There is an interesting change in the behaviour of the muscles, brought about by contraction, a change which in principle is the same for the invertebrates as for the transversely striped vertebrate muscles: the contraction causes an increase of the elastic component (fig. 9).

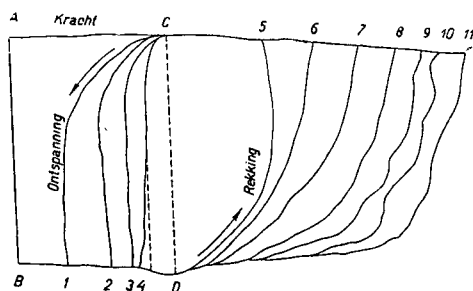


Fig. 9.

Load-extension curve of cross-striated muscle (shark).
(Jordan).

Ordinate: extension.
Abscissa: load.
ontspanning = relaxation,
rekking = stretching.

In the light of our previously given view, this is in agreement with the fact that contraction is accompanied by a diminishing double refraction. Here is the place to mention an observation of Derksen¹⁶⁾ on gelatin, which shows the close connection between amorphia and elasticity (fig. 10). He noticed that after heating of a gelatin gel the X-ray spectrogram grows vague, long before the temperature of deliquescence has been reached. From the fact that the equatorial interferences vanish sooner than those in the direction of the main chains, he concludes that disorder in the

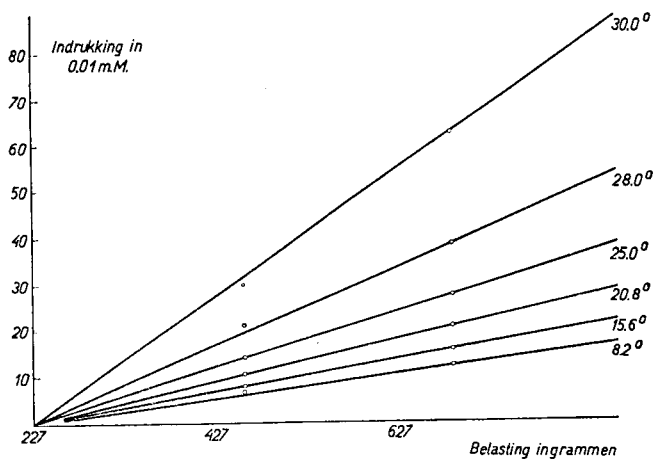


Fig. 10.

Rate of compression in 0.01 mm of 42 % gelatin ($p_H = 6.7$) (ordinate) plotted against the load (abscissa), determined at different temperatures.

micelles is due to sliding of the molecular chains along each other. In this half amorphous (may we not say mesomorphous) state the consistence of the gel is still solid; moreover, it is perfectly elastic (this in particular is of importance). Derksen calls these apparently still partly linked together main chain complexes "amorphous micelles". Obviously he means by this a condition practically cor-

responding to that of the micelle off-shoots of Gerngrosz and of Kolpak's praemicelles.

Considering what has been discussed so far, we find a fundamental similarity in behaviour in all fibre-forming proteins, in spite of considerable differences in chemical composition and in quantitative preference between elasticity and plasticity. We are besides aware of the fact that this combination of properties in general is by no means characteristic of the proteins as such, on the contrary apparently belongs to all gels with aniso-diametrical micelles, such as rubber, cellulose, chitin, etc. (fig. 11).

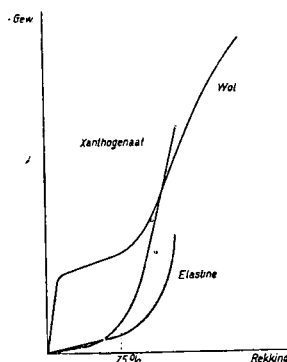


Fig. 11.

Comparison of load extension curves for wool, xanthogenate and elastin fibres.

Ordinate: load.
Abscissa: extension.

The 3 curves are plotted in different scales. Therefore the comparison is only a qualitative one.

It is indeed worth while to compare the general conclusion arrived at for the fibrous proteins with the considerations of Hermans¹⁷⁾ on cellulose xanthogenate. On the basis of theoretical contemplations he gave a detailed representation of how the phenomena taking place on deformation might be distributed according to their origin between strictly micellar constituents and the linked together off-shoots coming out from them. Apart from an array in groups ("Ordnung in kleine Bereiche") indicating the tendency to an ordered linking up of the molecular chains, these off-shoots would possess a much higher degree of freedom in their internal construction, and consequently remain a more amorphous component among the more regularly arranged micellar parts. Starting from a diagram previously given by Bungenberg de Jong¹⁸⁾, Hermans assumes that the amorphous parts form nodes of a compact network, built up of micellar threads, which on its part would behave more deformable, because of the looseness of these nodes. A long series of varied experiments yields results which in many respects are in perfect agreement with this theory.

Between the simple fringe theory of Gerngrosz and the more detailed network hypothesis of Hermans there is an undeniable relationship. In connection with the general similarity already stated between the physical behaviour of protein and xanthogenate gels, it would now be interesting to

¹⁷⁾ P. H. Hermans, *Kolloid Z.* 81, 143 (1937); P. H. Hermans and A. J. de Leeuw, *Ibid.* 81, 300 (1937); 82, 58 (1937).

¹⁸⁾ H. G. Bungenberg de Jong, *Z. physik. Chem. Cohen-Festband*, 205 (1927).

¹⁶⁾ J. C. Derksen, Thesis, Amsterdam 1935.

examine by means of a systematic comparison in how far Hermans' views also apply to proteins. It might be hoped to acquire in this way an insight concerning the properties which possibly are responsible for the specially chemical characteristics of the various fibre substances. Two circumstances, however, impede this comparison: in the first place that, as soon as natural fibre substances are concerned — which the proteins are from their very nature — there is always uncertainty concerning the degree of orientation present, while — as we saw and shall see later on — this factor has a very great influence on the properties; secondly that, owing to different arrangement and technique, the experiments of the different authors often are not in correlation. For example, apparently we have found a contrast between xanthogenate and keratin on observing that according to Hermans xanthogenate threads on stretching increase in density (contraction of volume), whereas according to Astbury hair at the transition from α - to β -keratin shows no change in specific gravity. This contrast gives way to growing similarity according as the xanthogenate threads under examination are less strongly swollen. The explanation is that absorbing and squeezing out water is only possible in so far as this is present intermicellary.

In Astbury's work an important place is given to the description of a few phenomena which he calls "temporary" and "permanent set" (fig. 12). Mutatis

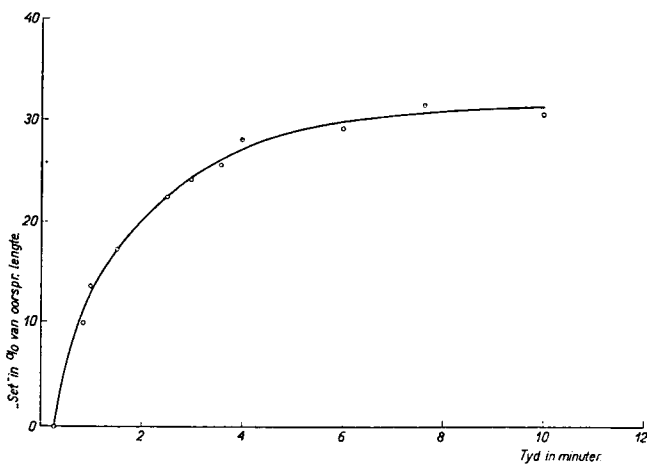


Fig. 12.

