five years' practical experience, and must possess great advantages for the class of students for whom it is intended.

A catalogue of minerals alphabetically arranged. By A. H. CHESTER. New York, Wiley.

Professor Chester's catalogue is best described by an extract from its preface: "This list is intended to embrace all English names now in use in the nomenclature of mineralogy. It includes species, varieties, and synonymes. Well-authenticated species are put in full-faced type. Dead and useless names have been omitted, so that the catalogue can be conveniently used as a check-list and in cataloguing collections." The list seems very complete, and admirably adapted for purposes stated by its author. G. H. WILLIAMS.

THE CHEMISTRY OF THE SUN.

MR. LOCKYER'S new book is unquestionably the most important work in the department of astronomical physics which has appeared for several years: it is especially interesting and valuable as coming, not from a compiler and dealer in second-hand materials, but from an original worker, who has himself made most of the observations and investigations on which his conclusions depend. We do not mean, however, to imply that he either ignores or is ignorant of the work of others, or fails to make proper use of it: in fact, he brings together a very complete account of all that bears upon his subject, with due credit to his fellow-workers and a generous appreciation of their labors and opinions, even when their conclusions differ from his own.

While the book can perhaps hardly be called a 'popular' exposition of its subject, it is certainly not *un*-popular, — not unnecessarily technical or abstruse; and the vivid, enthusiastic, perhaps here and there just slightly sensational, style of the author helps to make it attractive: so that it seems likely to be far more extensively read than most volumes of its class.

The main purpose of the writer is to present the spectroscopic evidence in favor of the hypothesis that our so-called elements are not truly elementary, but so constituted that they can be broken up, or 'dissociated,' into still more elementary components by the action of heat; and that on the sun and stars they are actually so dissociated by the high temperatures there prevailing.

In the preface, after pointing out the decomposing power of higher and higher temperatures as actually observed in our laboratories, the author adds as a sort of summary of his argument, "The question then, it will be seen, is an appeal to the law of continuity, nothing more and nothing less. Is a temperature higher than any yet applied to act in the same way as each higher temperature which has hitherto been applied has done? Or is there to be some unexplained break in the uniformity of nature's processes?"

The chemistry of the sun. By J. NORMAN LOCKYER. New York, Macmillan. 8°.

The first seven chapters of the twenty-eight which make up the book are mainly historical, occupied with an account of spectroscopic work previous to 1866, and giving perhaps the best *résumé* of the work of Wollaston, Fraunhofer, Kirchoff, Angstrom, and others, that can be found in the same space. The next three chapters discuss what the writer calls 'A new method in spectroscopy,' and its results. The 'new method' consisted merely in attaching the spectroscope to a telescope, and studying the spectrum of an object in *detail*, instead of in gross, so to speak. Huggins seems to have been the first to employ this 'new method' in his examination of the nebulae in 1864; but Mr. Lockyer was the first to employ it upon the solar surface in 1866.

The results were the recognition of many peculiarities in the spectra of sunspots and faculae, the development of the method of observing the chromosphere and prominences without an eclipse, and the detection of remarkable modifications of many lines in the spectrum, such as widenings, reversals, contortions, etc., all significant and evidently depending upon the physical conditions of temperature and pressure prevailing at that special point of the solar surface which happens to be imaged on the slit of the spectroscope at the moment of observation.

This is followed by an account of the author's early laboratory-work, especially his investigation of the so-called 'long and short lines' in elementary spectra, and the coincident lines in different spectra. This brings us down to 1873.

The next three chapters discuss the 'difficulties' that had presented themselves, and seemed to require a remodelling of the received theories. Our space does not permit a presentation of these difficulties here; but it must suffice to say that they are such as absolutely to compel us to suppose that a given element, such as iron for instance, either gives widely different spectra under different circumstances, the spectrum tending towards simplicity under the very highest temperatures, or else that it is decomposable.

This idea, that our elements are only relatively elementary, while really composed of still simpler substances, is no new one, as Mr. Lockyer himself points out, but had previously been brought forward, and more or less strongly advocated, by Dumas, Brodie, Sterry Hunt, and others, though not on spectroscopic grounds.

The succeeding chapters give us an account of the author's elaborate photographic study of the solar and metallic spectra, a fuller statement and discussion of the dissociation hypothesis, and a comparison of it with certain test-experiments and with the observations that have been made upon the spectra of sunspots and of the chromosphere.

