tained (0.10 per cent.–0.20 per cent.) but this ash appeared as white particles and was probably silica.

When I undertook to prepare a melanin from black rabbit hair and black feathers I found that the pigment was very *insoluble* in dilute (0.2 per cent.) sodium hydrate, and it was only after long boiling, in some instances nearly a week, that solution was effected. Of course this procedure altered the nature of the melanin molecule, but the fact that was of chief interest was that the resulting product contained between 2 per cent. and 3 per cent. of ash *and that this ash was chiefly iron oxide.* I have recently observed that there are probably at least two pigments in the darker colors of horse hair, one of these being a melano-protein with a very low ash content, and the other containing approximately 3 per cent. of ash *which is chiefly iron oxide.*

These pigments have been prepared in such a manner as to preclude any iron entering through contamination, and inasmuch as other pigments, *prepared by exactly the same process*, contain no iron, or at most only traces, we must conclude that *in some instances melanins may contain iron as a part of the molecule*, but that all melanins do not contain iron. Perhaps in this instance the oxidase acted on the hemoglobin, or some other iron complex, instead of oxidizing a protein containing no iron.

86 (695)

A five-year pedigreed race of Paramæcium without conjugation.

By **LORANDE LOSS WOODRUFF.**

[*From the Sheffield Biological Laboratory, Yale University.*]

The unicellular organisms afford a natural means of approach to the problem of fertilization, and the study of data, from a long series of careful experimental studies on these forms by various investigators, has pointed to the conclusion that the most important function of conjugation in the life history of the Protozoa is a satisfying of an inherent periodic physiological need of living matter, resulting in a renewal of the vigor of the cell. This "dynamic" view of fertilization has gradually assumed a com-

manding position, though it is neither contradictory nor confirmatory of the view that fertilization, resulting in amphimixis, is concerned in some way with the phenomenon of variation, or that it may be a process which enables certain forms to withstand changed environmental conditions.

The present paper briefly outlines the results which have been obtained to date from an intensive study of a pedigreed race of *Paramœcium aurelia* with reference to the problem of protoplasmic senescence and the function of conjugation. I have previously published[1] the results obtained to September, 1910, and the reader is referred to earlier papers for further details of the culture and for a general discussion of the various phases of the work.

This culture was started on May 1, 1907, with a "wild" *Paramœcium aurelia* which was isolated from a laboratory aquarium. This individual was placed in about five drops of culture medium on a glass slide having a central ground concavity, and when the animal by division had formed four individuals, each of these was isolated on a separate slide to form the four lines, Ia, Ib, Ic, and Id, of this culture, *Paramœcium* I. The pedigreed culture has been maintained by a specimen isolated from each of these lines practically every day up to the present time, thus precluding the possibility of conjugation occurring and facilitating an accurate record of the number of generations attained. A culture medium consisting of infusions of hay and fresh grass was employed during the first nine months of the work, but thereafter infusions of nearly any materials which might be found in ponds, swamps, etc., have been used. The medium has invariably been boiled to render the introduction of "wild" individuals into the culture absolutely impossible.

This race of *Paramœcium* has attained so far, (May 1, 1912) 3,029 generations during the five years it has been under daily observation. The number of generations attained during each of the first five years of its existence is as follows: first year 452, second year 690, third year 613, fourth year 612, and fifth year 662. The mean rate of division for the entire period is over three divisions in forty-eight hours. Periods of marked physiological depression have not occurred—such variations in the rate of

[1] *Archiv für Protistenkunde*, Bd. 21, 4.

reproduction as have appeared being either normal rhythms or the effects of environmental changes of temperature and culture medium. The organisms of the present generation are in as normal morphological and physiological condition as the original "wild" individual isolated to initiate the culture.

This study has demonstrated that, under favorable environmental conditions, the protoplasm of the cell originally isolated possessed (at least) the potentiality to produce similar cells to the number represented by 2 raised to the 3,029th power, or a volume of protoplasm approximately equal to 10^{1000} times the volume of the Earth. I believe this result proves beyond question that the protoplasm of a single cell may be self-sufficient to reproduce itself indefinitely, under favorable environmental conditions, without recourse to conjugation and clearly indicates that senescence and the need of fertilization are not primary attributes of living matter.

87 (696)

The influence of tartrates upon phlorhizin diabetes.

By **FRANK P. UNDERHILL.**

[*From the Sheffield Laboratory of Physiological Chemistry, Yale University, New Haven, Conn.*]

A recent communication of Baer and Blum (*Archiv für Experimentelle Pathologie und Pharmakologie*, 1911, 65, p. 1) shows that the subcutaneous administration of a number of organic compounds, containing two carboxyl groups, exercises a remarkable inhibitory influence upon the elimination of urinary nitrogen and dextrose in dogs with phlorhizin diabetes. Among the substances possessing this property may be mentioned glutaric and tartaric acids.

In an endeavor to explain the mechanism of the unique influence exerted by these compounds investigations have been carried out with tartrates upon both dogs and rabbits under conditions similar to those established by Baer and Blum. We have been able to corroborate the findings of Baer and Blum with respect to the action of tartrates although Ringer (PROC. SOC. EXP. BIOL.