at five o'clock on December 4, 6 and 11. The subject of the lectures will be "Problems Concerning the Pathogenesis of Infectious Diseases."

PROFESSOR W. M. THORNTON, the new president of the British Institution of Electrical Engineers, delivered his inaugural address before members of the institution on October 26 on "The Importance of Insulation in the Transmission of Electrical Energy."

THE department of botany of the Iowa State College and the Corn Research Institute of the Iowa Agricultural Experiment Station held on November 15 and 16 a symposium commemorating six decades of the modern era in botanical science at the college. The meeting commemorated the pioneer work of Professor Charles Edwin Bessey, who joined the faculty sixty-four years ago. Professor Bessey's compound microscope was on display. Two hundred botanists attended the exercises. Dr. Ernst A. Bessey, a son of Dr. Bessey, who is head of the department of botany at the Michigan State College, gave an address on the "Teaching of Botany Sixty-five Years Ago." On this occasion the honorary degree of doctor of science was conferred on Henry A. Wallace, Secretary of Agriculture, who was an honor graduate of the college in 1910.

THE American Board of Psychiatry and Neurology, as reported in the *Journal* of the American Medical Association, was organized at a meeting in New York, on October 20, with the following officers: Drs. H. Douglas Singer, Chicago, *president;* Charles Macfie Campbell, Boston, *vice-president,* and Walter Freeman, Washington, D. C., *secretary.* Other members are Drs. Lewis J. Pollock, Chicago; George W. Hall, Chicago; Franklin G. Ebaugh, Denver; Lloyd H. Ziegler, Albany, N. Y.; James Allen Jackson, Danville, Pa., and Adolf Meyer, Baltimore. A committee was appointed to consider plans for examinations, credentials and forms for application blanks.

THE Long Island College of Medicine has received a bequest of approximately $1,500,000, from the late Frank L. Babbott, who died in Brooklyn in December, 1933, for the establishment of an endowment fund, the income from which is to be applied to the furtherance of medical education and research.

THE Rockefeller Foundation has made a grant of $50,000 to the University of Chicago to carry on biologic research. This is an increase over the annual grant of $30,000 which the foundation has given to the university for the last five years. The additional $20,000 will be used to cover the expenses of the sex research program, which until this year has been financed by the committee on research in problems of sex of the National Research Council.

IT has been decided to publish all the papers presented on the occasion of the dedication of the Lilly Research Laboratories at Indianapolis in the form of a volume in which will be included an account of the laboratory and its activities. It is hoped that this volume will be completed and will be ready for distribution early next year. Copies will be sent to guests present at the celebration and to scientific and medical men who may be interested in securing a full report of the papers presented by Sir Henry Dale, Sir Frederick Banting, Dr. Irving Langmuir, Dr. Elliott P. Joslin, Dr. George R. Minot, Dr. Carl Voegtlin, Dr. George H. Whipple and Dr. Frank R. Lillie.

THE following awards have been made by the British Institution of Civil Engineers: Baker Gold Medal to Ralph Freeman, London. For papers read and discussed at ordinary meetings: Telford Gold Medals to Dr. J. J. C. Bradfield, Sydney, Australia, and to Ralph Freeman, London; Webb Prize and Telford Premium to W. E. Gelson, Delhi; Indian Premium to J. D. Watson, Lahore; Telford Premium jointly to Ralph Freeman, London, and Lawrence Ennis, London; Telford Premium jointly to E. F. Law, London, and Vernon Harbord, London; Manby Premium jointly to J. F. Pain, Winchester, and Gilbert Roberts, Margate; Trevithick Premium jointly to R. W. Foxlee, London, and E. H. Greet, Iver, Bucks. For papers published without discussion as "Selected Engineering Papers": Telford Premiums to E. F. Reid, London; jointly to F. W. H. Stileman, Weybridge, Surrey, and J. S. Young, Perth, Australia; to E. H. Bateman, Birmingham; to A. C. Gardner, Glasgow; to W. G. Morrison, London; to B. C. Hammond, Worcester; the Crampton Prize to G. M. T. Rees, Gerrards Cross, Bucks; the Charles Hawksley Prize has been awarded to H. G. Cousins, London, and the Coopers Hill War Memorial Prize to F. V. Appleby, Brighton.