The development of temporary set with time of exposure at a constant extension of 38.5% (Cotswold wool) (Astbury). Ordinate: set (% of initial length). Abscissa: time in minutes.

mutandis, for both the corresponding phenomenon in Hermans' theory may be easily traced. Temporary set is the hysteresis displayed by hairs stretched in cold water on their return to normal length. We find it as an elastic after-effect in all stretched gels. Astbury also mentions it as "long range elasticity". Permanent set is according to him the lasting elongation of fibres the stretching of which was accompanied by gliding and affecting of micelles (Astbury's second phase). Here we have to deal with a lasting deformation which is found in a perfectly similar way in cellulose (xanthogenate resp.) Like Astbury for keratin, Sauter¹⁹⁾ and Hermans account for it by re-hooking and renewed binding of torn and sepa-

rated fringes, which takes place the more easier as, by combining hydration with mechanical manipulations, more movement has been brought in a closely packed micellar mass.

Besides the elasticity-plasticity relation there is a second subject which attracts in the study of the physical properties of the fibrous substances the special attention of the investigators: hydration and swelling respectively. Actually the discussion of hydration cannot be separated from that of the mechanical properties, as there is an intensive interaction between them. Dry gels yield not nearly so easily to deformation as those with a certain water content. This applies particularly to stiffly built fibre substances, such as collagen and keratin with their closely packed and evidently strongly linked micelles. On the other hand a gel hydrates with greater difficulty and swells less according as it is more highly anisotropic. The first of both facts is clearly perceptible in a number of curves by which Hermans demonstrates the relationship between swelling, anisotropy, stretching and hydration (fig. 13 and 14)

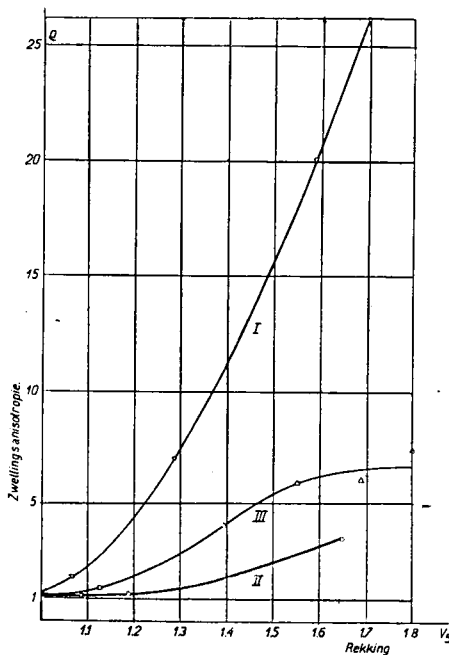


Fig. 13.

Anisotropy of swelling (ordinate) plotted against the extension (abscissa) for xanthogenate fibres of different water content. (Hermans).

- I: strongly swollen,
- II: dried,
- III: "air"-dried.

while the second is mentioned by Meyer and Mark²⁾, p. 161—162 and by Katz^{19a)}. The connection between elasticity and hydration is obvious in the annexed curve of Astbury (fig. 15), who gives the recovery as function of the humidity. This should be compared with the following figure by Hermans (fig. 16), where for xanthogenate the interaction may be seen between hydration and elasticity. These facts show that the deformation increases according as the micellary connection is undermined by hydration.

The hydration capacity of the proteins is highly different: fibroin hydrates less than keratin, this

¹⁹⁾ E. Sauter, Z. physik. Chem. B 35, 183, 117 (1937).

^{19a)} J. R. Katz, Chem.-Ztg. 15, 381 (1927).

much less than collagen and this again considerably less than gelatin. Evidently the tendency to hydration increases according as the X-ray spectrogram displays more amorphous components. When comparing

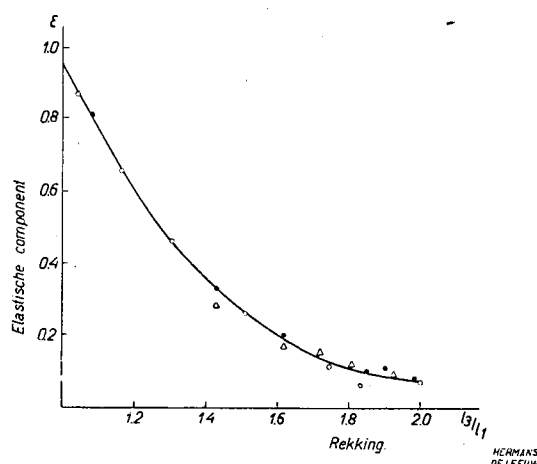


Fig. 14.

Xanthogenate.

Elastic component (ordinate) of the stretching plotted against the rate of extension (abscissa) (Hermans).

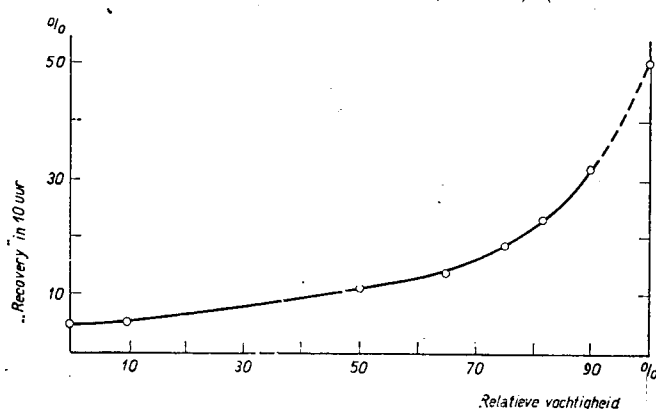


Fig. 15.

Recovery of Cotswold wool fibres after an extension of 50% (Astbury).

Ordinate: recovery in 10 hours.
Abscissa: relative humidity.

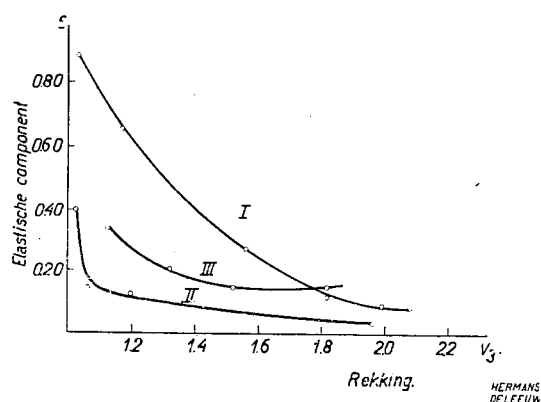


Fig. 16.

Xanthogenate.

Elastic component (ordinate) of the extension plotted against the rate of extension (abscissa) for fibres of different hydration (Hermans).

I: strongly swollen,
II: dried,
III: "air"-dried.

gelatin and collagen, Jordan Lloyd²⁰) is inclined to ascribe the slighter swelling capacity of the latter to "interstitial tissue". This hypothesis seems superfluous. Not only in histology but also in the culinary science it is well known that connective tissue is less easily made tender according as it is more tightly stretched: the ligaments of a soup-chicken are still intact when all the other collagen has long since turned into glue. Two suppositions may be advanced as an explanation of the slighter swelling in firm-fibred proteins: 1. the smaller quantity of capillary space in which water may be stored; 2. the closer, less easily hydrolizable bonds between the more closely packed molecular chains and fringes respectively. The first supposition leads us to the distinction between intra- and intermicellar swelling, to which we shall revert presently, the second is supported by the experience that by formalin, which strengthens the chemical bonds, the swelling is checked.

