than 2% of their usual phytofluene content, and represents but a negligible fraction of the total polyenes which are built up in the fruit during the ripening process.

The polyene nature of phytofluenol is indicated by the appearance of a dark bluish-green coloration when its hexane solution is filtered through acid earths (filtrol). It is more sharply characterized by the spectral curve, the shape of which is practically identical with that of phytofluene, showing in hexane solution two steep main maxima, at 348 mμ and 367 mμ respectively (see figure).

Phytofluenol and phytofluene may be easily differentiated by their behavior in partition or adsorption tests.

When partitioned between equal volumes of hexane and 83% ethanol, the ratio of concentration in the upper phase to concentration in the lower phase was found to be 6:1 for phytofluenol but 100:0 for phytofluene. In the partition between hexane and 95% methanol, the corresponding ratios were 2·2:1 for phytofluenol and 100:1 for phytofluene.

As we reported earlier, phytofluene shows strong adsorption affinity. This is, however, much surpassed by that of phytofluenol. The following top-to-bottom sequences on a calcium hydroxide column are typical:

Developed with petroleum ether (b. p. 60–70°) containing 15%acetone:	Developed with petroleum ether containing 1–3% acetone:
Lycopene	γ-Carotene
Neo-lycopene A	β-Carotene
Phytofluenol	α-Carotene
Cryptoxanthin	Phytofluene
γ-Carotene	Neo-α-carotenes

Evidently, the strength of the adsorption affinity of polyenes (with carotene-like carbon skeletons), cannot generally be predicted, even for hydrocarbons, solely on the basis of the number of all double bonds or conjugated double bonds present. When compared to the chromophore of carotenoid pigments, the conjugated systems of phytofluenol and phytofluene appear to be "incomplete", in the sense that they leave a considerable part of the aliphatic chain in the saturated state. This particular feature seems to be responsible for the surprisingly high adsorbability of the two colorless polyenes under discussion as well as for their strong fluorescence in solutions and adsorbates.

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Zusammenfassung

Die farblosen, lebhaft fluoreszierenden Polyene, Phytofluen und Phytofluenol, wurden in Pflanzenextrakten aufgefunden. Sie werden spektroskopisch sowie chromatographisch gekennzeichnet und ihre Beziehung zu carotinoiden Farbstoffen wird besprochen.

Mikrofibrillenbau der pflanzlichen Zellwände

Durch eine geeignete Zerkleinerungsmethode ist es gelungen, hinreichend dünne Fragmente von pflanzlichen Zellwänden *mit ungestörtem Feinbau* zu erhalten, die nach der Metallbedampfungsmethode präpariert[1], im Elektronenmikroskop einen wundervollen Fibrillenbau zeigen[2]. In Dutzenden von Aufnahmen, von denen hier vier reproduziert sind, kann festgestellt werden, daß sowohl die zum Flächenwachstum befähigten Primärwände als auch die durch Apposition niedergelegten Sekundärwände aus Mikrofibrillen[3] mit auffallend konstantem Durchmesser von 250–300 Å aufgebaut sind.

In den Primärwänden zeigen die Mikrofibrillen Streuung um eine Hauptrichtung (Abb. 1), wie dies für die

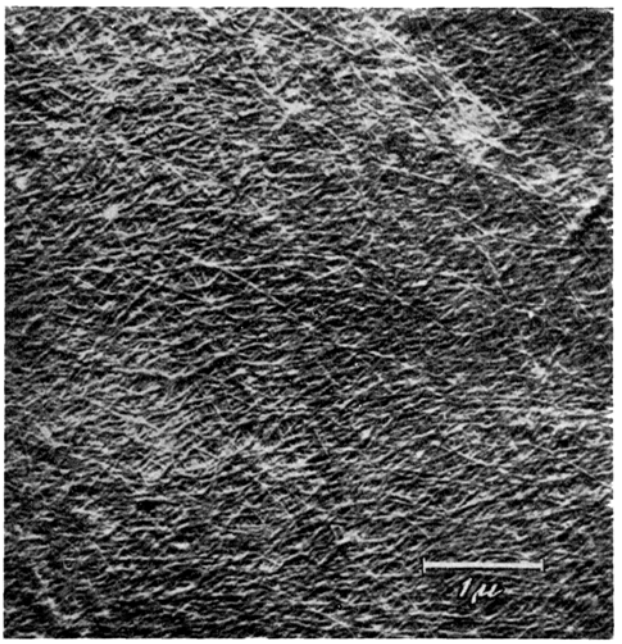

Abb. 1. Primäre Zellwand aus dem Wurzelmeristem von *Zea Mays*.

