to follow in its later growth the same logistic curve which it has followed in its earlier growth *only* if there has been no serious or cataclysmic alteration of the conditions (climatic, geological, biological, economic or social) under which its earlier growth has taken place. The present evidence indicates that the population of the United States during the period 1910–1930 continued in its growth along the same logistic curve that it had followed in the period 1790–1910.

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LIGNIN AS A POSSIBLE FACTOR IN LODGING OF CEREALS

LODGING is the laying over of the cereal plants at a period when their vegetative growth is nearly completed. It interferes with the normal development of the grain, frequently causing a loss of from five to ten bushels per acre.[1] The accepted opinion is that lodging is generally caused by nitrogenous overnutrition, as it occurs most frequently on naturally fertile soils rich in humus and on soils heavily fertilized with manure or inorganic nitrogen carriers. Lodging is consequently more of a problem under conditions of intensive cultivation than under those of extensive cultivation.

The immediate causes of lodging have been a matter of controversy for more than a century. Sir Humphry Davy[2] in 1798 associated lodging with a low silica content of the straw, although, as was characteristic of his time, his views were based largely on speculation. In 1842 Liebig,[3] the "father of agricultural chemistry," also attributed lodging to a deficiency in silica. His views were supported by a number of investigators but were opposed by the pioneer plant physiologist Sachs[4] and others. In 1900 Swiecicki,[5] after a thorough analysis of the opposing views of Liebig and Sachs and their respective followers and on the basis of his own experiments, upheld the view that lodging is caused by a deficiency in the silica content of the straw. He found that the silica content was invariably lower in lodged oats and barley than in normal crops of these cereals grown under comparable conditions. More recently Headden[6] and Davidson and LeClerc[7] found that the application of sodium nitrate, which frequently causes lodging, depressed appreciably the ash and silica content of wheat straw. In view of all this evidence pointing toward silica deficiency as a possible factor in lodging, it is remarkable that Welton,[1] who recently made an extensive investigation of the causes of lodging, did not deem it necessary to include ash and silica in the analytical examination of his materials.

Another factor which is considered as one of the causes of lodging is a deficiency in the lignin content of the plants.[1,4] It has been assumed that lignin lends mechanical support to the stalks, thus preventing them from falling over. The Bureau of Chemistry and Soils has undertaken to ascertain whether or not lignin is a factor involved in lodging of cereals.

Two wheat plots, about 1/50 acre each, were selected in the same field on the Arlington Experimental Farm. One received no fertilizer treatment and served as a control; the other received early in spring sodium nitrate at the rate of 600 pounds per acre, obviously a high application for wheat. The wheat on the fertilized plot grew luxuriantly but suffered from characteristic lodging close to the "milk" stage of the grain. That on the control plot remained erect until harvested. Samples cut from the two plots at frequent intervals up to maturity were analyzed for total ash, silica and other ash constituents, and lignin.

The results, which will be published in full elsewhere, corroborate those of Swiecicki and of Davidson and LeClerc mentioned above. The silica and ash content in the straw from the fertilized-lodged plot was in every case lower than from the control plot.

What came as a surprise, however, was that, contrary to the views of Sachs and of Welton, the lignin content of the straw from the fertilized-lodged plot was distinctly higher in every case than of that from the control plot. Accordingly, should the cause of lodging be sought in lignin-content variations between the lodged and erect plants, the conclusion would have to be reached that a high and not a low lignin content is the cause of lodging. This is in accord with the recent work of Dadswell and Hawley,[8] who found that brash specimens of Douglas fir contained a higher lignin content than tough specimens. It

1 F. A. Welton, "Lodging in Oats and Wheat," *Bot. Gaz.*, 85: 121, 1928.

2 Davy, "Elements of Agr. Chemistry," p. 51, 1813.

3 Liebig, "Die Chemie in ihrer Anwendung auf Agriculturchemie und Physiologie," 1 Theil, "Ernährung der Vegetabilien," p. 168, 1862.

4 Sachs, "Experimental-Physiologie der Pflanzen," p. 150, 1865.

5 Vitold von Swiecicki, "Die Anwendung der Kieselsäure als Bestandteil der Pflanzen und ihre Beziehung zum Lagern des Getreides," Berichte aus dem Physiologischen Laboratorium und Versuchanstalt des Landwirtschaftlichen Instituts der Universität Halle, p. 66, 1900.

6 W. P. Headden, "A Study of Colorado Wheat," Part III, Colo. Exp. Sta. Bul. 219.

7 Jehiel Davidson and J. A. LeClerc, "Effect of Various Inorganic Nitrogen Compounds Applied at Different Stages of Growth on the Yield Composition and Quality of Wheat," *Jour. Agr. Res.*, 23: 55, 1923.

