tion of American Geographers and of the retiring vice-president of Section E, will be given, and the remainder of the evening will be spent in a social gathering so that the members may become better acquainted. It is intended to devote one session to a symposium on "Ancient climates" and several afternoons to excursions to the Geophysical Laboratory, the museums, and, if weather conditions are favorable, the field in the vicinity of Washington. One session will be devoted to the problems which the geological and geographical division of the National Research Council is working on.

The Journal of the American Medical Association states that the Fonds d'Etudes Roche has been organized by the manufacturing chemists, F. Hoffmann-La Roche and Co., who offer space in their establishment, at Basel, to research workers in experimental medicine and biology, and all facilities for research and a stipend, if desired. Only exceptionally will a longer course than three months be granted. The places are open to medical students, physicians and other scientists. Professor F. de Quervain, Kirchenfeldstrasse 60, Berne, is chairman of the committee, to whom application must be made and credentials presented. The work is entirely independent of regular work in the establishment, and the subject must be approved by the committee, consisting of Professors Cloetta, Zurich; Michaud, Lausanne; Roch, Geneva; Staehelin, Basel, and de Quervain, Berne.

UNIVERSITY AND EDUCATIONAL NOTES

A GIFT of $250,000 has been made to the Hampton and Tuskegee Endowment Fund by an anonymous New York banker.

A CONTRIBUTION of £1,000 has been received from Lord Glendyne towards the Jubilee Endowment Fund of the London School of Medicine for Women, which is intended to provide for the endowment of three chairs in the school—anatomy, physiology and pathology. The sum of £27,500 has now been raised towards the completion of the proposed £60,000 endowment.

DR. W. J. MILLER, for some years professor of geology in Smith College, has accepted a position as professor of geology and chairman of the department in the University of California, Southern Branch, Los Angeles.

WARREN E. LORING, of the University of Maine, has been appointed assistant professor of mathematics at Colby College, to fill the vacancy caused by the illness of Professor Benjamin Edward Carter.

DR. GEO. F. WEIDA, of Kenyon College, has been appointed professor of chemistry at Centre College, Kentucky.

AT the Polytechnic Institute, of Brooklyn, N. Y., Dr. Parke B. Fraim, of Lehigh University, has been appointed assistant professor of physics, and Frank D. Carvin, of the University of Pennsylvania, assistant professor of mechanical engineering.

AT Tulane University, Dr. Parry Borgstrom has been appointed assistant professor of industrial chemistry, and A. Lee Dunlap, assistant professor in mechanical engineering, in the place of Ivor O. Mall, who has resigned.

DR. WALTER C. CRAIG, assistant director at the Johns Hopkins Hospital, Baltimore, has resigned to accept a position in the department of surgery at Yale University School of Medicine. Dr. Craig will be succeeded by Dr. John H. Snoke, who until recently was superintendent of St. Luke's Hospital, Shanghai, China.

MRS. LUGAN KEENE has been appointed professor of anatomy at the London School of Medicine for Women.

SIR CUTHBERT WALLACE has been elected dean of the faculty of medicine at the University of London.

PROFESSOR H. H. DIXON, whose appointment to the Regius chair of botany in the University of Glasgow was recently announced, is unable to accept the appointment.

DISCUSSION AND CORRESPONDENCE

A NEW FORMULA FOR THE ELECTRICAL RESISTANCE OF CERTAIN INHOMOGENEOUS SYSTEMS

IN a recent issue of SCIENCE (1924, lix, 403) Dr. F. H. MacDougall proposes a formula for the resistance of living cells suspended in a medium.

$$R = M\left[\frac{1 + a\left(\frac{S - M}{2S + M}\right)}{1 - 2a\left(\frac{S - M}{2S + M}\right)}\right]$$

In which S is the resistance of the cells, M the resistance of the medium and R the resistance of the suspension of cells in the medium and a the cell volume. This formula is the same as formula 17, page 440, in Clerk Maxwell's "Electricity and Magnetism," third edition, Vol. 1, 1892, provided the algebra is translated into the same form. Maxwell's formula is:

$$R = M\left[\frac{(2S + M) + a\,(S - M)}{(2S + M) - 2a\,(S - M)}\right]$$

By dividing both numerator and denominator of the fraction inside the brackets by $(2S + M)$ we obtain MacDougall's formula.