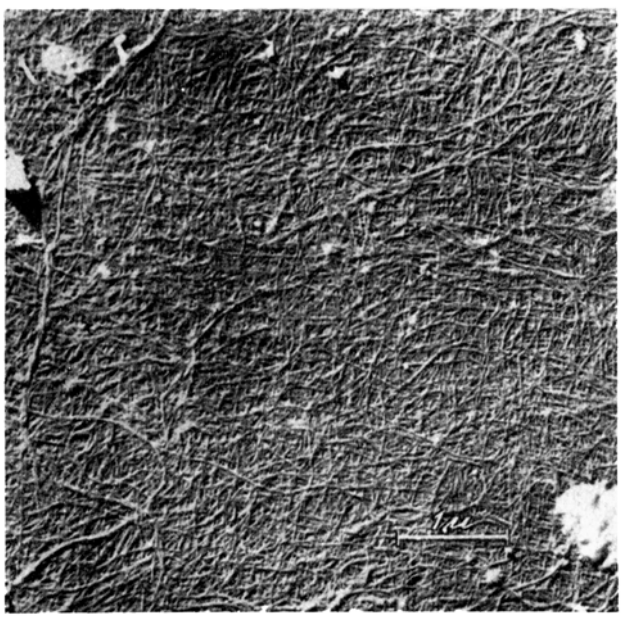

Abb. 2. Primäre Zellwand einer Flachsfaser.

[1] R. C. Williams und R. W. G. Wykoff, J. Appl. Physics *17*, 23 (1946).
[2] K. Mühlethaler, Biophysica acta, im Druck.
[3] A. Frey-Wyssling, Protoplasma *27*, 402 (1937).

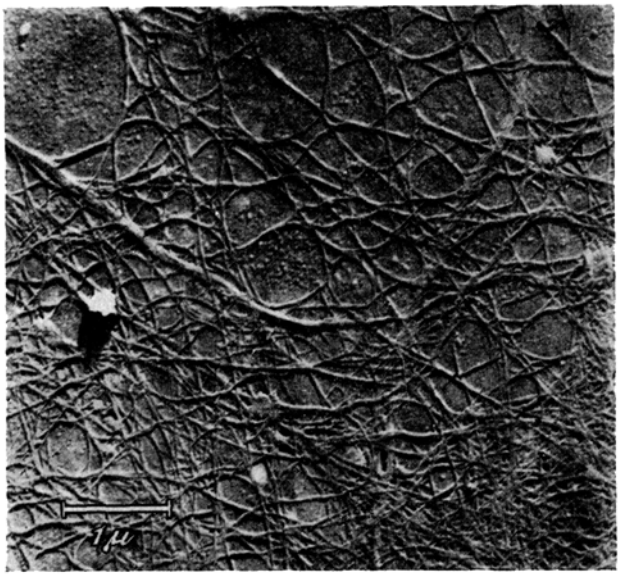

Abb. 3. Wachsende Primärwand aus der Maiskoleoptile.