The distinction between inter- and intramicellar swelling seems to be an absolute one, when we compare mutually different fibrous substances: Cellulose, fibroin, chitin, keratin only show an intermicellar swelling, as is apparent from the unchangeableness of their X-ray spectrogram: on the other hand gelatin and collagen are characterized by intramicellar swelling, widening of the side-chain distance, during absorption of water to a certain limit (Katz; Derksen²¹). However, on closer examination of the latter case we must admit immediately that here the boundary between intra- and intermicellar swelling is rather vague. Not only go both together from the very beginning (even at small degrees of water adsorption the swelling is far greater than is in agreement with the widening of the side-chain distance, both therefore don't run parallel, Derksen l.c. p. 45; fig. 17),

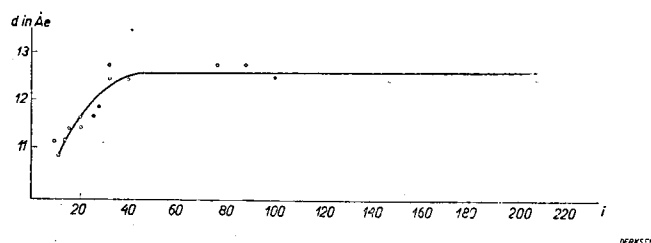


Fig. 17.

Distance of molecular chains in the gelatin micelles plotted against the water content of the gelatin gel (Derksen).

but at increasing hydration the enormous prevalence of the intermicellar process becomes really manifest, ultimately leading to complete deliquescence. This increasing hydration at a higher degree of humidity is, in our opinion, in agreement with what we observed above concerning antagonism between the tendency to hydration and the micellar density of packing.

An investigation of Leyns²²) in our laboratory produces interesting facts with regard to the hydration of collagen, in our opinion partly undermining the differentiation between inter- and intramicellar swelling. The idea of this investigation has been induced by a

²⁰) D. Jordan Lloyd, Trans. Faraday Soc. 29, 132 (1933).

²¹) J. R. Katz and J. C. Derksen, Rec. trav. chim. 51, 513 (1932).

²²) W. F. Leyns, Not yet published.

publication of Fischer²³) and Hertel²⁴) on the difference between cornea and sclera. These are collagenic tissues showing a discrepancy in physical behaviour (transparency, anisotropy), which is apparently due to a difference in water binding. On removal of water the sclera becomes transparent; the cornea is troubled both on water desorption and adsorption. In both, therefore, there is a connection between water content and transparency; but there is this difference that the cornea does not grow untransparent until the water content is 85 % or more, the sclera already at a water content of more than 40 %. A fresh cornea appears to be about 10 % richer in water than a fresh sclera (80 and 70 resp.). The explanation given by Fischer for the different optical behaviour assumes that turbidity sets in when free water between the tissue components forms reflecting faces with the collagen micelles. The troubled sclera consequently would store its water more intermicellarly, whereas in the cornea intramicellar water would have a more important part in the physiological condition. This seems to be in agreement with the investigation by Hertel. In the first place the latter shows that both sclera and cornea on exposure to X-rays from the front to the back yield an X-ray spectrogram corresponding to that of unstretched gelatin (only in case of radial exposure of the cornea we see an indication of a fibre diagram, pointing to a circular orientation of fibres), which on stretching and water adsorption undergoes the changes typical of gelatin. Marked differences between cornea and sclera are particularly obvious on stretching and adsorption of water, starting from the dry tissues: 1. for the sclera a fibre diagram is already perceptible at a stretching of 30 %, for the cornea not until 80 %; 2. on the other hand the X-ray spectrogram of the cornea is more sensitive to the influence of hydration. The changes observed by Hertel in the X-ray spectrogram are the same as have been described by Derksen for gelatin: reduction of the smaller equatorial interference i. e. increase of the "side-chain" spacing: (intramicellar swelling) and widening of the amorphous ring. This amorphous ring is according to Hertel a measure for intermicellar distances. This widening would then point to a narrowing of the intermicellar distance during adsorption of water by the micelles. From the comparison of the X-ray spectrogram of cornea and sclera during adsorption of water it appears that the intramicellar changes in the cornea are more quickly and intensively visible than in the sclera. On the other hand, on comparison of the two spectra at an equal water content, the intermicellar water content in the sclera appears to be the larger one.

In connection with this publication Leyns compared the water binding capacity of cornea and sclera, according to the technique used by Derksen, with the following remarkable result: The adsorption-isotherms of both tissues with regard to water are perfectly similar up to a vapour pressure of about 80 % (fig. 18). The two curves are identical with those found by Derksen for gelatin (fig. 19). Consequently they are undoubtedly due to the

collagen, which apparently is the same in cornea and sclera and besides passes uninterrupted from one tissue into the other. At a vapour pressure of more than 80 %, however, a large difference in behaviour between the two tissues sets in: The sclera does not swell any further, the cornea on the other hand

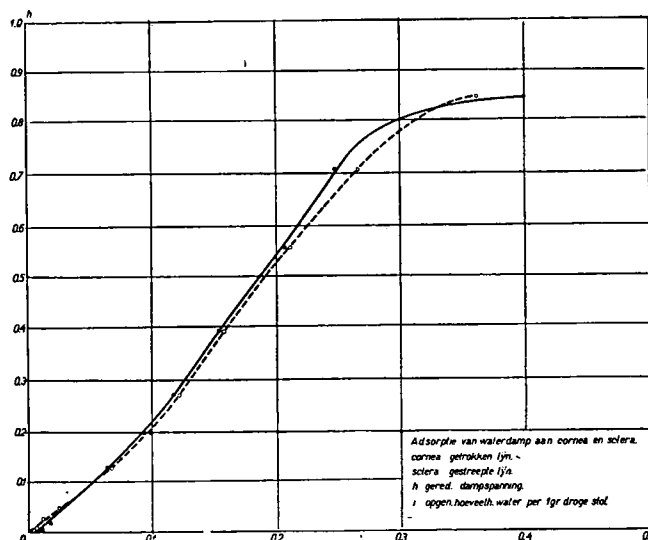


Fig. 18.

Adsorption of water vapour by cornea and sclera.

cornea ———
sclera - - - - -

h = reduced vapour tension
 i = amount of adsorbed water by
1 g of dry substance.

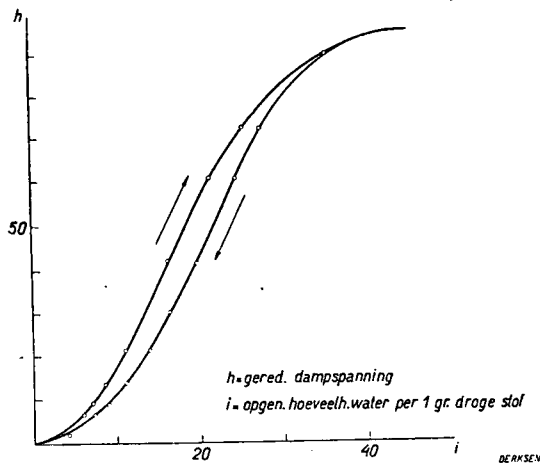


Fig. 19.

Sorption isotherme of water vapour on gelatin (Derksen).

h = reduced vapour tension,
 i = amount of the adsorbed water
by 1 g of dry substance.

goes on adsorbing water up to a weight of 3000 % and more. The explanation of this marked difference has been found. As has been conclusively proved by various parallel experiments, it lies in the quantitatively (20 resp. 13 %) and in the first place in the qualitatively different mucoïd content of the two tissues. The literature shows that, according to its swelling capacity in water at pH 7, corneal mucoïd resembles that of the umbilical cord, whereas the mucoïd of the sclera, where this swelling capacity is wanting, in this respect resembles that of tendon and cartilage. In agreement with this statement,

²³) F. P. Fischer, Arch. Augenheilk. 108, 41 (1933).

²⁴) E. Hertel, Arch. Augenheilk. 107, 259 (1933).

there is — as is apparent from an investigation by Gaulhofer²⁵) carried out in connection with that of Leyns — between umbilical cord and tendon the same difference in water adsorption as between cornea and sclera.

