knowledge to be gained from reading it, but he does wish to write with the greatest enthusiasm concerning the splendid result of wide cooperation. The termites, always important creatures in certain tropical countries, have been extending their normal geographic ranges largely by the unwitting assistance of man, and in their broadening range they have found that man in his slipshod and blind haste has created innumerable opportunities for their increase. Thus they have been becoming more and more important from the economic point of view. The normal food of termites is cellulose, and, as pointed out by Dr. Kofoid in one of his comprehensive opening chapters, it has been their function—their place in nature—since millions of years to break down dying and dead vegetation and to return it to the soil. But man, in his multifarious efforts to change the processes of nature, has found very many ways of utilizing dead wood and of utilizing it for very many years. At the same time he has been helping the termites to spread and has given them almost infinite chances to multiply. Thus the two forms of life have come into direct antagonism, and termites and termite damage have been increasing at an alarming rate. Within comparatively recent years federal and state entomologists have been appealed to from many directions. People have learned the meaning of the word *termite*. The newspapers have carried the advertisements of commercial "termite destroyers," and much misinformation has been disseminated.

While the Pacific Coast is by no means the only region in the United States to suffer, it has been the Californians who have done the big thing—to form a sound committee and to support it financially. And the committee has interested the very best experts and has reached valuable and far-reaching conclusions. And the University of California has published this big volume, which tells the whole termite story in a most conclusive way. It is a high spot in applied entomology. It shows what man can do and should do in the face of the progress of insect damage.

L. O. HOWARD

MASS SPECTRA AND ISOTOPES[1]

IT is very timely that this book by Dr. Aston should appear just when experiments on the artificial disintegration of atoms are giving a fresh significance to the subject. The second edition of "Isotopes" appeared in 1924, and this new book brings the subject up to date and emphasizes the recent experimental and theoretical results. In Part I the historical development of the subject is discussed. In Part II we have a detailed discussion of the latest experimental methods. Part III contains a valuable classified summary of the latest data on the separate chemical elements, including the experimental results of Bainbridge's published in the summer of 1933. In Part IV various theoretical aspects are discussed, including the packing effect, the relative abundance of isotopes and elements, the isotope effect in band spectra, and in atomic spectra, also a discussion of methods for separating isotopes.

The book is well illustrated, as it contains 43 figures and 8 plates, with reproductions of apparatus, mass spectra and optical spectra. In addition there are many tables summarizing in a very complete manner our knowledge of the various aspects of the subject. The book will be welcomed by any one interested in the subject of nuclear physics.

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[1] "Mass Spectra and Isotopes." By F. W. Aston. Longmans, Green and Company. pp. 243. $4.80.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

BEYOND URANIUM WITH THE MAGNETO-OPTIC METHOD OF ANALYSIS[1]

THE term "magneto-optic method" was coined by Allison and Murphy[2] to designate a procedure for which they claim applicability to chemical analysis. The apparatus used for such work is shown diagrammatically in Fig. 1. The substance to be examined is placed in cell B_2 in the form of a solution, and the positions of minima of light intensity are read on the wire path scale, from which the time lags are computed. The time intervals are supposedly dif-

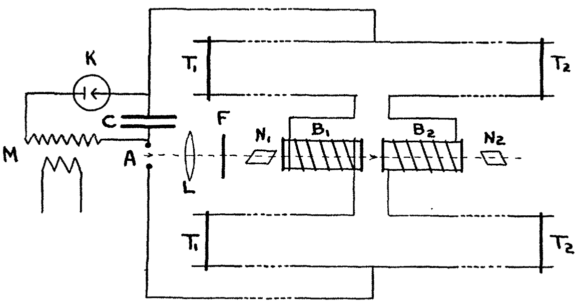

FIG. 1. Diagram of the magneto-optic apparatus. B_1, B_2, glass cells. N_1, N_2, Nicol prisms. F, light filter. L, lens. A, spark gap. K, kenotron. M, transformer. C, condenser. T_1, T_2, trolley.

[1] This note was taken in part from a paper read at the autumn meeting of the National Academy of Sciences, New Haven, Connecticut, November 18, 1931.

