WAVE-LENGTH TABLES

M. I. T. Wave-Length Tables. Compiled under the direction of G. R. Harrison. (John Wiley & Sons, Inc., N.Y.; Chapman & Hall, London), 1939. Pp. xxviii + 429. Price 90*sh.*

THE enterprise of Professor G. R. Harrison and his collaborators at the Massachusetts Institute of Technology has made possible the publication of this magnificent volume containing over a hundred thousand determinations of the wave-lengths of the lines in the atomic spectra of all the known elements except five which have not so far been studied. The Table gives the wave-lengths in international Angstrom units for all except the very feeblest lines emitted by these atoms in the first two stages of ionisation and lying between 10000 and 2000 Angstrom units. To increase the usefulness of the tables in identifying lines in spectra, 1381 band heads which frequently appear on spectrograms have also been included. About three-fourths of the entries in the tables are from determinations made in the spectroscopic laboratory of the M.I.T., this tremendous output having been made possible by the use of automatic recording comparators as described in the introductory pages of the volume. The entries of wave-lengths in every case have been carefully compared with the existing determinations. An interesting feature of the tables is the very open scale of 25 steps ranging from 1 to 9000 which has been used for indicating the intensities of the lines. Such a scale gives a truer indication of the actual relative intensities of the lines than the conventional scale usually adopted.

Every possible care appears to have been taken in the preparation of the tables which are very clearly printed on thick paper of a very pleasant cream colour. The lines are listed in order of wave-length for all the elements together, the name of the elements being given as also the stage of ionisation when this has been established by arrangement of the lines in series. The intensity and the literature reference then follows.

The volume should prove most useful to all spectroscopists. C. V. RAMAN.

THE ARCHÆAN COMPLEX OF MYSORE

The Archæan Complex of Mysore. By B. Rama Rao. (Mysore Geological Department, Bulletin No. 17 with 12 plates, 4 Geological Maps and Sections), 1940. Price Rs. 1–8–0.

MYSORE forms an important part of the Indian Peninsula, and is situated in the angle where the Western and Eastern Ghat ranges converge into the Nilgiri group of hills. The western part forms a belt of mountainous country, 20–25 miles wide, passing on to the Western Ghats, while the rest of it forms a fairly flat tableland. The geology of the area is very interesting and of great importance on account of its rich mineral resources.

A regular geological survey to map the territory and to explore its mineral resources was started in 1894 with Mr. Bruce Foote, who had already considerable experience of the geology of South India, in charge of the work. Since then our knowledge of the geology of the State has been considerably enriched by the work of several eminent geologists like Dr. J. W. Evans, Dr. W. F. Smeeth, Mr. P. Sampat Iyengar and others. The Survey has issued many valuable papers in its publications from time to time.

In the present paper of 100 pages, the author has presented, in a very lucid and masterly manner, the progress of geological ideas in Mysore during the past 46 years. He has therein made a useful and satisfactory contribution to the controversy on the origin of the Dharwar Schists in Mysore by very careful and detailed observations in the field and by analysis of representative samples in the Chemical Laboratory of the Department, and has proved that a part of the Dharwar Schists really consisted of metamorphosed sediments.

The two main geological formations of Mysore are (*i*) the Dharwar Schists, and (*ii*) a Series of acid and basic rocks intrusive into them. The Dharwar formation in Mysore consists of a series of basic and acid volcanic rocks, metamorphosed sedimentary rocks as ironstones, limestones, argillites, quartzites, conglomerates and granulitic schists, and basic and ultrabasic intrusions. Foote has described the Dharwar Schists as an intensely altered sedimentary series of rocks, which, associated with contemporary lava flows and basic intrusions, are preserved now as steeply folded, elongated synclinal bands resting unconformably on a basement complex of the granitoid gneiss. When the

examination of the Kolar Schist belt was concluded, Dr. Smeeth and his co-workers came to the important conclusions (*i*) that the conglomerate bands were of an autoclastic origin, (*ii*) that the Dharwar Schists did not rest on the granites, but the granites were really intrusive into them. Thus the Dharwar Schists became the oldest geological formation of the area.

This has also been proved to be the case in several other areas, but was contested by Mr. C. S. Middlemiss, late of the Geological Survey of India.[1] This view of the Mysore Geological Survey was accepted by Sir L. L. Fermor.[2]

The metamorphosed sedimentary rocks, quartzites, conglomerates, granulites and schists containing kyanite, sillimanite, graphite, garnet, etc., were all considered by Dr. Smeeth to be of igneous origin. Although individual geologists found some evidence for their being metamorphosed sediments, practically all the Mysore geologists had, by 1915, come to the conclusion that the Dharwar crystalline schists were really igneous in origin and that the sedimentary-looking types had been produced from igneous rocks by different processes of alteration such as crushing, alteration and replacement.