According to these experiments the water binding capacity of the cornea consists of two parts, one taking place in the collagen, the other in the mucoid component. In their relation to each other they behave more or less like Astbury's phases in the stretching of keratin: One after the other they dominate the phenomenology, while nevertheless it is clearly apparent from the X-ray spectrograms that they are also active by the side of each other (linked both in series and parallel, according to Astbury). However, there would be one important difference between Astbury's case and ours: Whereas the phases of the keratin would all be the same substance,

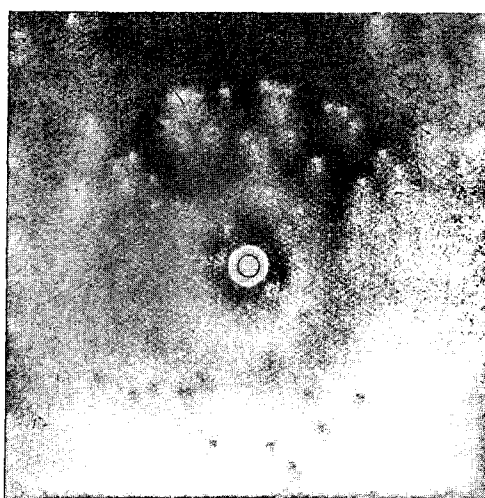


Fig. 20.
Stretched cornea (100 % stretching).



Fig. 21.
Stretched cornea freed from its mucoid content by extraction
(100 % stretching).

only different in degree of order, in our case the amorphous phase would not be collagen but mucoid, the substance present in all collagenous tissues as an

amorphous admixture. It is remarkable that only a comparatively slight change is found in the X-ray spectrogram of the cornea on extraction of the mucoid. The "amorphous" ring grows considerably sharper, the other interferences remain practically unaltered. Nevertheless, if we regard the mucoid as an amorphous admixture only, we place ourselves in an awkward position. Not only because we dislike, as it were, to take a step backwards to Herzog's „Kittsubstanz"-theory and to give up the illusion of understanding micelles and amorphous matter from the same point of view. Even more because of the following: How can we combine Hertel's conclusion, which from his point of view is well founded, that in the cornea intramolecular hydration prevails, with Leyns' discovery that a strong mucoid swelling exists there?

From the combination of Hertel's experiments with those of Leyns it seems that the mucoid puts its stamp on the intramolecular swelling as well as on the intermolecular one.

Another argument is that formol simultaneously checks the intra- and intermolecular swelling, although mucoid is not precipitated by formol.

Evidently the necessity to take the mucoid into consideration on the swelling of collagen produces a number of difficulties. It seems to us that there is only one way out: viz. the one given in the fringe-hypothesis which abandons the fundamental difference between micelle and amorphous substance. Making use of the fact, learnt from Astbury's work as well as that of Hermans, that the fringes react more easily owing to their being loosely intertwined, we should have no difficulty in assuming that in the intermolecular fringe-area the carbohydrate binding takes place between polypeptide chains and mucoids. Perhaps we should add then that, owing to the closer binding, which — by narrowing Hermans' meshes — turns the fringes into micelles, the carbohydrate would be split off.

The wide difference in mucoid behaviour between cornea and sclera, while the collagen is the same, impresses the biologist — not in the last place by its great adequacy — as a local phenomenon of adaptation, differentiation in metabolic properties of two originally identical tissues. We may be aware that this difference as such may be compared with numerous other metabolic modifications in living nature; also e.g. — undoubtedly a kindred phenomenon — with the regulation of inter- and intramolecular water binding, by means of which animals and plants may adapt themselves to varying climatological conditions (Gortner²⁶). Even without comprehending this process in detail, we can understand such a differentiation in metabolic properties in analogy with so many other instances of adaptation.

To the biologist it has a great charm to be able to connect such a regulation phenomenon with the modern extension of the micellar theory. It belonged to von Nägeli's classical hypothesis that not only the anisotropic cell products of fixed form are crystalline but also that the actual mobile protoplasm would consist of micelles, which in this case would be connected by a liquid amorphous intermediate substance. The special study of the stiff scleroproteids

²⁵) W. K. Gaulhofer, Not yet published.

²⁶) R. A. Gortner, Ann. Rev. Biochem. 1, 21 (1932).

put this side of von Nägeli's hypothesis for some time into the background. It seems as if — to the greater glory of the ingenious von Nägeli — now it begins to show to greater advantage. More and more we hear of constituents, belonging to the real "living" protoplasm, which possess a crystalline character. Mitochondria, chromosomes, the "bearers of heredity", and even complete living organisms (virus of mosaic disease) are described as crystalline. It is obvious that in all these cases we have not to deal with "pure substances, pure proteins". On the contrary, mixing proteins with and binding to other substances (lipoids, carbohydrates) is as characteristic of these organismic structures as the lability and reversibility of these bonds. Thus biology forces us on all sides to take into account the possibility that the proteins, even where they produce a fibre diagram, are strongly reacting substances which have their full share in the regulation capacity of living nature. How else could they be bearers of so many important vital functions and appear in so many forms? Now this conclusion, as it were, leads to the concession that there must exist a gradual series of transitions between the crystalline and amorphous condition.

It would be tempting from this point of view to study more closely the transition between fibrous and globular proteins in the sense of Astbury and Gorter²⁷⁾. Meanwhile I think that this would lead me to the domain of others, so that I conclude this report with the suggested hypothesis.

Discussion:

Ir. H. A. J. Hietink asks whether a structure based on a spiral is possible according to views held at present, an opinion which was put forward in 1927 by Prof. Woerdeman²⁸⁾. In this connection he draws attention to the hypothesis of Katz and Gerngross who suggest a micellar spiral structure in collagen fibrils. One can imagine the twisting as a spiral principle according to fig. 1 B of the article by J. Lotichius. The strong torsional forces which are produced in tendons and hairs²⁹⁾ by changes in the moisture content can only be understood if one considers not only the micelles themselves but also the fringes as being wound according to such a spiral principle as reproduced in the accompanying fig. 22.

Prof. Dr. G. C. Heringa answers:

Dr. Hietink's question as to the spiral construction of proteins is not in its generality amenable to answer. For fibroin and keratin the supposition of a spiral molecular chain (that is to say an axis which may or may not be spiral with side chains in various directions in the space) does not fit into Astbury's molecule scheme: the distinction found by Astbury between "side-chain spacing" and "back-bone spacing" would then indeed become impossible. For gelatine and collagen the fact that the innermost equatorial interference is drawn out into an arc might furnish an argument for assuming

a twisted structure of the molecule and one might be inclined to support this hypothesis with the microscopical and optical observations made by Woerde-

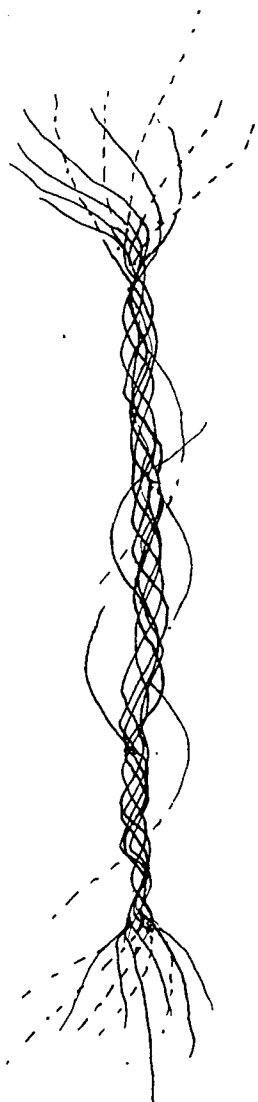


Fig. 22. Spiral structure of micelle and fringes. (The dotted lines are to be imagined as behind the plane of the drawing).

man and also by the speaker³⁰⁾ and with the hygroscopic torsion. These data are however not conclusive. Cellulose fibres also exhibit in a typical manner the phenomena of hygroscopic torsion, whilst torsion of the carbohydrate chains in the cellulose micelles can certainly be excluded. The production of hygroscopic torsion is completely explained in this case by the spatial linking together of the micelles (Jost). In view of this, one must continue to take a somewhat sceptical standpoint with regard to the spiral structure of gelatine and collagen molecules. Attempts have been made by Astbury³¹⁾ to discover in gelatine the spatial model of keratin. This attempt did not exceed altogether satisfactorily. It is not clear to the speaker what leads Dr. Hietink especially to postulate a spiral twining of the fringes other than a purely accidental, external enforced interlacing. No indication of it is to be

²⁷⁾ W. T. Astbury and R. A. Gortner, *Nature* **142**, 33 (1938).

