out." Still, here is a book well worth buying and studying. The illustrations and diagrams are admirable; and Dr. Millard has not only authority, but an excellent style.

Bibliotheca Geographica: Jahresbibliographie der Geographischen Literatur. Edited by Joseph Müller. Band xviii. Jahrgang, 1909 und 1910. Pp. xvii + 483. (Berlin: W. H. Kuhl, 1914.)

ASSOCIATED for many years with the name of Prof. Otto Baschin, this excellent publication is as useful as ever under its new editor. In previous issues the "Bibliotheca Geographica" purported to be a bibliography of all geographical books and articles that appeared; the current issue is limited only to scientific writings. And the list of them runs to 480 pages! The student will find in the catalogue all manner of books and studies in learned journals bearing on the many-sided problems of geography, not omitting methods of teaching. Turn, for instance, to the section on Austria-Hungary. Books on physical geography, cartography, climatology, mountains, hydrography, biological geography, historical geography, and last, but not least, maps are mentioned. The diligence of the editor deserves all praise, and his book should prove of great use generally, more especially in countries like Russia, of which the language is a sealed book to most. In many cases, immediately after the entry of a particular book, stands a reference to a review of it. Thus, following Mr. A. L. Salmon's "Dorset" in the "Cambridge County Geographies," we have a reference to the *Geographical Journal*, vol. xxxvi., p. 178, where the book is noticed. This additional information is certainly useful. But it does not go far enough. If only we had some indication in these long lists of books of their relative value (even in a very general way) the "Bibliotheca Geographica" would add much to our indebtedness.

Science and the Miller. By J. S. Remington. Pp. 166. (Liverpool: The Northern Publishing Co., 1914.) Price 4s. 6d. net.

ENGLAND is justly proud of its milling industry, and the advances made in it both on the mechanical and the technical side during the last decade have given the lead both to Europe and America. Our biggest milling concerns are already willing to learn, and there are indications that the smaller miller, too, is prepared to accept the help that applied science will give him. It is essential, however, that his chemist should be of the right type; such, for example, as is portrayed in the work under notice. The chapter on the training of the flour-mill chemist is an admirable statement of what is necessary, whilst the remarks as to the position the employer should take towards the chemist will be applauded by every man of science with works experience.

Later chapters give hints as to the directions in which the chemist can make himself useful in the mill, and from these we would select that on improvers and enrichment processes for special commendation. This question is imperfectly understood, and has formed the point of attacks by

ignorant food reformers in the public Press, who would do well to study Mr. Remington's book.

Lengthy sections of the work are devoted to breakfast, invalid and infant foods, and to the more prosaic subject of feeding cakes and offals. The disposal of residues, such as are made into compound cakes, is a most important consideration to both the flour and oil miller, and it is to be regretted that the average farmer does not yet fully understand the many virtues of the scientifically compounded cake.

Impurities of Agricultural Seed, with a Description of Commonly Occurring Weed Seeds and a Guide to Their Identification. By S. T. Parkinson and G. Smith. Pp. 105 + xxxviii plates. (London and Ashford (Kent): Headley Bros, n.d.) Price 3s. net.

THE authors of this little book express the hope that it will be of practical use to farmers, seedsmen, teachers and students. This hope will, we believe, be fulfilled, but we hold that had the volume been prepared for a less mixed community it would have been more specifically useful. As it is, the first thirty or forty pages are taken up with generalities—so beloved by the present-day teacher—which, if they are included at all, should come as savouries and not as *hors d'oeuvres*. Farmers know well enough that weeds are bad, and if the main object of the authors is to help farmers to judge of a sample of seed, they might well relegate to an appendix their description of the harm done by weeds, and bring into first place the excellent descriptions and illustrations which now occur in the latter half of the book. These descriptions might also be so adjusted as to occur in all cases opposite the photographs.

Discussion of questions on such subjects as national seed-testing stations and State legislation with respect to weeds might, we think, be omitted altogether, and the space saved filled to better purpose by weed-analyses of actual samples of bought-in seeds, by lists of weeds characteristic of different types of soil, and by notes on the respective appearances of new and of old and "treated" seed. In short, if the authors in preparing a second edition will forget the teacher and the student in agricultural colleges, and think of the farmer—the seedsman can look after himself—they will add to the utility of an already useful little book. The more so if they can persuade the publishers to reduce the price to a shilling.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

Enhanced Series and Atomic Models.

IN the Bakerian Lecture, "Series Lines in Spark Spectra," Prof. A. Fowler indicates an explanation on Bohr's theory of enhanced series in which the Rydberg constant is $4N$ instead of N . It may be of interest to point out how the model atom described

in my paper (*Phil. Mag.*, December, 1913) would be capable of emitting similar series. This atom can be shortly described as a rotating Thomson atom, capable of executing elastic vibrations. If the negative electron is constrained to remain on the surface of a sphere of radius r within the atom (radius a), it will have a frequency ν given by the formula $\nu = A - N(r/a)^2$, where A depends on the boundary conditions, and the homogeneous radiation emitted will be of amount $h\nu$, where h is the quantum constant.