[2] Allison and Murphy, *Jour. Am. Chem. Soc.*, 52: 3796, 1930.

ferential, the time lag for each compound being referred to carbon bisulfide or to some other standard liquid kept in cell B_1. From an empirical examination of a variety of substances Allison and Murphy concluded that "each chemical compound, regardless of the presence of other substances, produces its characteristic minimum (or minima) of light intensity," which persists at extremely low concentrations. They also stated that the positions of these minima are "functions of the atomic weights of the metallic elements of the compounds or, more precisely, of the atomic weights divided by the valence, that is, the chemical equivalents." The curves in Fig. 2 were

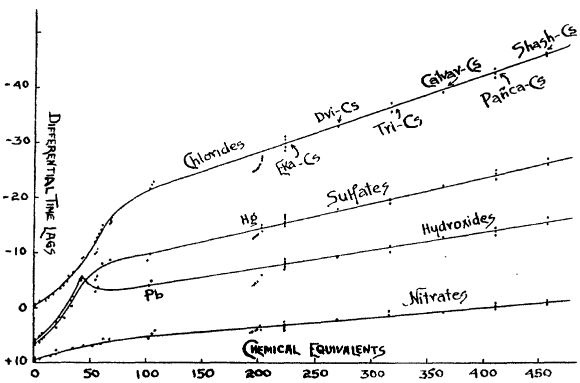

FIG. 2. Chemical equivalents of elements plotted against time lags. To avoid crowding few elements are recorded on this chart, and still fewer are designated with symbols.

obtained by plotting differential time lags against the chemical equivalents of a large number of elements in the form of chlorides, sulfates, hydroxides and nitrates. Such curves are claimed by Allison[3] to be "representative of the results for chemical equivalents up to 100 or thereabouts," and beyond this limit "they fail to conform to data." This claim, however, is obviously wrong, because in the very next paragraph Allison states that it was "entirely by this method that evidence of the presence of element 87 and later of element 85 was obtained." Both elements, 87 and 85, presumably are univalent, and the equivalent of each is considerably higher than 100. It was therefore deemed logical to utilize the magneto-optic method in search of elements with atomic weights higher than that of uranium.

With this object in view, the heavier analogues of ekacesium were decided upon. The decision was prompted by the assumptions that these elements, if existent, are apt to occur with cesium and rubidium in certain minerals and that they are univalent. Because of univalence their chemical equivalents will equal their respective atomic weights. But what are their atomic weights? This question of course is quite puzzling. By resorting to calculations based on the average difference of the atomic weights of the rarer alkalies, and by assuming the probability of long and short periodic series, the following values were decided upon: Dvicesium 271 and tricesium 315.

The experimental work was comparatively simple. Extracts of lepidolite were obtained, and the chloride, sulfate, hydroxide and nitrate were each placed in cell B_2 (Fig. 1) and readings were obtained with the Allison apparatus. As seen from the curves (Fig. 2) dvicesium has no isotopes, while tricesium has two.

But why stop with tricesium? The trolley wires were of ample length, and by assuming atomic weights for three additional alkalies, the following elements were observed: Catvarcesium 365, with no isotopes, pañcacesium, 412, and shashcesium, 459, with three and two isotopes, respectively. Shashcesium was the last alkali element to be observed by the magneto-optic method of analysis, because the end of the trolley wires had been reached.

It is obvious from the results just recorded that the magneto-optic method was not a success in our hands. The most scrupulous care was taken to make the apparatus an exact duplicate of the one developed by Dr. Fred Allison. One of us (A. C. S.) spent two weeks in Dr. Allison's laboratory working intensively under his direction with the magneto-optic apparatus. We take this opportunity to express our gratitude to Dr. Allison for his kindness and helpfulness; we must repeat, however, that in our hands the method proved to be a complete failure.

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CONTINUOUS PHYTOPLANKTON COLLECTION

IN the marine phytoplankton investigations of the inshore and inland waters of the northeast Pacific the problem of the localizations of growth of various genera and species of pelagic diatoms is often encountered. In an effort to obtain an idea of this "patching of the phytoplankton" and a continuous picture of the geographic localization of the plankton communities, it became necessary to devise a scheme for collecting plankton from a vessel underway.

The research vessel *Catalyst* of the University of Washington Oceanographic Laboratories has a seacock two meters below the water line just forward of the point of greatest beam. From it a pipe line is led to a convenient point below the water line in the ship. Here the water is filtered through the apparatus described below to collect the plankton.

The figure shows a diagram of the apparatus which consists essentially of a net (g) surrounded by a

[3] Allison, *Ind. and Eng. Chem.*, Anal. Edition, 4: 10, 1932.