might have some selective activity on the parathyroid. He called his solution Hydrochloric X and described it in the *Military Surgeon* for April, 1923. The article attracted little attention partly because endocrine workers did not regularly review the *Military Surgeon* for articles in their field and partly because they doubted the advisability of boiling a gland with a mineral acid in order to extract an active principle! Nevertheless, Hanson arranged to have his Hydrochloric X tested on parathyroidectomized dogs and was gratified with the result. He was convinced that he had hit upon a method of releasing the substance in the parathyroid gland that was responsible for raising blood calcium and relieving tetany in dogs. He published his results in the *Military Surgeon* for January, 1924. They were soon ably confirmed and extended by Collip (1924).

It is now learned that Dr. Hanson, immediately after having been awarded his patent, assigned to the Smithsonian Institution at Washington all income and royalties accruing to him. The grant has been accepted by Dr. C. G. Abbot on behalf of the institution and will be known as the Martin Gustav and Caroline Runice Hanson Fund, thus assuring that all income will be used in the furtherance of science. Three of the largest pharmaceutical houses in the country are already operating under the patent, namely Parke, Davis and Company, Eli Lilly and Company and E. R. Squibb and Sons.

The spirit which motivated Dr. Hanson through all the years when he worked alone on his problem, sacrificing his resources with the disregard of one truly unselfish, is well illustrated by his final act in the interests of science.—OLIVER KAMM.

AWARD OF THE COMSTOCK PRIZE OF THE NATIONAL ACADEMY OF SCIENCES TO PROFESSOR BRIDGMAN

THE Comstock Prize of the value of $2,500 was presented to Dr. Percy W. Bridgman, Hollis professor of mathematics and philosophy at Harvard University, at the dinner of the National Academy of Sciences held at Lowell House, Harvard University, on the evening of November 21. The report of the chairman of the Comstock Fund Committee, Dr. Max Mason, president of the Rockefeller Foundation, was made by Dr. Fred E. Wright, home secretary, and the presentation was made by Dr. W. W. Campbell, president of the academy. The report of the committee was as follows:

In awarding the Comstock Prize for the five-year period ending in the present year, the National Academy of Sciences recognizes the brilliant achievements of Percy Williams Bridgman in advancing our knowledge of the behavior of matter. Bridgman is both an experimenter and a theorist. Working indefatigably in a field of great experimental difficulty, he has derived an enormous array of fundamental facts, while new insights and physical concepts have come from the keen analysis of his theoretical studies.

Most of Bridgman's work falls into three categories: the first, so peculiarly his own, the behavior of materials under high pressure; second, the properties of single crystals at normal pressures; and, third, the application of thermodynamics to electrical phenomena.

To catalogue the phenomena and the material studied under the difficult technique of high pressures, and, of recent years, low temperatures as well, gives a picture of the astonishing extent of Bridgman's work. He has studied compressibilities, melting points, polymorphic transitions, electrical resistance, thermo-electric behavior, thermal conduction and viscosity. An idea of the amount of material gained through these difficult studies may be obtained from the fact that compressibilities have been measured for 80 solid compounds, 54 elements, 60 liquids, as well as several gases. To state very briefly some of the general results obtained, it has become clear that most of the compression of substances at high pressure is provided by the compression of the atoms and molecules themselves, and not by diminishing the space between them; that previous ideas on the course of the melting curve must be modified since, for example, there is no critical point, but melting temperature may rise with pressure until the atoms break. Theories of the solid state must reckon with Bridgman's result on polymorphic transitions. Why, for example, should rubidium chloride be forced by high pressure from a face-centered to a body-centered cubic arrangement when calcium chloride is not so affected? Many anomalies are shown in Bridgman's studies of electrical resistance under pressure. In 1930 a result of outstanding and fundamental significance was obtained. Working at enormous pressure and at low temperature, Bridgman determined that a temperature of minimum resistance exists for the alkalies. Lowering the temperature beyond this point increases instead of lowers the resistance. This result, of far-reaching importance, must be a guide for all theories of electrical conductivity.

A large series of determinations of the behavior of single crystals has resulted from Bridgman's development of an easy way of forming single crystals of metals and salts. In recent years he has determined for many such crystals the elastic constants, electrical resistance, thermal conductivity and thermo-electric effects.