²⁸⁾ M. W. Woerdeman, *Handel. XXIIe Nat. en Gen. Congr.* 1927, p.

²⁹⁾ H. A. Hietink, *Handel XXIVe Nat. en Gen. Congr.* 1933, p.

³⁰⁾ G. C. Heringa and collaborators, *Proceeding* **29**, 1081, 1087, 1092, 1385 (1926); **30**, 594 (1927).

³¹⁾ W. T. Astbury, *Cold Spring Harbour Symp.* **2**, 55 (1934).

found in the scheme of Katz and Gerngross.

Dr. Ir. R. Houwink remarks: The lecturer said, that the elastic part of the deformation can be attributed to the amorphous constituents of fibres, whereas the plastic part might be attributed to the crystalline constituents. It is known, that on stretching, the percentage of crystalline material increases at the expense of the amorphous constituents. Starting from the fringe theory, one might say that the (amorphous) fringes are gradually snapping into the crystalline pattern and this means a plastic deformation of the fringes, resulting in a plastic deformation of the whole. In this process the *plastic deformation* should therefore be attributed to the *amorphous* part.

We would agree with Prof. Heringa, if he were to say that the *high elasticity* of the system might be attributed to the amorphous parts. But then one has to consider that this is practically never pure elasticity and is always accompanied by the above described plastic phenomena ³²⁾.

Prof. Heringa says:

In the first place it is a question whether the observation made with rubber, that the amorphous phase is transformed into a crystalline one on stretching, is immediately applicable to the albumens. No actual data are available on this question. But the speaker is for the rest too unable to follow Dr. Houwink in his reasoning. A deformation, which is irreversible because it ends in crystallization, is in no way to be called plastic for that reason. The speaker is in fact in complete disagreement with Dr. Houwink if he wants to call the deformation of the fringes plastic on this ground.

On the other hand the speaker admits that elasticity is in no sense entirely absent in the crystalline phase. It is certainly difficult, if not impossible, to separate elastic and plastic transformations sharply from one another, the more so as they almost always occur together. Their practical separation is the more difficult the greater the elastic modulus and hence greater forces are needed for the deformation.

Dr. J. H. de Boer observes in this connection that generalization is dangerous. Metals can be deformed plastically although they are unmistakably crystalline.

Dr. P. H. Hermans remarks:

Prof. Heringa has laid much stress on the apparent fact, that the properties of deformability and elasticity seem to belong mainly to the non-crystalline regions of the structures. This conclusion is in perfect agreement with recent investigations in the field of artificial cellulose and other non-protein fibres ³³⁾ and can be hardly overemphasized at the present moment as a counterpart to a still often prevailing tendency to overestimate the importance of the submicroscopic crystalline structures revealed by X-ray examination, which may be the result of the surprising discovery that so many objects of highly complicated structure show a more or less pronounced "crystalline" diagram.

It may be of interest to mention here, that a yet

unpublished investigation by O. Kratky and myself provides very strong evidence, that also the tensile strength of artificial cellulose fibres is mainly connected with the condition of their non-crystalline parts. Starting from originally isotropic material and with no other means than mechanical deformations, one can produce two different kinds of fibres, both showing an equally well oriented X-ray fibre diagram, the one of which however having a very high, the other a very low tensile strength. Tested by the method of swelling-anisotropy, which apparently provides information in the first place on the condition of the non-crystalline intermicellar regions (which have to be considered as the bearers of swelling), the former one shows a perfect, the latter one almost no orientation at all.

Hence in this case there is even no correlation whatever between the mechanical strength and the X-ray diagram.

Dr. J. M. van der Zanden points out that Prof. Heringa, from the practical coincidence of adsorption isotherms in tissues of cornea and sclera, concludes that the state of the collagen in these two tissues is identical. He asks whether this is justified; the equality of a particular physical quantity is indeed no criterion for the identity of the substances (vapour pressure curves, boiling points melting points).

Prof. G. C. Heringa is in complete agreement with the remark of Dr. van der Zanden: equality of a particular physical quantity is certainly no criterion for the identity of the substances in question. There is however a misunderstanding. In the case of cornea and sclera it has been established by results obtained in other ways that the basic substance (about 80 % of the dried substance of both membranes) consists of a continuous mass of collagen. The emphasis in our reasoning does not fall upon the agreement which is more or less obvious and is moreover recovered in this physical phenomenon but on the equally present difference in physical behaviour between cornea and sclera. Furthermore we don't conclude from the coincidence of the vapour pressure isotherms on the identical chemical nature of the substances in question but on the conformity in their micellar structure, thus on a physical property in extra- of super molecular relations.

BOEKAANKONDIGINGEN.

53(075.3)

Benjamin C. Gruenberg, lecturer on the philosophy of science, College of the City of New York and Samuel P. Unzicker, Department of Physical Sciences, New Jersey State Teachers College, Paterson, Science in Our Lives. World Book Company, Yonkers-on-Hudson, New York, 1938, 14 × 20 cm, 754 pp., 411 fig., \$ 1.78.

Dit boek is bestemd als basis te dienen voor het onderwijs in de natuurwetenschap in de eerste klassen van de middelbare school. Er is een groot verschil met de Nederlandsche onderwijsmethode: De wereld rondom ons wordt hier als één geheel beschouwd en de schrijvers gaan steeds uit van eenvoudige vragen, die de kinderen uit zich zelf of naar aanleiding van het voorgaande zullen stellen. Schoolsche kennis wordt vermeden, formules zijn in het gehele boek niet te vinden. Memoriseeren wordt gemak-

³²⁾ Cf. for these problems: R. Houwink, Elasticity, Plasticity and Structure of Matter Cambridge 1937; German Ed.: Steinkopff, Dresden 1938.

³³⁾ In this connection attention may be drawn to the very interesting paper by C. S. Fuller on "Mixed linear condensation polymers". Ind. Eng. Chem. 30, 472 (1938).

kelijk gemaakt door de prettige wijze van vertellen, het directe contact met de dagelijksche ervaring en de vragen en oefeningen aan het eind van ieder hoofdstuk. De verkregen kennis zal oppervlakkig zijn, maar beter beklijven door zijn belang voor het gewone leven en het tegelijkertijd verworven algemeen inzicht.

De opzet blijkt misschien het beste uit de opsomming der deelen: I. The air around us. II. Water. III. Fire. IV. The earth in space. V. Controlling the world. VI. Electricity. VII. Being alive. VIII. Grasping our world.

Jammer is, dat het boek naast zeer goede, ook minder geslaagde deelen bevat. De atoombouw komt er slecht af. Een lithiumkern wordt voorgesteld als uit drie deelen bestaande. Ook lijkt mij de behandeling van het klimaat aan het begin te moeilijk.

Het boek eindigt met een aardige samenvatting over de methode der natuurwetenschap.

H. Kleijn.

544.8(075.8)

P. Arthur and O. M. Smith, *Semi-micro Qualitative Analysis*, Oklahoma Agricultural and Mechanical College. McGraw-Hill Publ. Co., Aldwyck House, London, 1938, XI + 198 pp., 21 × 14 cm, geb. 12 s.

De bedoeling van dit boekje is een handleiding te geven voor semi-micro-qualitatieve analyse. De opzet is eenvoudig en geschikt voor eerstejaars studentén.