It has been found that one-sixth of the area in Mysore is covered by the Dharwar Schists and the rest by the intrusive granites and gneisses. The effects of granite intrusions on such a vast scale must have affected the Dharwar sediments very much by granitisation, hybridisation, recrystallisation, etc., that these rocks now lack distinct signs of bedding and other structures of sedimentation. This aspect of the changes in the Dharwar sediments seems to have been completely overlooked by Dr. Smeeth and his associates, who advocated a theory of igneous origin even for quartzites, conglomerates and schists containing aluminous silicates. But in most of these areas, traces of current bedding and ripple marks have since been found by Rama Rao, who, from the mineral composition of these rocks containing kyanite, staurolite, sillimanite, etc., considers them to be altered sediments.

Since the publication of the "Outlines of the Geology of Mysore" by Dr. Smeeth, several new facts have been proved by Rama Rao, *e.g.*, (*i*) the Champion gneiss has been taken out of the intrusives and their origin is doubtful, and that part of the schists has been derived from the Champion gneiss as indicated by the presence of opalescent quartz in both; (*ii*) the hornblende-schists are intrusive into the chloritic-schists and do not underlie them as an older member; (*iii*) evidence for dividing the Dharwars into three divisions by two conglomerate bands in the northern parts of the State which, due to progressive metamorphism towards the south, is not very clear there, and (*iv*) the Peninsular gneiss and the Closepet granites are the only two major acid intrusives, and (*v*) the exclusion of the charnockites from the intrusives.

Besides, a detailed study of the metamorphosed argillaceous inclusions in granite, containing diopside, hypersthene, garnet, cordierite, sillimanite, etc., has enabled the author and others to establish a number of new rock types, as Bandite Series, Kodamite Series, Bidalotite Series and Sakarsanhalli Series.

A revolutionary idea advocated by the author is that the charnockites do not represent the differentiated phases of a normal plutonic magma, but have been formed by interaction between the older norite and pyroxenite and the younger intrusive Closepet granite. It is this interaction between the basic and acid igneous rocks of different ages which seem to have given rise to intermediate and acid types of charnockites.

Since Sir T. H. Holland published his paper on the Charnockite Series of India, no further detailed work has been published on these rocks of South India. It is rather inconceivable that such large masses of charnockite, as represented by the Palnis, the Nilgiris and Ceylon could be formed by the interaction of acid and basic rocks. Besides, in several parts of Africa and other regions similar petrographical provinces have been found.[3]

In conclusion a few points may be mentioned from the reviewer's point of view. Information on these would give additional value to the maps included in the Bulletin. (*i*) The Dharwar Schists have straight and sharp boundaries and it is not clear if they are fault boundaries; (*ii*) Dips in the schists would be helpful to understand the structure; (*iii*) The Dharwar sedimentaries could be shown separately from the igneous part of the formation and (*iv*) The Champion gneiss exposure has been omitted in the Kolar belt and perhaps in other areas also.

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[1] *Proc. As. Soc. Beng.*, N. S., 1917, **13**, cxcv–ccii.
[2] *Jour. As. Soc. Beng.*, N. S. **15**, clxxii–clxxvii.
[3] A. W. Groves, *The Charnockite Series of Uganda*, *Q. J. G. S.*, **41**. 150.

RECENT CHANGES IN THE NAMES OF INDIAN GRASSES

IN a recent issue of *Blumea*[1] Dr. J. Th. Henrard, of the Rijksherbarium, Leiden, devotes some eighty pages to the nomenclature of certain species of the Gramineæ. As this journal is not readily available to workers in India, it is believed that a useful purpose will be served by making the result of Dr. Henrard's researches, in so far as they concern India and Burma, known to agrostologists in this country.

