turn, actuates an electro-magnet. In the case of the sorting machine this magnet opens a chute along which the card slides until it falls into the proper receptacle.

In the tabulating and accounting machines a row of brushes, corresponding to the columns of the card, takes the place of the single brush. . . . The contacts, similarly made, energize counters or print banks.

Because they are operated by electrical rather than by any mechanical means, flexibility is an inherent feature of all electric tabulating and accounting machines. To attain this flexibility the more complex machines employ a plugboard which is similar in principle to a telephone switchboard.

A tabulator with four counters can, with an automatic control device, carry individual items, sub-totals, intermediate totals and grand totals in different counters. It prints at will each item or total as it is produced on the counters.

The original tabulator could perform additions only. In order to make the machine perform a subtraction it was necessary to feed into the machine a card on which the complement of the number to be subtracted was punched. A more recent machine is the direct subtraction tabulator.

Auxiliary machines which may be of major importance in some applications are the "verifier," the "reproducing punch," the "gang punch" and the "automatic interpreter," the last being a device for *printing* on the card the data already punched.

Among the important newer types are the "alphabetic punch," the "automatic summary punch" and the "multiplying punch." The summary punch produces summary cards during the process of tabulation. It eliminates the manual preparation of such cards from the printed record. The multiplying punch performs direct multiplications of numbers up to eight digits; it can be made to perform operations of the type $A \pm (B \times C)$.

The power of the Hollerith method, in addition to its flexibility and reliability, is the superhuman speed with which the machines operate. These speeds vary with different designs of the same machine. The following are quoted: A sorter will handle 400 cards a minute, the tabulator 150 cards a minute. The multiplying punch is slow compared with these speeds. It performs 1,500 operations per hour for 3-digit multipliers, and 740 per hour for 8-digit multipliers.

Only the first twenty pages of the book deal with the development and principles of the method, and with descriptions and illustrations of various tabulating machines and special devices. The bulk of the volume consists of thirty-eight chapters on various applications, grouped into nine parts.

Of particular interest is the part on miscellaneous research applications by Professors Hooton (anthropology), Eckert (astronomy), Spengler (economics), Fletcher (literature) and Johnson (social science). This part and that on methods of solution of statistical problems give, more so than the remainder of the volume, an insight into the great variety of possible applications of the Hollerith machines. They show that the machines can solve problems of almost any description. An experienced user of the machines has learned to adopt his procedure to the types of operation that the machines will perform. An interesting example of this adaptation is the Mendenhall-Warren-Hollerith correlation method, by which the coefficients of the normal equations in the method of least-squares are formed with a sorter and tabulator only. These coefficients are the sums of products of the coefficients of the observation equations, yet no direct multiplication is performed.

The chapter on astronomy by Eckert is the most tersely written article of the collection. It covers a wide range of applications in this field. It is regrettable that this article does not give more details. Due credit is given to Comrie's pioneer work in this field. Fletcher's chapter on applications in literature describes the use of an alphabetic punch in the construction of word indices and of concordances, an excellent use of the Hollerith method.

Every one reading this book, wholly or in part, will recognize that it has excellent qualities. Almost every single article is suggestive, interesting and worth reading. The book as a whole, however, hardly deserves such a favorable comment. There is too much irrelevant material; there are too many applications of the same elementary type. It is the reviewer's impression that the editor could have welded these thirty-eight articles into a smaller volume giving more condensed information.

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REPORTS

PRINCIPAL DECISIONS CONCERNING NOMENCLATURE MADE BY THE SIXTH INTERNATIONAL BOTANICAL CONGRESS, AMSTERDAM (1935)

(1) GENERAL acceptance of the text of the "International Rules of Botanical Nomenclature," ed. 3 (1935), as representing the decisions of the fifth International Botanical Congress, Cambridge (1930).

(2) Special acceptance of the date, January 1, 1935, recommended (instead of January 1, 1932) by the editorial committee of the "International Rules," ed. 3, (1935) as the starting-point for obligatory Latin

diagnoses of new groups of living plants (Bacteria excepted).—*Syn. Prop.* 29, Art. 38.

(3) Addition to Art. 20 of a paragraph to the effect that the two volumes of Linnaeus, "Species Plantarum," ed. 1 (1753) are treated as having been published simultaneously.—*Syn. Prop.* 16, Art. D 20.

