On the Wednesday preceding the lectures the ex-internes of the Hospital Division will have their annual meeting. A portrait of the late Dr. Manfred Call, clinical professor of medicine, will be presented to the college by the ex-internes.

The climax of the celebration will come at commencement on June 7 with a centennial program at ten thirty o'clock in the morning, with the usual commencement exercises in the evening. Dr. Henry A. Christian, Hersey professor of medicine in the Harvard Medical School, will be the chief speaker on the morning program, and J. Rion McKissick, president of the University of South Carolina, will be the speaker at the commencement exercises proper. Colleges and universities throughout the nation will be invited to send representatives for the morning program. About a hundred and forty students will be graduated on June 7 from the schools of medicine, dentistry, pharmacy and nursing.

THE EIGHTIETH BIRTHDAY OF MAX PLANCK

ON the twenty-third of April, Max Planck, originator of the quantum theory, celebrates his eightieth birthday. To him we owe the discovery of the initial clue to one of the most astonishing series of advances in the history of science. Among living physicists of the highest distinction he is the senior—a man of outstanding character, universally revered by his colleagues in every land. It is therefore fitting that we should take cognizance of the occasion and join in congratulations to him for his continued vigor.

Planck was born in 1858 in Kiel, where his father was professor of law. He attended the university at Munich to which his father had been called in 1867 and attained his doctorate at the age of twenty-one. From 1880 to 1885 he was privat-docent in physics at Munich. Thence he was called to a professorship in his native city of Kiel and after four years to become successor to Kirchhoff in Berlin.

Just a year younger than Heinrich Hertz, Planck like Hertz was to owe his advancement in part to v. Helmholtz, the outstanding figure in German physics at the beginning of Planck's career. Boltzmann was at the time actively at work in the development of the kinetic theory of matter, but his point of view still occupied a subsidiary place with respect to thermodynamics as an approach to the study of the properties of matter. So it was that Planck's first scientific interest was in the field of thermodynamics. In fact that remained his primary interest for many years and ultimately led to the discovery of the quantum. His many publications prior to 1900 deal chiefly with the clarification of the fundamental principles of thermodynamics with applications to physical chemistry and heat radiation.

Thermodynamics is a subject of maximum appeal to the conservative scientist who seeks to introduce as few special hypotheses as possible into his thinking. Planck's genius is of just this cautious type—he must find the speculations of present-day nuclear theoretical physics extremely distasteful. Nevertheless the work of Planck has led to a reformulation of the principles of physics so drastic that we can compare it only with the adoption of the Copernican view of astronomy or with the replacement of the kinematics of Newton by that of Einstein. As the Copernican system gave the key to the heavens, so the quantum theory of Planck has supplied the key to the sub-microscopic world and to the understanding of the structure of matter. On the philosophic side it has torn the law of causality from its central position as the essential basis of science and on the practical side it has provided the stimulus for a vast wealth of experiments and of experimental discoveries. The possibility that such an avalanche of change could result from the work of a conservative like Planck arose, of course, from the circumstances that the initial position of the science of physics was an unstable one.

The first of the series of researches which were to culminate in the overthrow of classical physics was apparently begun in 1894. Early in the following year Planck presented to the Berlin Academy of Science a paper on electrical resonance in which he calls attention to the harmony between his results and Kirchhoff's law relating the emission and absorption coefficients of matter for thermal radiation. Clearly he had in mind at this time the task of reconciling the electromagnetic theory of heat radiation with the demands of thermodynamics. This meant the application of the entropy concept to electromagnetic waves and the study of the equilibrium between radiation and model sources of light.

The path of progress was not a straightforward one. Planck conceived the process of establishing thermodynamic equilibrium between radiation and matter as a pure electromagnetic resonance phenomenon involving, however, an irreversible increase in entropy. The reversibility in time of the electromagnetic equations led to the same quandary here as that involved in reconciling the reversibility of the mechanical equations of motion with the entropy principle in statistical mechanics. The paradox was solved by the introduction of the postulate of a chaotic distribution of amplitudes and phases for the elementary vibrations of "natural radiation." By an analysis of the resonance phenomenon Planck was then able to derive a simple relation of proportionality between the average energy of charged linear oscillators of frequency ν and the specific intensity of radiation of the same frequency in equilibrium with these oscillators.