In a paper by F. H. MacDougall and R. G. Green in the *Journal of Infectious Diseases* (1924, xxxiv, 195), the formula for the resistance is:

$$\frac{1}{R} = \frac{1-a}{M} + \frac{a}{S}$$

after translating one term into the conventions of MacDougall's paper. In a paper by Karl Lichtenecker on the resistance of certain composite conductors in the *Physikalische Zeitschrift,* 1918, xvii, 381, is given a formula which when translated into MacDougall's terms is:

$$R = \frac{SM}{(1-a)\,S + aM}$$

If we reduce MacDougall's equation to a common denominator we obtain

$$\frac{1}{R} = \frac{(1-a)\;S + aM}{SM}$$

and by taking the reciprocals of each side of this equation we obtain the equation used by Lichtenecker.

J. F. MCCLENDON

LABORATORY OF PHYSIOLOGICAL CHEMISTRY,
UNIVERSITY OF MINNESOTA

HOW MANY FIGURES ARE SIGNIFICANT?

THE readers of SCIENCE are aware that varying practices are followed by the workers in the natural and social sciences regarding the number of decimal places kept and reported in their investigations. A definite and uniform practice would conduce to general understanding. Discussions with my colleagues regarding certain quantitative studies of my own which promised to be serious and worth-while have become mired around the decimal point. As a result of this I have determined upon a rule for my personal guidance which I believe may be of general utility.

Determine the probable error of the measure involved, by statistical means if possible, otherwise estimate it. *Keep to the place indicated by the first figure of ½ the probable error.*

As an illustration, suppose we calculate the mean and standard deviation of a certain series and find:

Mean = 81.7433
Standard deviation = 12.8294
Population = 100
The probable error of the mean according to the usual formula = .865
The probable error of the standard deviation according to the usual formula = .612
½ the probable error of the mean = .432
½ the probable error of the standard deviation = .306

Following the rule, we would publish: Mean = 81.7 and the standard deviation = 12.8.

As a second illustration: Suppose we have a correlation coefficient of .75248 from a population of 400. Its probable error, according to the usual formula, is .0146. One half the probable error equals .0073. Accordingly, the correlation coefficient should be published as equal of .752.

The argument underlying this rule is that one should not throw away data that are likely to influence judgment. A difference of 1 probable error indicates that the chances are 3 to 1 that the difference is of the sign indicated. This is scant evidence of significance but not entirely meaningless. A difference of one half of the probable error indicates that the chances are about 5 to 3 that the difference is of the sign indicated. For ordinary purposes this is of insignificant moment. Failure to keep more figures introduces a slight error, but keeping them introduces a much greater error in interpretation by suggesting an accuracy which does not exist. It is necessary to strike a balance and the rule suggested is offered as a reasonable compromise.

It is intended that it be applied to raw or original measures or observations as well as to derived constants such as averages, measures of variability, etc. It is to be expected that computation work preceding publication will be carried to at least one figure further than the final published result.

TRUMAN L. KELLEY

STANFORD UNIVERSITY

OPPORTUNITIES FOR SCIENCE TEACHERS IN NEW YORK HIGH SCHOOLS

A LETTER requesting information regarding opportunities for science teachers in the high schools of New York City was received by the writer some months ago from an associate professor in a large collegiate institution east of the Mississippi. The information furnished may be of interest to others and is outlined below. There is a real opportunity for important work, both in science education and in supplementary graduate work in science.

(1) There has been for some years a shortage of well-qualified teachers, especially of men for the boys' high schools. Three successive examinations in biology netted not more than three or four successful candidates, who were immediately appointed.

(2) The population of the New York City high schools stands at present at one hundred and ten thousand, and increases by thousands every year. All these ought to have several courses in science, and it appears that recognition of this fact is growing on the part of the administrative officials, and science work is entering a floodtide. At present between four and five hundred specially selected science teachers are required to offer the courses now given.

(3) The salary of the regular high school teacher,