'Na een duidelijk overzicht van de werkmethode en constructie van de benodigde apparaten, worden de voornaamste principes van de analyse behandeld aan de hand van de klassieke theorie. Hierna volgen enige uitgewerkte vraagstukken over oplosbaarheid en zwakke electrolyten.

Onder de titel moderne theoriën van electrolyten worden de onderwerpen: hydronium-ion, zouteffect, theorie van Debije en Huckel en copraecipitatie in enkele bladzijden behandeld. In deze vorm had dit ook wel wegge laten kunnen worden.

Typisch Amerikaans is, dat men het nodig heeft geoordeeld ter verduidelijking een paar maal de electronentheorie van Lewis te hulp te roepen in plaats van de electrostatistische voorstellingswijze, die voor problemen als complexvorming en dissocierend vermogen zeer zeker de voorkeur verdient.

Het hier gegeven schema voor de scheiding van de ionen is vrijwel gelijk aan dat, wat men gewoonlijk in de kwalitatieve H_2S -analyse gebruikt; slechts enkele reagentia ondergingen wijziging. Alleen de meest gangbare elementen zijn behandeld.

Tot slot volgt een vragenlijst en enkele opgaven om uit te werken. Het boekje maakt een prettige indruk en is als leidraad bij eenvoudige analyses zeer goed bruikbaar.

J. K. Oosterhoff—Sanders.

621.791.56 : 536.46(022)

D. Séférian, *High Temperature Welding Flames*, The Penton Publishing Company Ltd., London, 1937, 51 pp., 15 fig., 25 × 16 cm, gebonden 3 s. 9 d.

In dit uit het Fransch vertaalde boekje behandelt de schrijver de zuurstof-acetyleen-, de zuurstof-waterstof-, de zuurstof-methaan- en zuurstof-butaan-vlammen, waarvan de eerste twee in de techniek toegepast worden.

Gebruik makende van de specifieke warmten en de dissociatiegraden van de in de vlammen voorkomende gassen, berekent de schrijver de temperatuur en de samenstelling van deze vlammen.

De specifieke warmte en de dissociatiegraad worden zeer uitvoerig besproken in de eerste helft van het boek.

Verder worden de maximum-vlamtemperaturen berekend, die optreden, wanneer de verhouding, waarin de gassen in de vlammen worden aangevoerd, gevarieerd wordt.

J. C. van Eck.

574/578(083.5)

Tabulae Biologicae. Vol. XV (Pars 1.2.3.4), editores W. Junk, C. Oppenheimer, W. Weisbach. Uitgeverij Dr. W. Junk, Den Haag, 1938, 18 × 25 cm, 383 pp., f 35.—, bij abonnement f 30.—.

Zoals bekend vormen de *Tabulae Biologicae* een werk, dat eenig is in zijn soort: het beoogt te geven een verzameling van vooral numerieke gegevens, ontleend aan de biologie en alle daaraan grenzende wetenschappen, gecompileerd en gecontroleerd door bekende specialisten op de betreffende gebieden.

Het is daarom vooral voor laboratoria, die zich met dergelijke onderzoekingen bezighouden, een onontbeerlijk bezit. In verband met den „drogen" inhoud en den hoogen prijs zullen wel weinige belangstellende leken dit werk aanschaffen.

Het onderhavige Vol. XV bevat de volgende bijdragen: R. Oppenheimer, *Sexualhormone I*. F. Dessau, *Sexualhormone II*. R. R. Gates and C. E. Ford, *Chromosome catenations in Oenothera I*, II. A. Purr, *Tumoren bei Mensch, Tier und Pflanze*. N. N. Iwanoff und M. I. Knjaginischew, *Biochemie der Kulturpflanzen I*. H. W. Denzer, *Masse und Gewichte zur vergleichende Anatomie und Histologie der Vertebratenniere I*, II. J. R. Baker, *Latitude and egg-seasons in oldworld birds*. Register.

J. Selman.

668.5(910)(022)

Dr. P. A. Rowaan, *De aetherische oliën van Nederlandsch-Indië* (with english summary, *The essential oils of The Netherlands East Indies*). Kon. Ver. Koloniaal Instituut te Amsterdam, Mededeeling No. XLVII, Afd. Handelsmuseum No. 19, Amsterdam, 1938, 16 × 22,5 cm, 72 pp., 9 fig., f 1.50.

Dit werkje is bedoeld als een beknopte samenvatting van wat in de jongere literatuur over de Indische aetherische oliën is verschenen; het geeft voor elk product de volgende bijzonderheden: „geografische verspreiding binnen Ned. Indië, botanische en inheemse namen, chemische en physische eigenschappen (eventueel bepaalde eischen, b.v. door een pharmacopee gesteld), vervalschingen, verpakkingswijze, export en bestemming daarvan, toepassingen, concurreerende productiegebieden en concurreerende oliën enz." In enkele gevallen worden analysevoorschriften vermeld (citronellal, cineol).

Het overzicht wordt besloten met een korte bespreking van oliën, waarvan de cultuur overwogen en beproefd is zonder dat een productie van eenige betekenis plaats vindt.

Noodde worden richtlijnen voor de verdere ontwikkeling van de productie der aetherische oliën gemist.

Het geheel is zeer belangwekkend; wij wenschen deze publicatie vele lezers toe.

R. Schmidt.

54(075.3)

Dr. A. L. W. de Gee, *Scheikunde voor het middelbaar en gymasiaal onderwijs*; deel I, eerste beginselen, tweede druk. Wolters, Groningen 1938 91 blz., 14 × 21 cm, f 1.10.

In dit eerste deel heeft de schrijver die beginselen van de scheikunde verwerkt, die allen leerlingen van M.O. en V.H.O. moeten worden bijgebracht. In de volgende deelen wordt rekening gehouden met de verschillende richtingen, die de leerlingen vervolgens inslaan. Het werkje is met zorg samengesteld en de schrijver heeft zijn stof met veel overleg gekozen. Wel doet het boekje mij toch nog wat „moeilijk" aan. Overigens blijkt wel uit het zoo spoedig verschijnen van een tweeden druk, dat dit nieuwe leerboek zijn weg reeds gevonden heeft.

H. A. J. Pieters.

CHEMISCHE KRINGEN.

Rotterdamsche Chemische Kring. Ir. W. C. Bokhoven (Naarden) sprak op 13 Februari 1939 over: „Filtratie met Norit, alsmede de toepassing in eenige industrieën.”

Na een kort overzicht over de bereiding van actieve kool, waarbij de activatie met gassen en die met chemicaliën behandeld werd, ging spr. in op de eigenschappen van Norit, waarbij de volgende punten ter sprake kwamen: Totaal poriënvolume in diverse soorten. Verklaring van het ontstaan van de grootte van het inwendig oppervlak, wanneer de afmetingen der poriën steeds kleiner worden; meten van inwendig oppervlak met behulp van bevochtigingswarmte. Verband tusschen poriëndiameter en capillaircondensatie bij de adsorptie van dampen. Microstructuur van actieve kool. Bespreking der resultaten van röntgenografische onderzoeken van Hoffmann en anderen, waaruit bleek, dat actieve kool opgebouwd is uit micro-graphietkristallen. Adsorptieformules van Freundlich en Langmuir. De adsorbeerbaarheid wordt beïnvloed door de volgende factoren: oplosbaarheid van het adsorptief in het oplosmiddel, bevochtiging van adsorbens en vloeistof, chemische structuur van het adsorptief; invoering van OH-, COOH- en NH₂-groepen verlaagt, invoering van CH₃-, C₂H₅- en Cl-groepen verhoogt de adsorbeerbaarheid.

