planned that the increased space for books will meet all demands of nature lovers. The library is open: 10 to 12 A.M. and 2 to 5 P.M., from June 15 to September 15 each year, and during the winter two afternoons of each week from 2 to 4

GEO. P. GRAY has resigned his position as assistant professor of entomology and chemist, insecticide laboratory at the University of California to become chief of the division of chemistry of the State of California Department of Agriculture, with headquarters at Sacramento. The Department of Agriculture established at the last session of the California legislature was fostered by Governor Stephens as an economy and efficiency measure, and correlates under Director G. H. Hecke, several boards and commissions formerly charged with the enforcement of various laws pertaining to agriculture. The work of the department is organized into three divisions: Plant Industry, Animal Industry and Chemistry. The Division of Chemistry, under Professor Gray, is to handle the official analysis and testing of materials incidental to the administration of the state laws regulating the manufacture and sale of insecticides, fungicides, fertilizers and dairy products and the fruit and vegetable standardization laws.

IT is stated in *Nature* that the British Medical Research Council has recently established at the Lister Institute of Preventive Medicine a national collection of type cultures from which biologists in general, and bacteriologists in particular, may obtain authenic strains of recognized bacteria and protozoa for use in scientific work. The scheme is under the general direction of Dr. J. C. G. Ledingham, while Dr. R. St. John Brooks has been appointed to the post of curator of the collection and Miss Mabel Rhodes to that of assistant curator. It is proposed to collect and maintain bacterial strains from all departments of bacteriology, human, veterinary and economic, and already considerable work has been done towards the formation of a representative collection on these lines. The efforts of the staff are, however, at present particularly directed towards the securing of fully authenticated strains responsible for or associated with disease in man and animals. The bureau proposes to supply cultures on demand to all workers at home and abroad, and, as a rule, a nominal charge per culture will be made to defray postage and media. Strains sent for identification and maintenance should be accompanied by particulars as to source, date of isolation, etc. In due course a catalogue will be prepared for publication.

UNIVERSITY AND EDUCATIONAL NEWS

A PLAN for securing within five years $10,000,000 to meet the urgent needs of the University of Chicago is now being carried out. For salary increases already made or authorized the sum of $4,000,000 as additional endowment is needed. The new plans involve also the formation of certain institutes within the graduate school for conducting such research and training in pure science as has an immediate bearing on the application of the sciences to industry. The institutes proposed are those of physics and chemistry, plant agriculture, mining and the science of education.

PROFESSOR O. M. LELAND, formerly of Cornell University, but recently of the J. G. White Engineering Corporation, New York City, has been elected dean of the colleges of engineering, architecture and chemistry in the University of Minnesota. During the war, Professor Leland was lieutenant colonel of engineers in the 78 and 89 Divisions and saw active service in France and Germany. Up to a few months ago, he had been a member of the Cornell faculty since 1903.

DR. O. E. JENNINGS, curator of botany at the Carnegie Museum and for several years in charge of the work in botany at the University of Pittsburgh, has been given the rank of professor of botany at the latter institution.

DR. CLAUDE S. MCGINNIS has joined the faculty of Temple University, Philadelphia, as professor in the department of physics. Dr.

McGinnis has been for nine years professor of physics and electrical engineering in the University of New Brunswick, Fredericton, N. B.

DR. HARRY B. YOCOM, of the department of biology of the College of the City of New York, has been appointed assistant professor of zoology in the University of Oregon.

DR. F. FRANCIS, professor of chemistry, has been appointed pro-vice-chancellor of Bristol University, in succession to Professor C. Lloyd Morgan, who is about to resign office. Dr. Lloyd Morgan has been appointed emeritus professor of psychology and ethics.

DISCUSSION AND CORRESPONDENCE

A PRIORI USE OF THE GAUSSIAN LAW

TO THE EDITOR OF SCIENCE: Mr. Michael[1] in interpreting Dr. Johnstone's results[2] for twenty counts of bacteria in polluted shellfish deplores certain naive errors to which the lay statistician is prone, but is not, so it seems to me, free from statistical illusion himself. I had hoped, at least, that the identification of the Gaussian law with the ideal "chance" distribution was a custom of the past, and that the prevalence of this practise in the literature was simply due to the inertia of thinking. May I submit the following relevant observations?

1. The sole condition of "change" is ignorance.[3] In science the thing to do with ignorance is to admit it, not to posit the form of distribution that a variable assumes under it.

2. Biological and mental phenomena, of whose conditions of variability we are thus ignorant, do not necessarily give symmetrical distributions when observed. Pearl showed that the amount and direction of skewness and the dependence of skewness on known conditions might be the significant biological fact.[4] The Gaussian law does hold for cointossing, but the relationship has been scientifically observed,[5] not posited a priori.

3. Moreover, there can be no reason to expect a Gaussian distribution a priori when we are ignorant. A form of distribution is always function of the unit of measurement; and, since the choice of a biological unit is ordinarily arbitrary, the chances of getting the normal distribution are very small.[6] Galton pointed out, furthermore, that chance distributions of two related variables, when the relationship is not linear, can not both be Gaussian.[7]

4. When we observe a skew distribution and are in ignorance of the conditions that cause the variation, it is useless labor to factor the skew distribution into a Gaussian "chance" distribution and a skewing factor, as Mr. Michael does. The two factors that we so obtain are meaningless. The Gaussian function is biologically meaningless because there is neither a priori nor observational ground for taking it as the curve of chance (ignorance). Mr. Michael's logarithmic function is biologically meaningless because it is merely a measure of the manner in which the observed data depart from the meaningless Gaussian law. Pearson saw this point in 1900 and noted the fallacy.[8] He also made fun of the Gaussian "fetish," although the position of the Biometric School has since become less definite.

5. Probability in science means frequency and nothing more. Fundamentally in science

[1] E. L. Michael, "Concerning Application of the Probable Error in Cases of Extremely Asymmetrical Frequency Curves," SCIENCE, N. S., 51, 89–91.

[2] J. Johnstone, "The Probable Error of a Bacteriological Analysis," cited as Rept. Lanc. Sea-Fish. Lab., No. 27, 1919, 64–85.

[3] *Cf.* J. Venn, "Logic of Chance," 1888, espec. 119 ff.; B. Bosanquet, "Logic," 1911, I., 322 ff. If the scientist prefers not to go to the logician, let him see if he can formulate for himself, with scientific rigor, the conditions of "chance."

[4] R. Pearl, "Variation and Differentiation in *Ceratophyllum*," 1907, espec. 90 f.

[5] *E. g.*, see H. Westergaard, "Grundzüge der Theorie der Statistik," 1890, 21–38.

[6] J. Bertrand, "Calcul des probabilités," 1889, 180 f.

[7] F. Galton, *Proc. Roy. Soc.*, 29, 1879, 365–367.

[8] K. Pearson, *Philos. Mag.*, 5th ser., 50, 1900, 173.