DISCUSSION

MUSEUM CONDITIONS IN THE UNITED STATES

IT is the purpose of this article to present the results of a study of 134 museums of natural history representing a fair cross section of their distribution throughout the United States. The objective of the investigation was to evaluate the museum method of education among the people of this country. Although

there is no certain way of measuring the social value of museums we are able to approximate it by a study of their activities, these data being necessarily obtained by questionnaire.

The museums are found to be irregularly distributed among the states, their geographical center being approximately one hundred miles southwest of Chicago. Although Massachusetts, New York and California lead in number of museums per state this is deceptive in any just appraisal of the attitude of the people toward museum work. Factors which appear later will diminish the apparent importance of the states mentioned. When the distribution of these museums is charted on a map in various shades of gray a simple diagram showing the spread of museum interest is produced. With few exceptions it is surprisingly similar to a map of civilization in the United States, by Huntington (1924). On the museum map the Gulf coast and the Mexican border appear to be more enlightened, and the northern Rocky Mountain area less enlightened, than Huntington indicates. Although the museum map represents only one criterion in such a social study, it is of considerable interest to note how closely it resembles that produced by the assemblage of many criteria.

The first factor to be introduced in approaching a real picture of museum conditions is population; and this shows that a few New England states, the states of the High Plains and the West coast, lead in number of museums per population, a no small factor when we disregard economic conditions and consider only the interest that people take in museums.

Then again, if we study the museum situation with reference to educational activity we arrive at a somewhat different picture. The activities of a museum may be listed as exhibition, discovery, research, lectures, publication and school service. In a general way they indicate the energy expended by museums and if plotted in map form result in a very irregular dispersal throughout the country, Pennsylvania and Illinois being leading states. The distribution of activity could not be drawn in sweeping areas, as was the case in plotting the number of museums per state. The energy or educational activity map not only indicates the museum interests of the population, but it also shows the breadth of educational scope and to a certain extent the quality of the museums.

If we now prepare a map based on elements produced by computing the state averages of activity relative to the population of states we have a picture of the United States showing their qualitative relation to each other in the appreciation of the museum method of education. The results are extremely surprising and might even cause embarrassment to some of the wealthiest centers of population. Those states which are doing relatively the most in a museum way are Vermont, Rhode Island, North Dakota, South Dakota, Colorado and Arizona. To their credit they far outshine their immediate wealthy neighbors. States of intermediate classification are Maine, Connecticut and South Carolina. Astonishing as it may seem, among the states of low recommendation we find Massachusetts, New York and California, those very ones which lead in numbers of museums. In general, we might say that the poorer the state, the harder it struggles to give museum educational service.

If we classify the natural history museums according to type, they may be listed as metropolitan, provincial, college and private museums. The college museums are dominant in numbers, having increased steadily since the institution of the first one in 1705 at the College of William and Mary. However, the provincial museums are somewhat more active than the college museums. The metropolitan museums are more active in all lines than other types of museums, but they are fewer in numbers. There are nearly twice as many college museums as provincial museums, 10 per cent. of them being in New York State, 9 per cent. in Massachusetts and 9 per cent. in Michigan. The location of colleges in the United States has helped to locate museums in sections of the country where otherwise museums might not be situated, and may have given rise to the statement that "museums are most frequently found in sections of highest culture and enlightenment." It can not be questioned that museums are considered a valuable part of a college, since colleges lead in supporting natural science museums at least.

The financial support of museums is derived most commonly from taxation, state museums deriving their income almost entirely from this source. Endowment stands second as a source of income, half of the museums being partly supported by this method; and a very few museums are supported by membership dues.

Exhibition forms the chief activity of over 90 per cent. of the museums and is the principal method of conveying knowledge. This and research are the principal activities of state museums. While research is dominant in college museums, popular lectures are most noticeable in provincial museums. Private museums do the least amount of research. In general, more emphasis is placed on disseminating knowledge than increasing it. Extra-mural activity or school service is a lesser activity of museums but is rapidly becoming recognized as an important part of their work.