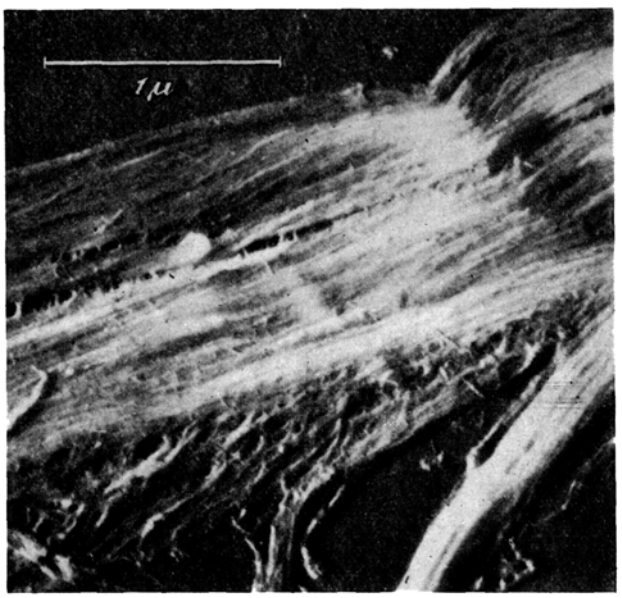

Abb. 4. Sekundärwand des Baumwollhaares. Rechts ist eine Stauung sichtbar, die sich im Lichtmikroskop als «Verschiebungslinie» zu erkennen gibt.

Röhrentextur der wachsenden Zellwände auf Grund indirekter Untersuchungsmethoden angegeben worden ist. Ferner kann man erkennen, daß die Mikrofibrillen der Primärwand sich gegenseitig *durchweben* (Abb. 2). Hieraus muß man schließen, daß sich die Primärwand nicht an der Oberfläche des Protoplasten bildet, sondern daß sie während des Wachstums vom lebenden Zytoplasma durchtränkt ist. Beim Flächenwachstum wird das Netzwerk der ruhenden Wand aufgelockert (Abb. 3) und nachträglich durch Einflechtung neuer Fibrillen wieder verstärkt[1].

In der Sekundärwand sind die Mikrofibrillen parallel gelagert (Abb. 4) und bilden dadurch eine viel dichtere Textur (Paralleltextur). Trotzdem sind die Mikrofibrillen von gleicher Dicke wie in den Primärwänden. Dies spricht für eine Kontrollierung der Zellulosekristallisation durch das lebende Zytoplasma.

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Summary

Primary and secondary cell walls display a beautiful fibrillar texture under the electron microscope. Microfibres of cell walls from many plants and from cultures of cellulose-forming bacteria have a remarkably constant diameter of 250–300 Å.

[1] A. FREY-WYSSLING, Protoplasma *25*, 279 (1936).

[1] E. SCHMIDT and co-workers, Cellulosechemie *10*, 126 (1929).

Tensile Strength and Chemical Composition of the Middle Lamella of the Flax Fibre

If flax fibre strands, treated with hot water, are submitted to tensile strength tests at a test length greater than the length of the elementary fibres, ruptures occur in the intercellular substance (the middle lamella), the strength of the latter being much lower than that of the fibres themselves. Thus, the tensile strength of the wet strands is a measure of the strength of the middle lamella. It may be assumed that this strength is dependent on the chemical properties of the lamella, and that a change in the strength is caused mainly by an alteration in the chemical constitution of the lamella.

In a study of the tensile strength of unretted flax strands in the wet state, after different chemical treatments, the author found it possible to reduce the strength of the intercellular substance to zero in three definite steps, i.e. by treatments with (1) solvents for pectin (hot dilute ammonium oxalate or sodium hexametaphosphate solutions), (2) dilute alkali, and (3) solvents for lignin (alternating treatments with dilute solutions of chlorine dioxide and sodium bisulphite[1]). Consequently, pectin and lignin, which have been earlier recognized as components of the middle lamella[2], both contribute to the strength of the lamella. In addition, the lamella seems to contain a third joining component which is soluble in alkali but insoluble in ordinary pectin dissolving reagents. However, the effect of the alkali might also be interpreted as depending on its swelling action. Therefore, an experiment was performed in which flax strands were extracted with ammonium oxalate or alkali, washed, and dried very slowly over sulphuric acid of increasing concentrations in order to reduce the swelling of the strands as far as possible. After renewed treatment with hot water the tensile strength of the wet strands was determined. The influence of the interposed drying on the strength of the strands was insignificant. This seems to support the opinion that the alkali dissolves a certain substance which forms a joining system in the middle lamella, and which is insoluble in hot dilute ammonium oxalate.

The lignin component could also be extracted directly after the removal of the pectin, without eliminating a rather considerable residual strength which could then be eliminated by treatment with weak alkali. Thus, the lignin and the oxalate-insoluble, alkali-sensitive com-

[2] K. STÖRMER, Diss. (Leipzig 1904). – G. HAVENSTEIN, J. Landwirtschaft *23*, 1 (1875).