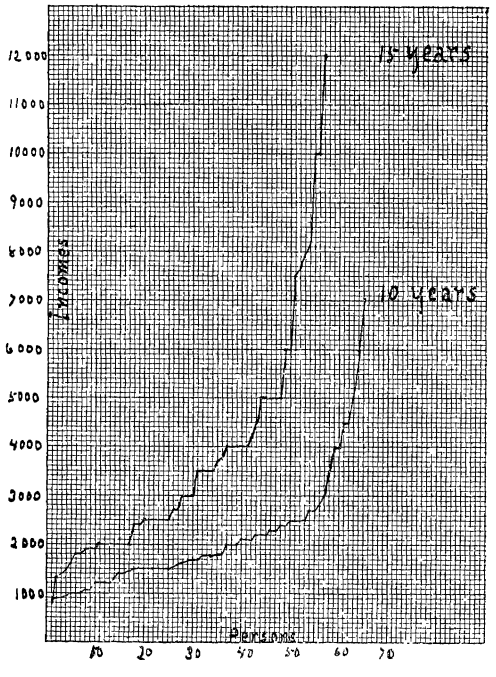
this capacity after ten years. Five years ago there were nineteen men getting fifteen hundred or less, this year only four. Then only seventeen per cent. had more than three thousand dollars and last year a little over fifty per cent. were in this class. Five years ago



the highest man had seven thousand dollars and this time the highest was twelve thousand with two tens. Five years ago the average was $2,097 and this time $3,729, with the men at present much more closely massed about the average.

The plat shows the lower line exactly as published five years ago, and the upper line shows the present distribution of incomes.

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SCIENTIFIC BOOKS

The Constitution of Matter. By JOSEPH S. AMES. Houghton Mifflin Co., 1913. 8vo. Pp. x + 242.

This volume represents the 1913 series of lectures, six in number, given at Northwestern University under the N. W. Harris foundation.

The purpose of this foundation, as expressed by the donor, "is to stimulate scientific research of the highest type, and to bring the results of such research before students and friends of Northwestern University and through them to the world." It was therefore necessary for Professor Ames, with the above subject, to undertake the extremely difficult task of presenting a true picture of the present status of scientific thought upon the broadest and the most fundamental, though the most dimly discerned, of the fields of science, and at the same time to do it in such a way as to hold the attention of a general audience.

That the lectures actually did command the interest of physicist and layman alike will be testified by all who heard them. Robbed however of the compulsion of Professor Ames's personality I suspect that the printed lectures will make their greatest appeal to the scientist rather than to that type of layman whose taste dictates the popular science of *Harpers, Scribners* and the like. For a careful scientific analysis, such as Professor Ames gives, of the concepts and phenomena which constitute the very foundations of physics, even though divorced, as it is here, from all attempt at mathematical formulation, is something more than the diversion of an idle hour. Indeed many a physicist will ponder long over some of these chapters, and read them more than once, and use them continually for reference as he attempts to put together the rapidly accumulating facts of molecular, atomic and electronic physics into a consistent theory of the constitution of matter.

There are few if any other men whose grasp of both the facts and the theories of physics is sufficiently comprehensive to enable them to discuss with such freshness, thoroughness and insight so many of the problems raised by recent investigations.

Perhaps the most charming feature of the lectures is the clearness and frankness with which Professor Ames reveals his own way of thinking about the problems of atomic and electronic physics and the definiteness of the physical pictures which he calls to his aid. There is no servile restatement of the most striking features of some other physicist's

point of view such as is so characteristic of most popular science writing, but instead a clear presentation of current scientific opinion as it has been incorporated into Professor Ames's own thinking.

The first lecture lays the foundation for the remainder by an admirable and a very discerning historical discussion of the introduction into physics of the concepts of mass, force, the ether, energy, molecules, atoms and corpuscles. Concerning this chapter I would make but two comments: It is a pity that all other writers have not shown as much discrimination in the use of the terms corpuscle and electron. The latter term was introduced into physics in 1891 by G. Johnstone Storey to denote the "natural unit of electricity" *altogether without reference to the inertia which might be associated with it* and it is surely desirable to-day to have some word to denote this idea. *Electron* is obviously the logical word for the purpose. A *negative* electron when associated with the smallest inertia which is ever found to accompany an electron, namely, 1/1830th that of the hydrogen atom, was called by Thomson a corpuscle, and Professor Ames wisely follows this usage. I can not myself be quite so enthusiastic about the statement that "a system has potential energy if it is in its natural condition" or indeed about the way in which the idea of potential energy is used throughout the first and second chapters, especially throughout the second, which deals primarily with the subject of electromagnetic mass. There is a sentence in one of the later lectures which reads as follows: "There is no word, I think, in our language which is so much used to conceal ignorance as 'heat,' and no word about which there is so much confusion of ideas as 'temperature.'" I should like to insert in each clause "*except the word energy.*" The third lecture treats together the newest and the oldest of the departments of physics, namely, radioactivity and gravitation, the former quite briefly (excellent judgment again), the latter quite at length but with a freshness and power which is born only of a very thorough and profound knowledge of original sources.

The fourth, fifth and sixth lectures are the finest and most stimulating of the course. They deal respectively with (4) the problems of radiation, (5) the electron theory of conduction, thermoionics and magnetism, (6) models of atoms and fundamental concepts of nature. These chapters represent I think the best general discussion which has appeared in English of the big problems which the researches of the past two decades have presented to modern physics.

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The Chemistry of Cattle Feeding and Dairying. By J. Allan Murray. London, Longmans, Green and Co. 1914. Octavo. Pp. 343.

This book discusses briefly (1) the constituents of plants and animals, (2) the nutritive requirements of animals, (3) feeding stuffs and (4) dairy chemistry. The treatment is, in the main, elementary in character. The distinctive feature is an attempt to break away from the Wolff and the Kellner feeding standards, especially in recognition of the fact that the nutritive requirements of animals do not vary directly as the live weight. The point of view is rational, and the tentative formulæ suggested for the separate computation of food requirements for maintenance, labor, milk production, growth and fattening constitute a notable step in a direction in which progress is much to be desired. The discussion of the chemistry of the subject is generally satisfactory.

The author's statements regarding the functions of the mineral elements, and regarding other matters of physiology and histology, are frequently lacking in discrimination. We quote a few such passages:

Page 8: "The ingredients of the ash are not 'mineral.' They are just as much organic matter as the fats or proteins."

Page 9: "It is probable, however, that the chlorides naturally present in the food of herbivora are sufficient to provide all the hydrochloric acid required."