MR. HENRY GROVES, who with his brother, Mr. James Groves, is the author of important contributions to botany, died in London on November 2, aged fifty-seven years.

DR. HEINRICH RITTHAUSEN, formerly professor of agricultural chemistry at Königsberg, has died at the age of eighty-seven years.

UNIVERSITY AND EDUCATIONAL NEWS

MR. GEORGE F. BAKER, president of the First National Bank of New York City, has given a large sum, reported in the newspapers to be $2,000,000, to bring about an alliance between the New York Hospital and the Cornell Medical College.

DR. ARTHUR T. CABOT, a fellow of Harvard University, has bequeathed $100,000 to the Harvard Medical School and the larger part of his estate, estimated at $500,000, to Harvard University, after the death of Mrs. Cabot.

ACCORDING to the accounting of the executors of the estate of George Crocker, Columbia University receives $1,566,635 for the Crocker Cancer Research Fund.

IT is announced at the University of Rochester that $262,510 has been contributed to the endowment fund by alumni living elsewhere. Dr. L. E. Holt, of New York City, gave $10,000; J. Sloat Fassett, of Elmira, $5,000, and F. R. Welles, of Paris, $12,000.

AN annual fund of $15,000 for the purpose of carrying on research work in medicine at the University of Toronto has been subscribed for five years by a few citizens of Toronto, who have become interested in medical education through the efforts of Professor Alexander McPhedran, head of the department of medicine.

MR. ANDREW CARNEGIE has offered to the University of Paris the last $20,000 necessary for equipping the new Institute of Chemistry in course of erection in the Rue Pierre Curie.

GRADUATE students in the department of botany at the University of Chicago have received the following appointments from other institutions for the present year: Joseph S. Caldwell, fellow in the department, to be professor of botany at the Alabama Polytechnic Institute; Charles A. Shull, to be assistant professor of plant physiology at the University of Kansas; Ansel F. Hemenway, to be professor of biology at Transylvania University, Kentucky; Claude W. Allee, to be instructor in plant physiology at the University of Illinois; Norma E. Pfeiffer, to be instructor in botany at the University of North Dakota, and Rachel E. Hoffstadt, to be instructor in charge of biology at Marshall College, West Virginia.

DONALD W. DAVIS, for the past three years a student in the graduate school of arts and sciences of Harvard University, has been appointed assistant professor of zoology in Clark College, Worcester, Mass.

IN consequence of the additional grant made by the London County Council to the University of London, professorships of mathematics and of civil engineering have been established at King's College. To the former Dr. J. W. Nicholson, lecturer at Cambridge, has been appointed, and to the latter Mr. A. H. Jameson, engineer of the Thirlmere aqueduct. A professorship of mathematics has also been established at Bedford College, to which Mr. Harold Hilton, of the college, has been promoted.

DR. P. EHRENFEST, of St. Petersburg, has been appointed professor of physics at Leiden.

DISCUSSION AND CORRESPONDENCE

A SIMPLE DEMONSTRATION OF THE ACTION OF NATURAL SELECTION

IN a recent presidential address, an eminent biologist referred to "such highly speculative disciplines as natural selection, Neo-Lamarckianism, neo-vitalism, etc." The criticism of natural selection implied by such association would have been quite in place a few years ago. Since it represents a widely prevailing opinion at the present time, it may not be out of order once more[1] to direct attention to the fact that natural selection is no longer neces-

[1] The progress which has recently been made by biometricians in the investigations of the selective death rate—the mortality which is not random but which is a function of the characteristics of the individual—has been reviewed in a paper,

sarily a "highly speculative discipline," but rather a field for quantitative research. Weight may be given to this statement by a brief description of an experiment made this year at the Station for Experimental Evolution.

Much of the biometric work on selective mortality has necessarily been of a highly statistical character, but this particular experiment has the virtue of extreme simplicity. In the spring of 1912, a series of about 238,000 bean seedlings was examined for morphological variations to serve as a basis for experiments in selection within the "pure line." Of these, about[2] 4,217 abnormal[3] and 5,030 normal[4] seedlings were transplanted to the field. In doing this great care was used to maintain precisely comparable conditions for both normal and abnormal plants. As plants died, from any cause[5] whatever, their labels were brought in and at harvest time a summary was prepared showing the numbers of seedlings failing to develop to fertile maturity.

Of the 5,030 normal plants, 226, or 4.493 per cent., died. Of the 4,217 seedlings showing some morphological variation from type, 286, or 6.782 per cent., failed to reach maturity.

Line	Death Rate of Typical Seedlings	Death Rate of Atypical Seedlings
1– 10	4.85	4.98
11– 20	5.16	7.46
21– 30	5.03	7.75
31– 40	4.59	6.49
41– 50	3.81	5.56
51– 60	6.80	8.39
61– 70	5.26	6.94
71– 80	3.30	5.88
81– 90	8.12	9.15
91–100	5.84	11.33
101–110	1.95	2.35
111–120	3.92	7.03
121–130	4.00	7.08
131–140	4.05	9.81
141–150	4.28	5.09
151–160	3.89	2.65

Thus under conditions of careful cultivation, with ample space, with no intra-specific and practically no inter-specific competition, and with a general mortality of less than 5.55 per cent. there is a clearly marked selective death rate.