Setaria verticillata (Linn.) P. Beauv. is a well-known European species and is to be found listed in the Flora of British India. The European species differs, says Dr. Henrard, from the tropical by being densely ciliate on the hyaline margins of the leaf-sheath. Dr. Henrard says this is a very fugitive character and it is certainly absent in some sheets of the European material of this species in the Herbarium at Dehra Dun. It is very doubtful whether it is sound to differentiate between species on a fugitive character. Proceeding further, however, Dr. Henrard says that for this species we must accept the combination *Setaria adhœrens* (Forsk.) Chiovenda. Forskal called his plant *Panicum adhœrens* and published the name in the *"Flora Ægyptiaco-Arabica"* (1775), p. 20. In his description he only mentions the retrorsely barbed bristles below the spikelets and says nothing about the ciliate margins of sheaths. Moreover, the type of this species is not to be found in Forskal's herbarium. Hence it is by no means certain that the *Panicum adhœrens* of Forskal is the tropical counterpart of the *Setaria verticillata* of Palisot de Beauvois. Stapf and Hubbard say with regard to this species in the *"Flora of Tropical Africa,"* 9, 827, that it is "a polymorphic species, the polymorphy probably not being so much due to the presence of a number of genetic strains as to the readiness with which the grass responds to varied ecological conditions". Agrostologists in India would be well advised to continue to call their plant *Setaria verticillata* P. Beauv. until stronger arguments validate a change.

Dr. Henrard next treats *Eragrostis major*, a well-known Indian species, which has recently been known as *Eragrostis cilianensis* (Allioni) Link. apud Vign. Lutat. based on the *Poa cilianensis* of Allioni. This name was accepted by most, if not all, agrostologists on account of a paper published by Hubbard in the *"Philippine Journal of Science,"* 1913, 8, No. 3, in which the author shows that the correct name of *Eragrostis major* Host. is *E. cilianensis* (All.) Link. and not *E. megastachya* (Koel.) Link. as Dr. Henrard would have us believe. Sprague and Hubbard, C. E., came to the same conclusion in *"Kew Bull.,"* 1933, 17–18.

Dr. Henrard next proceeds to make new combinations in the section *Avenastrum* of the genus *Avena* Linn. It has recently been shown by C. E. Hubbard (*Flor. Trop. Africa*, 1937, 10, 104) that the genus *Avenastrum* Jessen (*Deutschl. Gräser*, 1863, 214) is illegitimate as it was superfluous when published, Jessen having included in his genus the older valid genera *Trisetum* Pers. and *Arrhenatherum* Beauv. The species of the section *Avenastrum* of *Avena* found in Madras have been transferred to *Avenastrum* by Fischer in the *Flora of Madras*. These species have now to be transferred to the genus *Helictotrichon* Besser.

The species of the section *Avenastrum* found in India are named as follows in the *Flora of British India*: *Avena pratensis* Linn.; *Avena polyneura* Hook. f. and *Avena aspera* Munro. The first two species should be known in future as *Helictotrichon pratense* (Linn.) Pilger and *H. polyneurum* (Hook. f.) Henrard.

The other species of the Flora of British India is *Avena aspera* described by Munro in *Thwaites Enum, Pl. Zeyl.*, 1864, 372. Hook. f. has three varieties under *Avena aspera* Munro: (1) *Avena aspera* proper; (2) var. *Roylei* Hook. f.; (3) var. *parviflora* Hook. f.; and (4) var. *Schmidii* Hook. f.

The var. *Roylei of* Hook. f. had already been described as *Trisetum virescens* by Nees apud Steudel (*Syn. Pl. Glum.*, 1854, 226). The type *Trisetum virescens* Nees, Royle 137, is in the herbarium at Dehra Dun and it is undoubtedly a distinct species. The *Avena aspera* Munro, from the Khasi Hills, Sikkim and Ceylon is also a distinct species and it is very likely that var. *parviflora* will also have to be given specific rank. Henrard has already raised var. *Roylei* and var. *Schmidii* to specific rank, the former as *Helictotrichon virescens* (Nees) Henr.

The *Avena aspera* of the Flora of British India, in fact, disappears and the following emerge: *Helictotrichon virescens* (Nees) Henr.; *H. Schmidii* (Hook. f.) Henr.; *H. asperum* (Munro) Bor. The latter combination was made by the writer in *Ind. For. Rec. Bot. I.*, 3, 68. The distribution of these three is as follows: *H. asperum* (Munro) Bor., Assam, Burma; *H. Schmidii* (Hook. f.) Henr., Nilgiris; *H. virescens* (Nees) Henr., Western Himalaya. The consideration of the status of var. *parviflora* must wait for the present.

An addition to the grass flora of British India is *Cyrtococcum schmidii* (Hack.) Henr. based on *Panicum schmidii* Hack. from Thailand. It was collected by Young in the Southern Mahratha country and in North Canara fide Henrard. There are no specimens in the Dehra Herbarium. It is distinguished from other species of *Cyrtococcum* "verrucis crebris elevatis breviter piliferis obsita" according to Hackel.

[1] *Blumea*, 1940, 3, 3.