(4) Treatment of provisional names (*nomina provisoria*) as not validly published.—*Prop. Brit. Bot.* (1929), 16, Art. 44; Briq. *Rec. Syn.* 41, Art. 37 ter; amended wording, excluding the words *"seu eventuale."*

(5) Treatment of alternative names (*nomina alternativa seu eventualia*) as validly published. Example: The names *Cymbopogon Bequaerti* De Wild. and *Andropogon Bequaerti* De Wild., proposed simultaneously as alternative names for a new species described in *Bull. Jard. Bot. Brux.* vi. 8 (1919), are both treated as validly published.

(6) Replacement of Art. 54, paragraph 2, by a paragraph to the following effect:

"When, on transference to another genus, the specific epithet has been applied erroneously in its new position to a different plant, the new combination must be retained for the plant on which the epithet was originally based, and must be attributed to the author who first published it."—*Syn. Prop.* 39, Art. B 54, amended wording.

(7) Textual amendment of Art. 60. The second sentence to read as follows:

"The publication of an epithet in an illegitimate combination must not be taken into consideration for purposes of priority, except as indicated under Art. 61."—*Syn. Prop.* 46, Art. A 60 [This brings the text of Art. 60 into conformity with Art. 61].

(8) Addition to Art. 61 of a paragraph to the following effect:

"When an author simultaneously publishes the same new name for more than one group, the first author who adopts one of them, or substitutes another name for one of them, must be followed."—*Prelim. Opin.* 18, Art. A 61 [The same principle of selection is already embodied in Art. 56, where two or more names have been published simultaneously for the same group].

(9) Addition to Art. 70 of a note to the following effect:

Note 2 bis. "The liberty of correcting a name must be used with reserve, especially if the change affects the first syllable, and above all the first letter of the name."

Example: The spelling of the generic name *Lespedeza* must not be altered, although it commemorates Vicente Manuel de Céspedes.—*Syn. Prop.* 52, Art. D 70; *Rhodora,* xxxvi. 130–132, 390–392 (1934).

(10) Rec. XLIII amended to read as follows:

"Specific (or other) epithets should be written with a small initial letter, except those which are derived from names of persons (substantives or adjectives) or are taken from generic or vernacular names (substantives or adjectives)."

Additional examples: *"Schinus Molle* (Peruvian vernacular name), *Astrocaryum Tucuma* (Brazilian vernacular name)."—*Syn. Prop.* 55, Rec. B XLIII.

(11) Art. 72, Section (1), to be replaced by the following: "A Greek or Latin word adopted as a generic name retains its classical gender. In cases where the classical gender varies, the author has the right of choice between the alternative genders. In doubtful cases, general usage should be followed.

"The following names, however, whose classical gender is masculine, are treated as feminine in accordance with historic usage: *Adonis, Orchis, Stachys, Diospyros, Strychnos. Hemerocallis* (m. in Sp. Pl.: Lat. and Gr. *hemerocalles* n.) is also treated as feminine in order to bring it into conformity with all other generic names ending in *-is."—Syn. Prop.* 58, Art. C 72.

(12) (a) Rejection of the principle of *Nomina specifica conservanda* by a majority of 208: 61.—*Syn. Prop.* 18, Art. A 21, 21 bis.

(b) Appointment of a Special Committee to draw up a list of names of economic plants in accordance with the International Rules. This list may remain in use for a period of ten years.

(13) A resolution was passed recommending the adoption by botanists of the standard-species (*species lectotypicae*) of Linnean generic names printed in *International Rules,* ed. 3, pp. 139–143, unless there is clear reason for rejecting any species in favor of another. Any changes considered desirable should be communicated to the Secretary of the Special Committee for Phanerogamae and Pteridophyta, Miss M. L. Green, The Herbarium, Royal Botanic Gardens, Kew.

(14) The list of Standard-Species of Nomina generica conservanda printed in *International Rules,* ed. 3, pp. 143–146, was referred to the Special Committee for Phanerogamae and Pteridophyta.

(15) The lists of *Nomina generica conservanda proposita* printed in *International Rules,* ed. 3, pp. 118–138, *Synopsis of Proposals,* pp. 66–73, and *Preliminary Opinions,* p. 25, were referred to the appropriate Special Committees appointed at Amsterdam.