Now if p be the number which perish in a population of m individuals the probable error of that number is given[6] by

$$E_p = .67749\sqrt{p \times \left(1 - \frac{p}{m}\right)}$$

From the absolute probable error, the percentage probable error is at once obtained by taking the ratio of 100 p to m. Thus we have for the death rates:

	Per Cent.
For normals	$4.49 \pm .20$
For abnormals	$6.78 \pm .26$
Difference	$2.29 \pm .33$

Thus the difference is seven times its probable error, and is clearly trustworthy statistically. That it is not due to chance is most strongly brought out by splitting the material up into 16 lots of about ten "pure lines" each, and determining the death rate for normals and abnormals in each lot separately. The little table gives the results.

Because of the low mortality great irregularity is to be expected in the results. *But in*

"The Measurement of Natural Selection," appearing in *The Popular Science Monthly*, Vol. 78, pp. 621–638, 1911. Several other studies have been published since the writing of that résumé.

[2] The numbers given here are substantially correct, but may be slightly modified when the records are verified by checking against the labels of the individual plants. This can not conveniently be done until the 8,000 and more individually wrapped plants are opened for shelling and planting in the spring of 1913.

[3] Abnormal includes all morphological deviations from the normal type.

[4] For every abnormal seedling found at least one normal was taken quite at random from the same seed flat. The chief reason for the excess of normals is that in some lines the quantity of seed was not as large as necessary for securing a good number of abnormals, and in these cases normals were planted to avoid losing the line.

[5] An exception is made in the case of a large area of plants which were completely ruined when nearly ripe by obviously non-selective causes outside the experimenter's control.

[6] *Biometrika*, 2: 274, 1903.

fifteen out of the sixteen lots the failure is higher among the abnormal than among the normal plants.

The material is classified in only the alternative categories, normal and abnormal, or typical and atypical—of which the latter is highly complex, comprising many different morphological variations in their permutations. Possibly, some types among the atypical show a lower mortality than the typical seedlings. When materials are ample I hope to determine approximately the selective value of each of the chief types of variation, both alone and in various combinations. In the meantime, the data given here may serve to record another case of the quantitative demonstration of a selective death rate.

J. ARTHUR HARRIS
CARNEGIE INSTITUTION OF WASHINGTON

THE DOMAIN OF COMPUTATIONAL ASTRONOMY

TO THE EDITOR OF SCIENCE: In the light of Professor Campbell's criticism (SCIENCE, October 25) it is to be regretted that I did not state explicitly that the domain of computational astronomy is much larger than that of the determination of orbits. This is so obviously true that it did not occur to me that my remarks could be misinterpreted. Let me amend, therefore, with the statement that Buchholz's Klinkerfues's "Theoretische Astronomie" belongs in the general field of computational astronomy.

My remark that the computational field might perhaps be called the bookkeeping, or auditing, department of astronomy may have been "unfortunate." Since it incurred the criticism of Professor Campbell I feel quite certain it was. But there is nothing in his communication which leads me to doubt its essential accuracy.

This classification of "theoretical astronomy," which was made only in the interest of exactness, clearly does not imply any disrespect for computation which is of great value not only in astronomy but in many other subjects.

W. D. MACMILLAN
UNIVERSITY OF CHICAGO,
October 25, 1912

SCIENTIFIC BOOKS

Gould and Pyle's Cyclopedia of Practical Medicine and Surgery, with particular reference to diagnosis and treatment. Second edition, revised and enlarged by R. J. E. SCOTT, M.D., with six hundred and fifty-three illustrations. Philadelphia, P. Blakiston's Son & Co. Royal 8vo. 1912.

In our times the medical sciences make such rapid advances that medical text-books and encyclopedic works are soon out of date. It was therefore a happy idea and a meritorious work of Dr. Scott to revise and republish Gould and Pyle's valuable "Cyclopedia," which first appeared in 1900. The new edition retains the excellent features of the first and new ones have been added. The list of contributors is a guaranty of the sterling value of the book.

The work is in size and arrangement of contents very much like those eminently practical encyclopedias of Forbes (1833), Todd (1835), Tweedie (1840), Quain (1882), which differed notably from the huge German and French works of a similar character, like those of Eulenburg (1886–89) and Dechambre (1864–89), in that they condensed a very large amount of knowledge in one or two volumes. What the general practitioner wants is not a cumbersome work of reference of twenty or thirty volumes, where he has to wade through a lengthy and exhaustive exposition of a subject, but a concise presentation of the salient facts, which he can take in in a few minutes. Such a book is the one before us. It is the only medical reference book of its kind in America and it may truly be said that it fills a much needed want.

On examining the book the reader is at once struck at the large amount of knowledge compressed in such a small space. It is, indeed, the comparatively small size of the book which gives it a great advantage over similar works. The writers have succeeded in giving the essential and important points of the various subjects in the most concise form. Titles like cerebrospinal meningitis, heart-disease, infant feeding, malarial fever,