The twenty-fifth chapter deals with the results deduced from the observations of recent eclipses; the twenty-sixth is devoted to the 'basic lines,' to which the author still clings with something like a parent's tenderness for a feeble child; the twenty-seventh deals with the spectroscopic phenomena of the electric arc; and the twenty-eighth and final chapter gives a sort of summing-up and general application of the hypothesis to the phenomena of solar physics.

As to the 'basic lines,' which if really existent would amount to something hardly short of a demonstration of the dissociation hypothesis, the author frankly concedes that the apparent coincidences between the lines of different metals are not exact when examined with sufficient dispersion, but he maintains that the near approach to coincidence is hardly less significant, and appeals to the observations of lines affected in the spectra of sunspots and prominences to show that the 'basic lines' are essentially different from other lines. It is certainly true, that, as compared with other lines, these 'basic lines' are observed with very disproportionate frequency and intensity; but to most spectroscopists it appears that a sufficient explanation exists in the fact that each of them is double or multiple, having each of the components separately affected. In most cases the thickening or reversal of a line is a very delicate phenomenon, difficult to make out at best; and, when two or more such lines happen to stand close together, they catch the eye more readily: probably that is all.

Taking the whole work through, it may be said, that, while here and there passages are open to obvious criticism and objection, Mr. Lockyer undoubtedly makes out a strong case in favor of his 'dissociation hypothesis' by showing its accordance with the phenomena of the solar and stellar spectra. At the same time the alternative hypothesis that an elementary molecule, *without breaking up*, may, after the analogies of allotropism, be capable of very different modes of vibration under different circumstances of pressure, density, and temperature, and so give entirely different spectra, — this hypothesis seems equally reconcilable with observed facts. And it does not encounter the difficulties, which Mr. Lockyer barely alludes to, that our present chemical elements seem to be set apart from all compound bodies by Dulong and Petit's law of atomic heats, and Mendeljeff's periodic series. Until this difficulty is overcome, — we do not mean to imply that it is necessarily insurmountable, — we doubt whether most physicists and chemists will be disposed to abandon entirely the hypothesis of 'multiple spectra' for that of 'dissociation.'

PROFESSOR LEIDY, in the *Journal of comparative medicine and surgery*, communicates his observations on the subject of tape-worms in birds. He finds that birds are as much infested with intestinal worms as other classes of animals, and that none appear to be exempt, no matter what may be the nature of their food, though aquatic birds appear to harbor a greater number of species, as exemplified by ducks and geese. Among the parasites, tape-worms — mostly of the genus Taenia — are common, though less so than the thread-worms. The domestic fowl in Europe has been reported to harbor half a dozen different species of Taenia, though Leidy has observed but one in our domestic fowl, and this but rarely. In the turkey, guinea-fowl, and pea-fowl, no species has been observed. In the sage-fowl (Centrocercus urophasianus), tape-worms are often found in large numbers, sometimes so as to distend the intestines: the species seems to be Taenia microps Diesing. The reed-bird or rice-bird (Dolichonyx oryzivorous) is also infested with tape-worms (Taenia pestifera). Leidy has found that in a bunch of a dozen obtained in the Philadelphia market three or four individuals will contain this parasite. The thin birds are the ones especially affected, the fat ones being commonly exempt. Tape-worms have also been found in the yellow-breasted chat (Icteria virens), the cow-bird (Molothrus ater), the quail (Ortyx virginianus), the chuck-wills-widow (Antrostomus carolinensis), the blue heron (Florida coerulea), the robin (Turdus migratorius), the woodcock (Philohela minor), and in the horned grebe (Podiceps cornutus).

— Dr. Wilcox of Washington, D.C., writes to the *Medical record* that the cow-boys of Idaho treat animals affected with 'loco' poisoning, to which he has already referred in *Science*, by amputating the tails of the affected animals. The paralysis is due to congestion of the spinal cord, the posterior parts of the body being first affected. The plants which are charged with producing this poisoning are Oxytropis Lambertii, Astragalus mollirimus, and possibly others of the leguminosae. The cow-boys call these plants 'larkspur,' although true larkspur is not found in their line of march, nor at the season when loco-poisoning occurs.