This investigation of conditions among the natural science museums of the United States is not without its limitations because of slowly changing conditions, the general nature of the quality and amount of the

various museum activities, the original source of wealth and many other unknown facts; but it may be assumed that the data, even though obtained by questionnaire, give a fairly reliable picture of average conditions.

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BLOOD PRESSURE OF TYPHOID CARRIERS

IT has been known for years that typhoid carriers are very likely to exhibit signs and symptoms of gall bladder disease. Carriers submitting to cholecystectomy, whether because of clinical symptoms or to protect the public health, almost invariably have cholecystitis and, if the infection has been of long standing, cholelithiasis.

It has recently been found in Michigan that a chronic typhoid carrier of long standing is more likely to have hypertension than a person of the same age in the general population. The arbitrary limit of normal systolic blood pressures is frequently placed at 140 mm, and in Symonds's tables[1] the mean systolic pressure even for those over 60 is but 135.2 mm, if the 5.7 per cent. who had systolic pressures above 140 mm are excluded. On the other hand, of 40 carriers of long and short standing, 55 per cent. had a systolic pressure above 140 mm, the mean systolic pressure of the group being 155 mm. An elderly group of 27 persons in a county home, many of whom had arterio-sclerosis, had a mean systolic pressure of but 145 mm, whereas 27 carriers with the same mean age had an average pressure of 175 mm. In the 11 carriers who had had typhoid fever before 1911, the lowest systolic pressure was 158 mm and the mean 197 mm.

We are not prepared to evaluate as yet the relative importance of age and the age at which the person becomes a carrier, nor has our experience been great enough to draw any conclusion as to relative longevity. If our observations are representative, it would seem that a typhoid carrier does not have as great a life expectancy as a person of the same age in the general population.

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THE SPECTRUM OF DEUTERIUM?

IN a paper in *The Astrophysical Journal* of July, 1918 (Vol. xlviii, p. 10), entitled "The Astronomical Atom and the Spectral Series of Hydrogen," the present writer undertook to calculate the value of the nuclear charge of the hydrogen atom from the wavelengths of the lines in its different spectral series. From these computations he concluded that the "principal series" of hydrogen must be due to an atom having twice the nuclear charge of the atom of the Balmer series. He says:

> It would seem that it must be possible to have a hydrogen atom with a nuclear charge of $2e$. Such an atom should give off radiation of higher frequency than one with a charge only half as great, and its spectrum should be looked for in the ultra-violet.

In SCIENCE of July 13, 1934 (p. 23), Lord Rutherford says that double weight hydrogen has been prepared of such purity that the Balmer lines are not visible in its spectrum, but does not mention the lines of the principal series.

FERNANDO SANFORD

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BERL ON NATURAL OIL

IN a recent number of SCIENCE[1] appeared an article by E. Berl, of the Carnegie Institute of Technology, entitled "Origin of Asphalts, Oil, Natural Gas and Bituminous Coal." The present writer is concerned meanwhile only with the short closing paragraph of the article. There one reads: "The so-called animal theory, which explains the formation of oil by the heat decomposition of fish, and the lignin theory, which assumes that bituminous coals are derivatives of lignin, can not be substantiated by experiments."

To any one at all familiar with the history of petroleum and its possible primary origin, alike on a colossal scale in nature, and on a small scale experimentally, the first part of the above assertion betrays a serious ignorance on the part of its author. For it should be known to all who have given any attention to the subject that the two eminent investigators, Professors Warren and Storer, published in 1867[2] a striking and suggestive paper, which has been too much neglected in recent years by investigators.

A condensed account of their experiments was published by the present writer some years ago,[3] and reads as follows: "We owe the first exact and definite proof that fish oil can be converted into secondary products like those of petroleum and its derivatives, to the careful researches of Warren and Storer. To some prepared milk of lime they added a quantity of commercial menhaden oil in a wooden tub, at the bottom of which was a coil of perforated pipe that introduced steam. Saponification was effected in a few hours, and the saponified mass was dried. It was then strongly heated with hydrate of lime in a retort, when

[1] *Jour. Am. Med. Assn.*, 80: 232, 1923.

[1] September 7, 1934, page 227.

[2] Amer. Acad. Arts and Sc., Memoirs," S2, 9, page 177, 1867.

[3] "Fishes the Source of Petroleum," page 21, Macmillan Company, 1923.