

CENTENARIES

Lexell, Anders Johann (1740-1784)

ANDERS JOHANN LEXELL, a Finnish astronomer, was born at Abo in the south-western coast of Finland, December 24, 1740. He became professor of mathematics in the University of Abo in 1768 and went over to a similar post in St. Petersburg in 1771.

Lexell was a prolific writer. His first contribution entitled *Recherches sur la vraie orbite de la comete de l'an 1769, etc.*, appeared in 1770. The last which appeared posthumously in 1787 was entitled *Disq. de theoremete quodam singulari Lambertii, etc.*

Perhaps Lexell's name is best known in connection with the discovery of Uranus, which was the first planet to be discovered in historic times. On March 13, 1781 Sir William Herschel noticed a new heavenly body larger than fixed stars and suspected that it might be a comet. For a long time people could not compute a satisfactory orbit for the supposed comet, because it seemed to be near the perihelion and no comet had ever been observed with a perihelion distance from the Sun greater than four times the earth's distance. Lexell was the first

to suspect that this was a new planet eighteen times as far from the sun as the earth is. In 1763 Laplace published its elliptic elements and Lexell's suspicion was confirmed. The paper of Lexell on the subject appeared in 1770 under the title *Recherches sur la nouvelle planete decouverte par Herschal.*

Lexell's name is also associated with the discovery of the deflection of comets. In 1770 he discovered a comet which had been deflected in 1767 by Jupiter out of an orbit in which it was invisible from the earth into an orbit with a period of 5½ years, enabling it to be seen. In 1779 it again approached Jupiter closer than some of his satellites and was sent off on another orbit, never to be again recognized. Lexell's paper on the subject appeared in 1772 under the title *Reflexions sur le temps periodique des cometes en general et principalement sur celui observee en 1770.*

Lexell died at St. Petersburg, November 25, 1784.

S. R. RANGANATHAN

University Library,
Madras.

SCIENCE NOTES AND NEWS

Radio-frequency Spectra.—In the *Physical Review*, 1940, 57, 765, P. Kusch, S. Millman and I. I. Rabi describe a new method for studying the radio-frequency spectra of atoms. When the energy of an atom changes on account of a change in the orientation of the nuclear spin, the frequency of the quantum corresponding to this change of energy is of the order of a few thousand megacycles, and the idea underlying the experiments is to produce oscillatory currents of such a frequency and employ them so that a reorientation of the nuclear spin is brought about. The occurrence of such a reorientation is examined by the method of molecular beams. A beam of atoms is projected through two inhomogeneous magnetic fields so arranged that the deflection of the beam produced by the first is exactly compensated by the second when the orientation of the atomic magnets is not changed during their passage from one field to the other. Next, a suitable homogeneous magnetic field is produced in the space between the two inhomogeneous fields. A weak oscillating field is set up perpendicular to the homogeneous field and the frequency is adjusted so that the nuclear spin of the atom changes from one to another of its possible positions in the given homogeneous magnetic field. Thus the frequency inducing such a transition is equal to that of the quantum corresponding to the change from one hyperfine Zeeman level to another. When such a reorientation occurs, the deflection due to the first inhomogeneous field

will not be compensated by the second inhomogeneous field and hence the intensity of the atomic beam at the collector falls. By observing the various frequencies of the oscillating field at which such minima of intensity occur, the various hyperfine Zeeman components corresponding to the homogeneous magnetic field can be determined. This is called the radio-frequency spectrum of the atom. Since the authors were able to measure the frequency of the oscillating field to an accuracy of one in twenty thousand, the accuracy in the measurement of hyperfine structure components has been improved a hundred-fold, so that we may expect many questions of nuclear structure to receive new light from these measurements. As an example of the results, we may quote the following from the paper of Millman and Kusch, *Phys. Rev.*, 1940, 58, 438

Nucleus	λ of ground state component
Na ²³	0.059103
Rb ⁸⁵	0.10427
Rb ⁸⁷	0.22707
Cs ¹³³	0.30661