The ultimate goal of Planck's operations was to derive the law of the distribution of energy in the spectrum of a black body, or in the spectrum of a hollow cavity in thermal equilibrium with absorbing and emitting matter. Strange to say he made at first no application of statistical mechanics to the linear oscillators which he employed as model sources of light. Because of his thermodynamic bias he chose to treat the equilibrium between the oscillators and radiation from the point of view of entropy and so to reduce the problem to that of determining the entropy of a system of ideal linear oscillators as a function of their energy and frequency. Still adhering to the phenomenological method of thermodynamics he was able by plausible hypothesis to formulate an expression for the oscillator entropy which led to the Wien radiation formula—then the best representation of the existing experimental facts. For a moment it seemed that the problem was solved, but new experimental data showed the Wien formula to be incorrect for low frequencies and required a modification of the theory. Planck's first step was to invent a purely formal alteration in the differential equation for the oscillator entropy, thus deriving a better radiation formula—the famous one we now associate with his name. Only then did he turn to the microscopic point of view and to Boltzmann's correlation of entropy with probability in search of a genuine physical meaning for his revised entropy formula. And here Planck made the culminating discovery (1901) that the entropy expression required by radiation measurements can be reconciled with the statistical interpretation of entropy if, and only if, the possible oscillator energies are assumed to be integral multiples of a finite unit proportional to the frequency. Later investigation was to replace the proposed energy quanta by equivalent quanta of action.

When we consider how violently contradictory to every previous concept this new hypothesis was, we need not be astonished to find it practically forced upon the unwilling investigator by obdurate experimental facts. A revolutionist in spite of himself, Planck felt as keenly as any one the difficulties in his hypothesis and spent much energy during subsequent years in the effort to reconcile the quantum concept with the wave theory of light. Recognition of the existence of an element of discontinuity in the microscopic world came slowly, but doubt was followed by growing interest and after a quarter of a century of intensive research the initial difficulties of the quantum theory found their solution.

Space does not permit more than a passing mention of Planck's many other important contributions to science, to his reputation as a teacher, and to his books. He is a staunch defender of religious faith and an able and vigorous proponent of the conservative point of view with respect to the philosophy of physics. In 1913 he became rector of the University of Berlin. In 1920 he was awarded the Nobel prize in physics. To-day we acknowledge our indebtedness to his achievement and draw inspiration from the story of his disciplined life.

E. C. Kemble

THE FIFTIETH ANNIVERSARY OF THE AMERICAN PHYSIOLOGICAL SOCIETY

At a banquet on the evening of April 1 at the Lord Baltimore Hotel in Baltimore, the American Physiological Society celebrated the fiftieth anniversary of its founding. The actual invitations to the organization meeting were dated December 30, 1887.

The celebration was planned by a semi-centennial committee appointed by the council consisting of Drs. Charles W. Greene, William H. Howell and Walter J. Meek, *chairman.* The celebration took the form of a special program at the annual federation banquet and the preparation of a history of the society.

At the banquet four of the five living original members were present as guests of honor: Professor R. H. Chittenden, emeritus professor of biological chemistry at Yale; Professor William H. Howell, emeritus professor of physiology at Johns Hopkins; Professor Joseph Jastrow, formerly professor of psychology at Wisconsin, and W. P. Lombard, emeritus professor of physiology at Michigan. Dr. F. W. Ellis, the fifth surviving original member, was unable to be present.

For the occasion Dr. W. T. Porter had been made honorary president by the society and he presided as toastmaster. Dr. J. J. Abel, emeritus professor of pharmacology at the Johns Hopkins University, was also a distinguished guest. Dr. W. H. Newton brought the cordial greetings of the British Physiological Society, and Dr. C. H. Best represented the Canadian Physiological Society.

The program consisted of the roll call of the original members by Dr. Walter E. Garrey, president of the society, and the introduction of Dr. Porter, the toastmaster. The introduction of the original members present followed. Eulogies of the three founders of the society were then given: Henry P. Bowditch, by Dr. Walter B. Cannon; H. Newell Martin, by Dr. William H. Howell, and Silas Weir Mitchell, by Dr. A. J. Carlson.

An account of the celebration would not be complete without a word in regard to the toastmaster and the authors of the eulogies. It is safe to say that never in the history of the society had the membership ever listened to such eloquent and finished speeches. From the literary remarks of Dr. Porter, which were filled with humor, to the vigorous words of Dr. Carlson,