8 H. E. Dadswell and L. F. Hawley, "Chemical Composition of Wood in Relation to Physical Characteristics. A Preliminary Study," *Ind. Eng. Chem.*, 21: 973, 1929.

would seem that the relatively higher lignin content makes the straw (or wood) brittle so that it tends to break under the violent impact of winds, whereas with a normal lignin content the plants only bend and straighten out again.

No explanation can be offered at present for the increase in lignin caused by nitrogenous hypernutrition. It may be due to an effort on the part of the plant to overcome the weakening of the culms caused by the relative decrease in silica.

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Salts of the enolic form of quinaldine: F. W. BERGSTROM (introduced by E. C. Franklin). Formally quinaldine is a ketone of the ammonia system because of the CH_3–C = N– grouping, but the ketonic properties are generally subordinated to the stability of the six-membered ring. Nevertheless quinaldine reacts readily with liquid ammonia solutions of the ammono bases, KNH_2, $NaNH_2$, $LiNH_2$ and $Ba(NH_2)_2$ to form salts. These salts are colored a deep red and are very reactive. A liquid ammonia solution of ammonium bromide reacts with them to form an unstable ammonium salt, or perhaps the pseudo quinaldine itself, which soon changes into ordinary quinaldine. Methyl iodide and ethyl bromide, in liquid ammonia solution, react to form, respectively, 2-ethyl and 2-n-propyl quinoline, a reaction akin to the alkylation of acetoacetic ester. The potassium salt of the enol modification of quinaldine is readily soluble in ether. The above-mentioned reactions can also be carried out in ether solution.

The rotation of the planets Uranus and Neptune determined from spectroscopic observations (illustrated): J. H. MOORE (introduced by R. G. Aitken). In 1911 Lowell and Slipher found from their spectrographic observations of Uranus that the planet is rotating in the same direction as that of the revolution of its satellites and with a period of 10¾ hours. Leon Campbell, Slavenas and others have reported a variation in the planet's light in very closely this period, while Stebbins, from observations made with the photoelectric photometer, concluded that the light of Uranus is constant. Recent observations obtained at the Lick Observatory with spectrographs of three-prism and one-prism dispersion confirm the direction of the planet's rotation as found by the Lowell observers. The period of rotation derived from fifteen one-prism spectrograms in 1928, 1929 and 1930 is of the order of that previously found. The three-prism spectrograms to which exposures of 6 hours were given are under exposed and difficult to measure. The period derived from two of these obtained in 1927 is 11.5 hours. A consideration of the probable sources of the discrepancy in observations of planetary rotation obtained with different spectrographs shows that for objects like Uranus and Neptune with small apparent disks the rotation period determined spectrographically is at best only approximate. Seven well-exposed spectrograms of Neptune were obtained with the one-prism spectrograph in 1928. The slit was placed parallel to the planet's equator, the position of which was derived by Eichelberger and Newton on the assumption that the well-known motion of the plane of the satellite's orbit is caused by the attraction of an equatorial protuberance on the planet. All these spectrograms show a very noticeable inclination of the spectrum lines, in the sense that the portion of the line originating at the east limb of the planet is displaced toward the violet, indicating that the rotation of Neptune, like the other planets, with the exception of Uranus, is direct. The measured inclination of the lines yields an approximate period of rotation for Neptune of 15.8 ± 1.0 hours. The investigation of the rotation of Uranus and Neptune was carried on jointly by the author and Dr. D. H. Menzel.

Spectrophotometric measures of interstellar light-absorption (illustrated): ROBERT J. TRUMPLER (introduced by R. G. Aitken). The investigation of open star clusters recently furnished some definite evidence that within our Milky Way system light rays, passing through interstellar space, suffer a loss of intensity. Such a phenomenon is usually designated as "absorption" in the most general sense of the word. On the one hand the evidence is based on the fact that distances of open star clusters derived from their angular diameters do not agree with those derived from magnitudes and spectral types of the stars. On the other hand, we also find a change of color with distance for stars of the same spectral type, which indicates that the absorption is selective, *i.e.*, that it depends on the wave-length of the light. In order to gain information on the physical process causing this absorption and on the nature of the absorbing medium, it is of prime importance to find the law according to which the absorption depends on the wave-length. For this purpose the spectra of the brighter stars in the clusters N.G.C. 6910 and N.G.C. 6913 (distance about 2,000 parsecs) were observed with the slitless quartz spectrograph of the Crossley Reflector and compared with the spectra of relatively near stars of the same spectral type. Taken on Panchromatic plates these spectra cover the region from 6300 A to 3200 A and show at once the great difference in the intensity distribution of the continuous spectrum between near and distant stars. This difference, which must be an effect of interstellar light absorption, was measured with a Moll self-registering microphotometer. The results show that the absorption increases rapidly with decreasing wave-length; but the absorption does not seem to be inversely proportional to the fourth power of the wave-length, which law should hold if the effect were due to Rayleigh scattering by extremely small particles.

Report on the completion of the research surveys of 1,091 minor planets: A. O. LEUSCHNER and H. THIELE.