Na een kort overzicht van de methode van het ontkleuren met poedervormig Norit in de praktijk, mengmethode en laag-filtratie, kwam de filtratie van Noritsuspensies onder constanten druk uitvoeriger ter sprake. Er werd op gewezen, dat het verband tusschen filtratiesnelheid en gefiltreerd volume, resp. filtratietijd, bij het filtreerbaarmaken van met colloïden verontreinigde oplosmiddelen door Norit, gecompliceerd is. De verstopping van het filter is sterk afhankelijk van de verhouding colloïden in oplossing tot percentage Norit, dat toegepast wordt, en neemt af, naarmate de colloïden beter op het oppervlak van de kooldeeltjes vastgelegd zijn. De filtratietijd van een constant volume vloeistof wordt bij toenemende percentages Norit eerst belangrijk kleiner, bereikt bij een bepaald percentage een minimum, en neemt dan bij behandeling met grotere hoeveelheden Norit weer toe.

De praktische toepassing van Norit in de bietsuikerfabrieken, bij de raffinage van rietsuiker en in de glucoseindustrie, lichte spr. met behulp van eenige schema's nader toe; daarna besprak hij het gebruik van Norit voor de verbetering van den smaak van drinkwater en van korrelvormig Norit voor de dechlorering.

Ten slotte werd de methode van terugwinning van dampen van vluchtige oplosmiddelen uit lucht en de winning van benzol uit lichtgas met behulp van actieve kool in het kort aangegeven.

Utrechtsche Chemische Kring. Op Donderdag 9 Maart a.s. zal des avonds te 19 u. 45 in de kleine collegezaal van het Pharmaceutisch Laboratorium, Catharijnesingel 60, een gewone vergadering wordt gehouden. Prof. Dr. Ir. J. Böeseken (Delft) zal spreken over: „De beteekenis van het perazijnzuur voor de organische chemie”.

PERSONALIA, ENZ.

Prof. Dr. Ernst Cohen, die op 7 Maart a.s. den 70-jarigen leeftijd zal bereiken, is, naar wij vernemen, dien dag buitenslands.

Het was op 1 Maart 25 jaar geleden, dat Dr. S. Postma benoemd werd tot leeraar in de scheikunde aan het gymnasium en de hogere burgerschool te Zutphen. Voordat hij te Zutphen kwam, was hij leeraar aan de tweede hogere burgerschool te Amsterdam.

Aan de Universiteit van Amsterdam is geslaagd voor het candidaatsexamen wis- en natuurkunde L. mejuffrouw L. S. Katz.

Aan de Universiteit te Leiden is geslaagd voor het doctoraal-examen wis- en natuurkunde, hoofdvak chemie, de heer R. E. J. Zieck.

Aan de Technische Hoogeschool te Delft is bevorderd tot doctor in de technische wetenschap, op proefschrift „Enkele chemisch-technische toepassingen van tyrosine bevattende eiwitten”, de heer Tj. W. A. Borgesius, scheikundig ingenieur, geboren te Rotterdam.

Voor het Natuurkundig Genootschap te Groningen hebben gesproken: Dr. W. Meyer ('s-Gravenhage) over „Vervalsching van voedingsmiddelen vroeger en nu” en Dr. H. Mulder (Hoorn) over „Producten der zuivelindustrie”. Beide lezingen werden door een aantal proeven toegelicht.

In de „Handelingen van het Genootschap van melkkunde” over het jaar 1938, II, treft men de lezing aan, door Dr. H. Mulder gehouden over „De consistentie van boter” en die van Dr. C. I. Kruisheer over „Consistentiebepaling van boter” (vergelijk Chem. Weekblad 35, 719 (1938)).

Bij Springer te Berlijn is verschenen „Reine Metalle”: Herstelling, Eigenschappen, Verwendung”, bearbeitet von A. E. van Arkel, P. Assmann, G. Borelius, G. Chaudron, E. J. Daniels, R. Gadeau, W. Geibel, W. Grassmann, C. R. Hayward, G. Jantsch, W. Kroll, K. Lins, D. J. Macnaughtan, R. Müller, P. Rosbaud, L. Schlecht, W. Schopper, J. Spanner, M. Waehlert und H. Winter; herausgegeben von Prof. Dr. A. E. van Arkel (Leiden); 67 Abb., VII + 574 S.

Als publicaties van de Union Internationale de Chimie (secrétariat général, 28 rue Saint-Dominique, Paris), zijn verschenen: „Comptes rendus de la treizième conférence, Rome, 15—21 Mai 1938” en „Méthodes unifiées pour l'analyse des matières grasses (deuxième rapport de la commission internationale pour l'étude des matières grasses), 1938”.

Van 6 tot 15 Juli a.s. zullen te Berlijn en München de bijeenkomsten worden gehouden van het internationale congres voor glas. Inlichtingen geeft de „Geschäftsstelle”, Frankfurt a.M., I, Junghofstrasse 27.

Op uitnodiging van Dr. J. Blomberg, apotheker te 's-Gravenhage, heeft men gisteren de vertooning kunnen bijwonen van twee wetenschappelijke, door „Bayer” vervaardigde, geluidsfilms: I. „Het bloed”, hoofdstukken uit de hæmatologie; II. „Wonderen die het microscoop ontsluit”.

Ter gelegenheid van het 25-jarig bestaan van het laboratorium der N.V. De Bataafsche Petroleum Maatschappij aan den Badhuisweg te Amsterdam (N.), heeft de directeur van het laboratorium, Ir. G. J. L. Caviët, een herdenkingsrede gehouden.

Op 9 Mei a.s. is het 375 jaar geleden, dat de bierbrouwerij De Boog te Haarlem, welk bedrijf in 1914 met De Haas' azijnfabrieken is vereenigd, voor het eerst met de bereiding van azijn is begonnen.

Onlangs verscheen de vierde mededeeling van de commissie van advies nopens chemische en aanverwante verdedigingsvraagstukken, getiteld „acetylcholine en verwante verbindingen”. Het is een literatuurstudie van de hand van Prof. Dr. H. J. Backer en drs. C. M. H. Kool.

The Electrochemical Society, Inc. houdt van 26 tot 29 April a.s. een bijeenkomst te Columbus (Ohio). Twee symposia behandelen: Refractories for electric furnaces and for corrosive electrochemical products. Electro-organic chemistry in industry.

TER BESPREKING ONTVANGEN BOEKEN.

(aanvragen te richten tot de redactie).

American standard safety code for the protection of heads, eyes, and respiratory organs. Nat. Bur. of Standards Handbook H 24. U.S. Dept. of Commerce, Governments Printing Office, Washington, 1938, 13 × 19 cm, 95 pp., \$ 0.15.

A. E. van Arkel, Reine Metalle, Herstellung-Eigenschappen-Verwendung. Berlin, Julius Springer, 1939, 17 × 25 cm, 574 pp., 67 Abb., RM. 48.—, geb. RM. 49.80.

Deutsches Bergbau-Jahrbuch, 30. Jahrgang 1939. W. Knapp, Halle (Saale), 16 × 24 cm, 116 + 395 + 84 pp., Auslandspr. RM. 11.85.

- A. Bickel, Über die Beziehungen der Qualität des Nahrungseiwisses zum Ablauf des Betriebsstoffwechsels. Benno Schwabe & Co., Verlag, Basel, 1938, 16 × 24 cm, 100 pp., Schw. Frn. 10.—.
- G. Egloff and A. von Grosse, Physical constants of mononuclear aromatic hydrocarbons. Universal Oil Products Company, Chicago, Illinois, Booklet No. 217, 15 × 23 cm, 72 pp.
- A. Hay, The uses and possibilities of rubber in agriculture. Bulletin 8. The British Rubber Publicity Association, London, 1938, 14 × 22 cm, 25 pp.
- W. Lemkin, Visualized chemistry, fourth edition. Oxford Book Company, New York, 1938, 14 × 20 cm, 337 pp., \$ 1.87.
- D. McKnight Jr., A study of patents on petroleum cracking with special reference to their present status. The University of Texas (Austin), 1938, 17 × 26 cm, 627 pp.
- Prof. Dr. E. H. Riesenfeld, Lehrbuch der anorganischen Chemie. 2. Aufl. Fr. Deuticke, Wien-Leipzig, 1939, 17 × 26 cm, 706 pp., 90 Abb., RM. 14.—, geb. RM 16.—.
- P. Schut, De betekenis van het leraarsambt in de tegenwoordige tijd. (Openbare les.) J. B. Wolters, Groningen-Batavia, 1938, 16 × 24 cm, 14 pp.
- L. A. Tromp, Field transport of cane on steel and rubber. Bulletin 9. The British Rubber Publicity Association, London, 1939, 14 × 22 cm, 32 pp.