(16) Acceptance of the list of *Nomina familiarum conservanda* printed in *Syn. Prop.* pp. 64–65.

(17) The following four resolutions concerning Algae were adopted:

1. In describing new species of Algae special importance should be attached to the provision of illustrations and to maintenance of cultures of the species concerned.

2. The desirability of adopting further monographs as the starting-points of particular groups of Algae, as in the *Oedogoniaceae,* should be investigated.

3. A list of *Nomina dubia* of species, genera and families should be prepared, and also lists of *Nomina conservanda* and *rejicienda* of genera and families.

4. The desirability of retaining the Latin language for diagnoses of new Algae should be investigated.

(18) All proposals concerning mycology, submitted to the Amsterdam Congress, were referred to subcommittees to be appointed by the Special Committee for Fungi.

(19) Additions concerning paleobotany to be made to the rules and recommendations for the following objects:

1. To recognize as taxonomic groups, organ genera and artificial or form genera.

2. To ensure that the names originally given to detached organs or parts of plants shall only be used in their original signification, and shall not be employed in the designation of different organs, or of the plant as a whole.

3. To provide for the naming of an entire plant when it has been possible to reconstruct it by the association of its different organs.

4. To define how the names of the artificial genera are to be used.

5. To set up a permanent committee to consider the interpretation of the rules; to adjudicate in cases of dispute or difficulty; to draw up lists of *Nomina generica conservanda;* and to make such further recommendations as may prove necessary, including rules for the determination of types.

(20) Appointment of a Special Committee to report on the effects of the adoption of the proposed Art. A 19 and Appendix "IX," dealing with the rejection of certain works.—*Syn. Prop.* pp. 15, 77–80.

T. A. SPRAGUE

SPECIAL ARTICLES

THE EFFECTS OF PHYSIOLOGICAL AGENTS ON ADULT TISSUES IN VITRO[1]

THE dormant state of adult tissue cells has been studied by observing the effect of various agents upon the initial growth of the adult tissue *in vitro.* Fresh pieces of adult tissue (mainly chicken aorta) have been treated with these agents previous to planting in a dilute plasma medium. The resulting effects on the lag period preceding growth and on the rate of the initial growth have been recorded.

Furthermore, the physiological state of the cells has been studied by treating active cultures of adult tissue cells with various "factors" obtained from normal blood plasma.

A study of over 40,000 pieces of tissue has given the following results:

(1) The lag period preceding the first visible growth of fibroblasts from aortas of one-year-old chickens was normally three to five days (as contrasted with a few hours for embryo tissue).

(2) The lag period of aorta tissue from five- or six-year-old chickens was about the same as that of the one-year chickens, but the average rate of initial growth was 46 per cent. faster for the older tissue.

(3) Plasmas from the older chickens induced growth 9 per cent. sooner than young plasmas. The initial growth rate was 50 per cent. faster in two-year plasmas than in one-year plasmas; but it was 21 per cent. slower in the five-year plasmas than in the one-year plasmas.

(4) Trypsin stimulates the growth of adult tissue. Digestion of the tissue with trypsin previous to planting in a plasma medium reduces the lag period to less than one day and accelerates the rate of the initial growth. This has been repeated many times, not only on artery tissues, but also on liver, thyroid and some tumors. Papain stimulates in the same manner.

(5) The stimulating action of trypsin was found to result from the proteolytic digestion of the tissue. This apparently removed an inhibitor contained in the tissue. The digestion fluid after this treatment was found to contain an inhibitor which could be precipitated out. This "tissue inhibitor" is destroyed by heat. It seems to be widely distributed in normal adult tissues (and in tumors). It presumably plays a rôle in restraining growth in adult animals. It appears to be produced by cells in tissue culture.

(6) Embryo extract and spleen extract had little effect on the initial growth of adult tissue. Both contain inhibitors. Pituitary growth hormone was slightly stimulating, particularly in the presence of serum.

(7) Blood plasma contains a growth stimulant, the "A factor." It is present in a concentration more than adequate to induce growth *in vitro.* It is also present in tissues, in lymph, in urine, in serum and in the ultrafiltrate from serum. Serum ultrafiltrate is prepared routinely for use in washing cultures and as a basic medium in our sterile perfusion pump.

[1] These investigations have been supported by grants from the Josiah Macy, Jr., Foundation.