Is produce grown with chemical manures deleterious to health?—A rather startling answer, in the affirmative, to this very important question is furnished by Dr. G. B. Chapman of the Physical and Mental Welfare Society of New Zealand and an account of a three-year experiment in the feeding of school-boys on fruit and vegetables grown on soil manured exclusively with 'humus' as against chemical fertilisers, conducted in one of the school hostels in that country is reported in support of the conclusion (*Nature*, June 8, 1940). It is stated that prior to the experiment the subjects, comprising some sixty boys, teachers and staff, were being fed on a liberal dietary well above the customary standard for boarding schools but that they were nevertheless consistently suffering from colds, catarrh, septic tonsils, epidemics of influenza, dental caries and other preventable complaints. The food supply was being derived from the ordinary New Zealand produce which, the report says, was all being grown on soils manured only with chemical fertilisers. It is rather hard to believe that New Zealand soils receive no kind of organic matter at all which would furnish humus; what then becomes of the farm-yard manure, the excreta of the sheep and poultry, the crop residues on the land, and all the plant material not used as or useful for food is not made clear. On the assumption however that the local produce is all from soils only manured with artificials, it was decided to grow on the school land, fruits and vegetables manured only with 'humus' for consumption in the hostel and these, it is said, now supply the greater proportion of the requirements of some 77 persons. In the twelve months following the change-over a marked improvement in health resulted. Catarrh, which was general previously, declined as likewise did cold and influenza. In an epidemic of measles in 1938 which was general in New Zealand new boys suffered from acute attacks while boys who had been in the school for a year or more (and fed evidently on the humus-grown food) suffered only mild attacks with a much more rapid convalescence. Fewer accidents occur in the football season indicating stronger bone formation; dental condition has improved, constipation and bilious attacks are rare and the boys are 'increasingly active and virile'.

Though a good deal is now being heard on the effect of farm-yard manure, as opposed to chemical fertilisers, in improving the "quality" of produce, in making the seed more productive, with a higher content of factors indispensable for growth promotion, one is hardly prepared for a sharp and vital distinction of the kind described in the above experiment. If the results can be confirmed by other workers and in a much larger number of experiments, under conditions capable of accurate control, it goes without saying, that they will have far-reaching practical importance besides bringing about a radical change in the present ideas of manuring and plant improvement.

A. K. Y.

Entomological Results from the Swedish Expedition (1934) to Burma and British India.—The results obtained by the expedition have been reported in three papers published in *Arkiv. fur. Zoology* (32, Nos. 2-3). The

expedition made extensive collections of certain common as well as little known insects in British India and Burma.

The greater portion of the collections consists of aquatic coleoptercus insects belonging to the families Gyrinidæ and Dryopidæ.

The Gyrinid beetles are small shiny insects commonly found briskly moving about on the surface of water in ponds and streams, paddling themselves by means of their modified posterior legs, and excreting a foetid liquid round about them.

Of the three important genera of Gyrinidæ, namely, Gyrinus, Dineutas and Orectocheilus, the last-named genus has been well represented in the collections besides yielding ten new species of considerable interest. The work of the Swedish expedition has thus widened our knowledge about one of the most interesting families of aquatic beetles.

The Dryopid beetles are little-known small, pubescent and aquatic beetles. The expedition has thrown much light on this family. The two principal sub-families, Dryopinæ and Helminæ have been studied in detail and one new genus and two new species in the former, as well as another new genus and three new species in the latter have been erected. The new sub-genus *Indosolus* and the four new species of *Grouvellinus* are of considerable interest to the students of the family Dryopidæ.

Technical Institute, Delhi.—The Government of India have decided to convert the existing Government High School and Commercial Institute at Delhi into a *Technical Institute*, in pursuance of one of the main recommendations of the Abbott-Wood Report.

The proposed Institute will contain, in addition to an experimental Technical High School, provision for courses or classes in technical, commercial and art subjects for students already in or preparing to enter employment.

The Technical High School will provide for an annual intake of 60 pupils. The minimum age at entry will be eleven and the normal length of the course six years. The school will thus contain about 360 pupils and no reduction in the total facilities for higher education in Delhi will be involved. It is hoped to start the new venture in the school year 1941-42.

For the first three years the Technical High School's curriculum will be of a general character and similar to that followed in a good middle school so that at the end of this stage it may be possible to make transfers from and to schools providing the ordinary High School course.

After this stage the curriculum will include a certain number of subjects of a practical character, e.g., the properties of materials, the elements of engineering science, measured drawing and simple design.