CORRESPONDENTIE ENZ.

T. te Z. Zie voor ammoniak-luchtontploffingen: W. P. Jorissen, Explosies waarop menigeen niet verdacht is, Chem. Weekblad 25, 228 (1928); A. M. van Deventer, Explosiviteit van koelmedia, dissertatie Leiden, 1936; Gmelins Handbuch der anorganischen Chemie (onder Ammoniak).

Men vraagt of roerstaafjes bekend zijn van kunsthars, bestand tegen vrij hoge temperatuur en verdund zoutzuur.

Aangevraagde boeken. Wanneer men ons boeken opgeeft met verzoek deze ter bespreking aan te vragen, geschiedt dat steeds. Maar de uitgevers zenden niet altijd wat hun gevraagd wordt. Ziet men de titels dus niet vermeld in het Chem. Weekblad, dan zijn de boeken niet ontvangen. Correspondentie kan hierover niet worden gevoerd.

Wij ontvingen 27 Febr. een exemplaar van Krupp's „Führer zur Leipziger technischen Frühjahrsmesse vom 5.—13. März“, die ter inzage ligt op het Redactiebureau, Willem Witsenplein 6, den Haag.

Volume on creep data. De American Society for Testing Materials, 260 South Broad Street, Philadelphia, Pa (U.S.A.), verzoekt ons het volgende op te nemen.

Compiled by the Joint A.S.M.E.—A.S.T.M. Research Committee on the effect of temperature on the properties of metals, this volume of 864 pages affords in convenient form important data on high-temperature creep characteristics of metals and alloys. The 486 sheets of test data, 273 graphs and 37 tables cover wrought steels and ferrous alloys, cast steels and ferrous alloys and non-ferrous materials. Extensive tables give complete data on the large number of materials considered. There are charts of stress and corresponding creep rate for each type of material at each temperature; tabulated forms which give detailed descriptions of each material including its form, heat treatment, chemistry, hardness, grain size after the McQuaid-Ehn test, impact values, initial physical properties, manufacturing data, room temperature properties of specimens after creep tests, creep characteristics, and in so far as possible photomicrographs showing the initial microstructure and microstructures of completed creep specimens. Copies can be obtained from A.S.T.M., 260 S. Broad St., Philadelphia, Pa., at \$ 14. postpaid.

VERBETERING.

Op blz. 121, 1e kolom, regels 39 en 41, staat: albumin (resp. albumins), lees: protein (resp. proteins).

VRAAG EN AANBOD *).

Correspondentie wordt over deze rubriek niet gevoerd: de Redactie zendt alleen brieven door, waarvoor men porto insluit.

Ter overneming gevraagd:

Toestel voor de bereiding van gedestilleerd water in 't klein. N. F. Newbury, The teaching of chemistry.

Ter overneming aangeboden:

- Chem. Reviews 1934 t./m. 1938.
Ind. Eng. Chem. Anal. Ed. 1925, 1934, 1935, 1938.
J. Chem. Educ. 1935, 1936.
1 Heine centrifuge (zuurbestendig) inh. 20 l, 3000 t/min, met drijfwerk; nooit gebruikt.
Nederl. Pharmacopee, 5de uitg.
I. G. Farben, Veröff. des wissensch. Zentrallab. fotogr. Abt.-Agfa. Bd. V, 309 pp.
H. R. Krut en H. S. v. Klooster, Colloids, 1930, 275 pp.
J. G. Rutgers, Bekn. anal. meetkunde, 1925, 471 pp.
B. G. Escher, Alg. mineralogie en kristallographie, 1935, 500 pp.
Chem. Weekblad, 1908—1926 in stempelband; 1927 — heden in losse afl.
Clayton, Emulsions, 3rd ed, 1935.
Findlay, The phase rule, 1911.
Abel, Bakteriologisches Taschenb., 1916.
Banson, Senior practical chemistry, 1919.
Le Blanc, Elektrochemie, 1911.
Haber, Thermodynamik techn. Gasreaktionen, 1905.
Winikler—Brunik, Techn. Gasanalyse, 1919.
Zimmermann u. Mäder, Das Beizen und Färben des Holzes, 1920.
Weinschenk, Das Polarisationsmikroskop, 1919.
Böeseken, Koolwaterstoffen I en II (1915 en 1916); Koolzuur- en cyaanderivaten, 1913; Beknopte scheik. der suikers, 1912.
Bakhuys Roozeboom, Heterog. Gleichgewichte, 1911, 3, 1e deel.
Diverse gasdroogstoven wegens aanschaffing van elektrische.
Pharm. Weekblad 1919, '20, '22, '23, '27, '28, '29 compl. '21, '30 inc. alles in afl.
P. Harting, Het mikroskoop, 4 dln. (1848—1850), 1469 pp., geb.
G. J. Mulder, De elementen, 1844, 27 pp.
A. Duflos u. A. Hirsch, Oekonomische Chemie, 1842, I, 155 pp.
W. Odling, Manual of chemistry, I, 380 pp. (1861).
A. C. Oudemans Jr., Hist.-krit. overzicht v. d. bepaling der equivalent-gewigten van 22 metalen, 1853, 174 pp.
W. H. de Vriese, De handel in getah-pertja, 1856, 46 pp.
H. E. Potts, The chemistry of the rubber industry, 1912, 153 pp.
J. Frick, Physikalische Technik, 1864, 656 pp.
A. Burgemeister, Das Glycerin, 1871, 63 pp.
A. C. Oudemans, Das spez. Gewicht der Essigsäure u. ihrer Gemische m. Wasser, 1866, 59 pp.
G. J. Mulder, Studium generale, 1865, 36 pp.
E. Mulder, De methode bij scheik. onderz. te volgen opgespoord u. d. geschiedenis, 1868, 36 pp.
P. J. van Kerckhoff, Over chem. verbinding, 1868, 37 pp.

Economische Berichten.

Nadere inlichtingen verstrekt het Bureau der Vereeniging van de Nederlandsche Chemische Industrie, Laan Copes van Cattenburch 16, Den Haag¹⁾.

*België.**

Kalksuperfosfaat en celluloid in bladen. Bij Kon. besluit van 18 Februari j.l. is de invoer van kalksuperfosfaat, geprecipiteerd fosfaat (post 392) en van plastische stoffen van cellulose (celluloid, cellulose-acetaat, viscose, enz.) in dunne bladen (post 1173 d en f-2) eveneens afhankelijk gesteld van een invoervergunning. Beide besluiten zijn dd. 20 Februari 1939 in werking getreden.

*Letland.**

Tariefwijziging. Met ingang van 16 Februari j.l. zijn de volgende wijzigingen aangebracht in het Letsche douanetarief (per kg):

- 269 aliphatische alcoholsoorten, met uitzondering van aethylalcohol en glycerine; b. propyl-, butyl-, amyl- en andere daarmede overeenkomende alcoholen,
1. oleinalcohol Ls. 0.30 (2.00)
2. andere „ 2.00

*) Wie uitvoerigere mededeeling wenscht, plaatse een advertentie.

¹⁾ De met * gemerkte berichten zijn ontleend aan gegevens, verstrekt door den Economischen Voorlichtingsdienst van het Departement van Economische Zaken.