

to correspond to a number and kept on special blanks; collaterals to be registered on separate blanks).

Blanks for *baby records* (growth, development, etc., complete in physical and psychological features, but not too exacting—extra data to be inscribed on special pages provided).

Blanks for *personal history* (of each individual of over one year of age, from birth to time of writing—later occurrences to be placed under "special happenings").

Blanks for *phenomena of attack of illness, injury or operation* (when they occur—to be filled in by physicians).

Charts for *weight and height* (also tables of standard weights and heights). Blanks for *observations and findings of specialists*; charts for *special clinical data* (eye, ear, nose, throat, etc.); blanks for *laboratory findings* (urine, feces, blood, sputum, etc.); pictorial charts for *anatomical memoranda*; blanks and charts for *dental memoranda*; special blank for *photographs* (interesting to preserve photographs at different ages, of children and adults); and, among the most important, pages for *special happenings*, notable occurrences of personal history, including memorabilia of tendencies, trends of thought, genesis and course of purpose, cherished or revealed potentialities, ideals, conduct, self-discipline, lines of development, of capacities, education, achievements, distinctions, renunciations, conservations, etc., constituting a picture of the evolution of personality.

The whole to afford accurate data, whereon alone can be based many present and future determinations, mental and voluntary processes, decisions and economies in health, mental and physical, legal and insurance precisions, inheritance, etc.

The author will be grateful for any comments, criticism and especially for encouragement.

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#### HERMAPHRODITE FEMALES IN *LYCHNIS DIOICA*

SOME years ago Strasburger<sup>1</sup> reported that female specimens of *Melandrium rubrum*

<sup>1</sup> *Biologisches Centralblatt*, XX., 657 et seq., 1900.

Garcke (a form of *Lychnis dioica* L.) growing in his experimental garden at Bonn, were changed to apparent hermaphrodites as a result of infection with the anther-smut, *Ustilago violacea*. The infected plants had fully developed stamens, but the sporogenous tissue of the anthers was completely replaced by the spores of the smut. Strasburger suggested that all the cases of hermaphroditism which had been occasionally reported in this species were probably due to infection by *Ustilago*.

When I discovered functional hermaphrodite mutants in *Lychnis dioica* and demonstrated by numerous genetic experiments<sup>2</sup> that these functional hermaphrodites are modified males, I believed that Strasburger had misinterpreted his material and that his hermaphrodites which resulted from infection by *Ustilago* were produced by the development of female organs in the male, and not as he supposed by the development of male organs in the female. Strasburger was correct, however, as to the nature of his apparent hermaphrodites, as demonstrated by two facts which he has recently pointed out,<sup>3</sup> namely, (a) that the females are not always completely infected, in which case the uninfected branches bear normal female flowers, and (b) that infected males show no development of the female organs.

Professor Doncaster, of the University of Cambridge, England, has tested the influence of *Ustilago violacea* upon *Lychnis dioica* by artificial infections, and his results completely corroborate the conclusions of Strasburger. He sends for publication in *SCIENCE* the following brief account of his experiments:

It is well known that *Lychnis vespertina* is dioecious, but that all plants infected with the fungus *Ustilago* have well-developed stamens. Some of these plants have the typical male form, without trace of ovary; others have a vestigial ovary and styles in addition to the stamens and anthers filled with *Ustilago* spores. This suggests that when a female plant is affected by the para-

<sup>2</sup> *Botanical Gazette*, XLIX., 110, 1910.

<sup>3</sup> *Jahrbuch für wissenschaftlichen Botanik*, XLVIII., 427, 1910.

site, the stamens are caused to develop and the ovary is reduced, while the form of the flower of a male which is infected is not altered. In order to test this suggestion, I planted some ustilaginized plants in my garden in the late summer of 1910, and put with them some uninfected plants which I attempted to infect by sprinkling them with spores and by rubbing spores into parts of the stem from which I had scraped away the epidermis. The results were as follows: Of seven females which I attempted to inoculate in August, 1910, one became infected, and had the typical "hermaphrodite" form of flower in October, but in June, 1911, was again quite free from *Ustilago*, and had typical female flowers. A second female plant showed infection in June, 1911, but only on part of the plant; one branch was quite clean and had typical female flowers, the rest of the plant was infected and had "hermaphrodite" flowers.

Of eight male plants which were inoculated in August, three showed some infected flowers before the end of September; the anthers contained *Ustilago* spores, but there was no change from the male type of flower. Three of these eight plants were dead in June, 1911; one of the remaining five was infected.

Of five ustilaginized plants transferred to the garden, four had the hermaphrodite type of flower and one the male. One of the hermaphrodites so far recovered in September, 1910, as to set some seed; in 1911 all were still infected. One of them had some branches with hermaphrodite flowers containing large ovary, short styles and stamens with little or no pollen, but without *Ustilago* spores, while the rest of the plant had flowers with anthers full of spores, and the ovary and styles more reduced.

These observations seem to prove that infection with *Ustilago* can turn the female flower into the apparent hermaphrodite, but that no production of female organs takes place in a male flower when it becomes infected.

L. DONCASTER.

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The occurrence of uninfected hermaphrodite flowers on one of Doncaster's original infected plants may possibly indicate that this plant was not a female previous to its infection, but a hermaphrodite. If it were possible to secure pollen from a ustilaginized female, certain genetic problems of very great interest might be solved. It is of great theoretic importance

to know whether infection by *Ustilago* affects the genotypic nature of the host. If the effect is purely somatic, as seems to me the more probable, the offspring of a self-fertilized hermaphroditic female, or of a normal female fertilized by sperms from a hermaphroditic female, should consist only of females (if uninfected), and not of females and hermaphrodites, as I have shown to be the case when a female is fertilized by a hermaphroditic male. If infection by *Ustilago* produces a genotypic modification, it would be interesting to know whether such induced hermaphrodites are homozygous like the females by whose modification they are produced; they should in that case yield only hermaphrodite offspring. Hermaphroditic males produce both female and hermaphroditic male offspring, because the males are sex-heterozygotes.

As I have been fortunate enough thus far not to have a single infection from *Ustilago* among the many thousands of individuals of *Lychnis dioica* which have been involved in my cultures during the past seven years, I do not care to take up at present the here suggested line of investigation upon ustilaginized females. I do not wish to jeopardize by importing infected material, the solution of many other genetic problems now under investigation, but I hope that Professor Doncaster or some one else who is in a position to do so, will give attention to breeding from hermaphroditic females if this proves to be technically possible.

GEO. H. SHULL

#### SCIENTIFIC JOURNALS AND ARTICLES

CONTENTS of the September number of *Terrrestrial Magnetism and Atmospheric Electricity* are as follows: "A New Type of Compass Declinometer," R. L. Faris; "The Physical Theory of the Earth's Magnetic and Electric Phenomena, No. VI.: On the Origin of the Earth's Magnetic Field," L. A. Bauer; "Magnetic Declinations and Chart Corrections Obtained by the *Carnegie* from Batavia to Manila, and Thence to Suva, Fiji, November, 1911, to June 5, 1912," L. A. Bauer and W. J. Peters; "Resultate der Inklinationsbeobacht-