This second stage will last three years, the practical subjects occupying a progressively larger place during the last two years. Importance will be attached from the beginning to a sound practical knowledge of English and it will be possible for the pupils in their last year to take a suitable school leaving examination without any risk of their course of study being unduly circumscribed by examination requirements.

Mr. William Walter Wood, F.R.I., B.A., M.I.Struc.E., at present Principal of the Mid-Essex Technical College of Arts, Chelmsford, has been appointed Principal of the Institute. He is expected to take up his duties early in the new year.

Production of Drugs in India. Owing to the extended production of drugs in India as many as 92 drugs have been taken off the import list.

The manufacture of disinfectants has been taken up by the Medical Stores Supplies Committee under the chairmanship of Lieut.-Gen. G. G. Jolly, I.M.S., Director-General, Indian Medical Service. The manufacture in India of Acriflavine is under investigation. Samples have already been produced in an Indian laboratory.

Tablets of vitamin C are now being produced from the Indian gooseberry, *amla*, which is available in large quantities in the Nilgiris. Amla berries are collected under the supervision of the Director, Nutrition Laboratories, Coimbatore, dried and made into tablets of suitable size. The Committee is now contemplating the production of a more concentrated form of vitamin C.

Manufacture of China Glass. The manufacture of China glass, a decorating material used chiefly by the glass bangle industry, is described in detail in a recent bulletin of the Indian Industrial Research Bureau (*Bull. No. 17*; Manager of Publications, Delhi, 1940. Price As. 5 or 6d.). The process was perfected about two years ago by the Research Branch of the Industrial Research Bureau at the Government Test House, Alipore, and it was subsequently demonstrated that large-scale manufacture should present no difficulties. The details of the process were supplied to various glass manufacturers, through the Directors of Industries of certain Provinces and States, and it has been reported that China glass is now being produced in India and is being marketed by certain glass manufacturers at a price somewhat lower than that of the imported material. The publication of this bulletin, it is hoped, will further encourage the production of China glass in the country.

China glass is a dense opaque white glass of low melting point. Low melting characteristics are essential, as otherwise the glass articles on which it is applied may be deformed during the process of application.

For decorative application, the solid glass is powdered fine—say to the consistency of ordinary flour—and a paste is made of it with water, and this paste is used to make the requisite artistic designs on the glass surfaces to be decorated. The decorated article is then fired in a furnace, which melts the decoratives and fixes them to the surface.

The material, when prepared as described on a factory scale, proved highly satisfactory and was comparable with the best quality of imported China glass.

A New Jute Substitute. Among the new fibres and threads produced mainly as substitutes for jute, ramie, hemp and similar natural fibres, the "Hofa" thread has drawn some attention of the trade. This thread consists of wood fibre stock and viscose, the latter serving

as a binder. In contrast to the practice in wood pulp production, the wood fibre stock is entirely freed from "fibre shive" and fine fibre fragments by thorough washing, so that a less homogeneous fibre structure similar to that of raw cotton results. By suitable spinning and other treatment, a thread resembling home spun is produced.

Atmospheric Pollution. Despite the increasing industrial activity in the years preceding the outbreak of the war, the state of the atmosphere in the British Isles has shown a steady improvement since 1936. This is shown in the Report on the investigation of Atmospheric Pollution for the year 1938-39.

The local authorities making the measurements of atmospheric pollution on which these reports are based have decided to carry on with the investigation, if possible, since a knowledge of the state of the atmosphere is of importance even in war-time. Although more urgent tests have delayed its issue, the report on the year's observations has now been issued by the Department of Scientific and Industrial Research (The Investigation of Atmospheric Pollution, Twenty-fifth Report on Observations in the year ended 31st March 1939. Published by H.M. Stationery Office. Price 25s. 6d. net). The seasonal variation of pollution in cutting off daylight from the centres of towns is brought out in diagrams. The report also contains an article on the effect which atmospheric impurities have upon building stones.

A brief account of the valuable work carried out at the Malaria Institute of India during the year 1939, is given in the Annual Report of the Institute, issued recently. The Institute is financed by the Indian Research Fund Association.