Reasons are given in the paper for showing that if the atom were executing radial vibrations the electron would be imprisoned on a nodal sphere and usually on the smallest nodal sphere of a given mode. Thus if the radii of the nodal spheres were given by the formula $r = a(n/m)$, where n and m are integers ($n < m$), then in the formula for ν we take for a series $n=1$ and $m=3, 4, 5, \dots$. For the enhanced spectra it is only necessary to suppose that the electrons may be on the second nodal sphere of each mode, *i.e.* putting $n=2$.

ARTHUR W. CONWAY.

Elsinore, Dalkey, Co. Dublin, October 1.

Theodore Schwann and the University of Louvain.

It might not be altogether inappropriate at this time when the world of true culture is grieving inconsolably over the destruction of the University of Louvain, to be reminded that the originator of the famous cell-theory, Theodore Schwann (1810-82), was for nine years a professor at that University. To biologists this fact is probably the most interesting association which the mention of Louvain arouses. Schwann went to Louvain as professor of anatomy in 1838, and left it for a chair at Liège in 1847. It was in 1839 that he gave to the world the cell-theory in a treatise, "Microscopical Researches into the Accordance in the Structure and Growth of Animals and Plants," as the title runs in the translation made by Henry Smith in 1847 for the Sydenham Society.

This great generalisation was made public, therefore, while Schwann was in his chair at Louvain. It is perhaps not so well known that after he had been seven years at Liège, he invented a self-contained respiration apparatus in which carbon dioxide was absorbed and oxygen liberated. It was the precursor of the rescue apparatus so much used in coal mines at the present day, for Hales's apparatus (1726) was too crude to have been of any real value.

It is interesting to know now that, through a crime no expiation can ever atone, the University of Louvain is no more than a memory, its name will be associated with one of the most far-reaching generalisations ever made in the nature of living things—the cell-theory of Schwann of Louvain.

D. FRASER HARRIS.

Dalhousie University, Halifax, N.S.,
September 18.

Filtering Power of Sand.

To those who wish to repeat the experiments on the filtering power of sand, mentioned by Prof. Trouton at the recent meeting of the British Association, I would strongly recommend a solution of the aniline colour known as "Nachtblau." A strongly coloured solution of this substance passed through Fontainebleau sand issues from it absolutely colourless for a much longer time than does that of potassic permanganate.

C. J. WATSON.

The Midland Institute, Birmingham, October 1.

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FLIGHT OBSERVATIONS IN INDIA.¹

VARIOUS theories have been proposed by different writers to account for the fact that birds are able, in certain countries, to remain suspended or even rise in the air without any apparent exertion and without flapping their wings. This action appears to have become known as "soaring flight," notwithstanding the fact that in two English dictionaries now before us the verb "soar" is defined as meaning to rise in the air, without any reference to the means adopted. On the other hand, the action in question does not necessarily imply rising, but it may exist equally when a bird maintains the same level for an indefinite time. We prefer to describe this action as "sailing flight."

Now while writers innumerable have attempted to offer explanations of this apparently paradoxical phenomenon, very little has been done to obtain systematic records, extending over long periods, of the conditions under which soaring or sailing flight takes place. This is probably due to the fact that in northern Europe, where most scientific work is done, sailing flight rarely occurs. During his residence at Agra, Dr. Hankin has had specially favourable opportunities for observing large birds in sailing flight, and his present record of observations should do much to systematise our knowledge of the subject.

The principal birds which figure in Dr. Hankin's observations are as follows:—

	Span in feet.	Load in lb. per square foot
Cheel (<i>Milvus govinda</i>) ...	4	0.55
Scavenger (<i>Neophron gingianus</i>) 5	...	0.87
Common Vulture (<i>Pseudogyps</i> <i>bengalensis</i>) ...	7	1.13
Black Vulture (<i>Otogyys calvus</i>) 6.5	...	1.23
Adjutant (<i>Leptoptilus dubius</i>) ...	9-11	1.54

Dr. Hankin distinguishes a number of different sailing actions, some of them continuous, others alternating with flappings of the wings. These he designates by such names as ease circling, flap circling, flap gliding, flex gliding. A large portion of the book is occupied with illustrated descriptions of the positions of the wings, tail, and body in different kinds of flapping and sailing flight (*cf.* Figs. 1, 2, 3).

The principal theories that have hitherto been advanced attribute sailing flight to irregularities in wind velocity (*cf.* Langley's "Internal Work of the Wind") or upward air currents (Maxim and others). Dr. Hankin attempts to prove that neither of these causes is sufficient to account for the phenomena as they occur in India, and that the explanation must be sought in some other unknown cause. In particular he uses the term "soarability" to designate the state of the atmosphere when sailing flight is possible, and so far as his observations tend to define when and under what conditions this state exists, they constitute a first step in the solution of the problem.

Now Dr. Hankin observes that in fine weather there is a definite time in the morning, varying

¹ "Animal Flight," a Record of Observation. By Dr. E. H. Hankin. Pp. 405—Index. (London: Liffé and Sons, Ltd., n.d.) Price 12s. 6d. net.