In a series of articles Bridgman has applied thermodynamic analysis to electrical phenomena, with results of far-reaching importance. It was thus discovered and experimentally demonstrated that an internal Peltier heat in crystals exists where the direction of current flow changes. This means that the direction of motion of an electron in a metal can not be changed without the expenditure of a definite amount of energy, the result again furnishing a fundamental fact which must be reckoned with in electron theory. Through application of thermodynamics to the transverse galvano-magnetic effects Bridgman has shown the existence of a new physical concept, a thermo-motive force, by virtue of which under proper conditions temperature differences may exist within a material without heat flow. Bridgman

has established by further thermodynamic arguments the existence of several new effects, among them a new kind of electro-motive force in a circuit carrying a current in which the temperature is changing.

In addition to his many contributions to the form and substance of his own special branch, Bridgman has served the broad field of science in a most significant way. His writings on the logical and philosophical foundations of science have given sensible and suggestive answers to many fundamental questions. His development of the idea of operational concepts has clearly played an important rôle in the most recent physical theories. It has been an unusual and gratifying experience to read, from his pen, scientific philosophy that is both philosophical and scientific. Such contributions could perhaps be made only by that rare person who is at the same time a gifted experimenter, an able theorist and a sensible man.

Professor Bridgman, in accepting the award, expressed his great appreciation of the high honor done him by the academy and the Comstock Committee. It was a particular pleasure that the chairman of the committee was Dr. Mason, with whom he had been closely associated in experimental work for the government during the war. He continued:

Dr. Mason has given some idea of the nature of the work already accomplished; it is of interest to indicate what in addition may be expected in the future. With regard to work under high pressure, it appears that there is an enormous amount of fine scale irregularity in the relation between pressure and volume of a number of solid substances, which may perhaps depend on a complicated interchange of electrons between the atoms. Quantum theory is just beginning to be able to handle this sort of thing, and a wealth of new experimental data may be expected to clarify our understanding of the nature of the fundamental processes. Further, there are a number of questions connected with the electrical resistance of conductors which involve measurements under pressures higher than those yet used, and these experiments are now being started.

Most of the work has been in a field not fashionable at present. This field is to be broadly characterized as concerned with the properties of matter in bulk, as opposed to the properties of matter on a small scale, atoms and electrons, with which most physicists are at present occupied. It is entirely proper that activities should be mostly concerned with a study of the submicroscopic elements of the physical world, for here are the most interesting problems, and it is here that the deepest insights are to be obtained. But the study of large-scale phenomena is also important, and it is justifiable that at least a few physicists should be occupied with it. There are two very broad purposes which may be furthered by a study of large-scale phenomena, which in principle can not be obtained from small-scale phenomena. In the first place, modern theoretical physics seems committed to the thesis that all large-scale phenomena can be completely understood in terms of the properties of the small-scale elements. A justification for this can be only empirical, and that justification has not yet been given by any means. It is entirely conceivable that large-scale matter might embody properties which the biologists would call "emergent," which can not be predicted from even an exhaustive knowledge of the properties of the isolated elements. We can never be sure of the thesis that there are no "emergent" properties until the explanation of large-scale properties is completely worked out, and for this reason it is important that our knowledge of large-scale properties be as wide as possible. In the second place, the concepts in terms of which we describe small-scale experience are themselves derived from large-scale experience, and it is therefore vital that the concepts be adequate to describe large-scale experience. These concepts were a slow growth and the result of long rumination, continual fitting and adjustment, to insure that the evolving concepts completely corresponded to all the known experimental facts. The later generations forget this slow process of growth, and accept the concepts as they find them. But the discovery of new experimental facts beyond the range of those known when the concept was crystallized should demand the reexamination of the concept to determine whether it is still adequate. Only by being everlastingly self-conscious of the experimental basis of our concepts and the possibility of necessary revision as knowledge of large-scale phenomena broadens, can we be sure that the basis for our theoretical speculations remains sound.

SCIENTIFIC NOTES AND NEWS

RESPONDING to protests against the enforced retirement of Dr. William H. Park from the New York City Health Department, Mayor O'Brien wrote recently to Dr. Park assuring him that he would be continued in service after he reached the retirement age of seventy years on December 30.

THE John Scott Medal of the City of Philadelphia has been awarded to Dr. Frank Conrad, engineer of the Westinghouse Electric and Manufacturing Company, for his research work on radio broadcasting.

THE American Association of State Highway Officials, the American Road Builders' Association and the Highway Research Board of the National Research Council announce the conferring of the George S. Bartlett Award on James H. MacDonald, formerly state highway commissioner of Connecticut and for many years treasurer of the American Road Builders' Association. The presentation will be made at the annual meeting of the Highway Research Board on December 7. Mr. MacDonald was chairman of the original State Highway Commission of Con-