The Field Station of the Institute which was located in Karnal (Punjab), was transferred to Delhi during the year. This step was taken after mature consideration. Delhi with its riverain problem, irrigation problem, rural and urban malaria problems offers an extensive field both for research and teaching.

During the year, the officers of the Institute published 11 research papers. Four numbers of the *Journal of the Malaria Institute*, containing 35 papers, were issued during the year. Other publications of the Institute include Health Bulletin, Miscellaneous reports and Notes.

The Institute maintains a museum well equipped in all respects for demonstration purposes in all branches of malarology, for the members of the medical profession and laymen.

The intensive antimalarial operations in progress in the Delhi urban area were continued. The work consists in the application of larvicides, clean weeding of pools, and levelling and draining operations. Special attention has been given to the development of oil booms to deal with mosquito breeding in irrigation channels and stormwater drains for the prevention of larval drift. The year-end census of school children and fever figures from Delhi dispensaries, showed a fall over the previous year's figures. The cost of the annual recurring antimalaria measures for the Delhi

urban area is Rs. 64,000 or just over two annas per head per annum of the population protected.

Rural Antimalaria Schemes have been started in various provinces as a result of the grant made by the Government of India to the *Indian Research Fund Association* for the purpose. Such schemes in operation are: 1 in Delhi Province, 3 in United Provinces, 3 in Madras and 1 in Bengal.

Much valuable research has been carried out both in the field and in the laboratory. One of the interesting results recorded relates to the existence of 2 entirely different biological races or species of *A. fluviatilis* as evidenced by the examination of the blood meals of the mosquitoes: the percentage containing human blood in the U.P. Terai is 1.4, as compared with 96.9 in Wynaad series. This finding is in agreement with the results of dissections.

Bose Research Institute.—"Scientific Research and the Future of Indian Industry" formed the subject of the Memorial Address, delivered by Dr. S. S. Bhatnagar at the Twenty-third Anniversary meeting of the *Bose Research Institute* held on the 30th November. The illustrious founder of the Institute was intimately associated with a number of experimental investigations having important industrial applications. To mention only a few, his investigations on the transmission of electric signals through space, and on the rectifying action and photo-conductivity of semi-conductors have received due recognition in the field of industry. A reference to this aspect of Sir J. C. Bose's work is to be found in the Director's annual report presented at the meeting.

The report also gives a resume of the work carried out by the research staff in the various departments of the Institute. Results of far-reaching importance have been obtained, and the Director must be congratulated for the successful manner in which he has conducted the work of the Institution.

Calcutta University.—The Syndicate has recommended to the Senate, that the Degree of Doctor of Science be conferred *Honoris Causa*, on Sir Nilratan Sircar, Kt., M.A., M.D., LL.D.

The Sir Asutosh Mookerjee Medal in Science, for the year 1939, will be awarded to Dr. B. Mukhopadhyay, M.B., M.D., D.Sc., in consideration of his thesis entitled, "Search for some Ephedrine-like Antispasmodic Remedies" and to Dr. Dinesandra Sen, D.Sc., for his thesis entitled, "Studies in the Camphor Series", the value of the medal being equally divided between the two candidates.

Andhra University: Natural Sciences College.—The Senate, at its meeting held on the 5th December, sanctioned the proposal of the Syndicate that a "Science College in the Faculty of Science be instituted; that Honours B.Sc. Degrees be instituted in Botany, Zoology and Geology; that Honours and Pass B.Sc. courses be instituted in Botany, Zoology and Geology in the above college and that the required cadres of the teaching staff in each of the three branches of learning be instituted". The Senate placed on record, its sense of deep gratitude to the Government of Madras for their generous grant to the Natural Sciences College.

This decision of the University is an important landmark in its history. The Government have sanctioned a capital grant of 3½ lakhs of rupees and a recurring grant of Rs. 40,000 for establishing the college.

SEISMOLOGICAL NOTES

During the month of November 1940 one great, one moderate and six slight earthquake shocks were recorded by the Colaba seismographs as against one great and six slight ones recorded during the same month in 1939. Details for November 1940 are given in the following table:—

Date	Intensity of the shock	Time of origin I. S. T.	Epicentral distance from Bombay	Co-ordinates of the epicentre (tentative)	Depth of focus	Remarks
1940		H. M.	(Miles)		(Miles)	
November 4	Slight	14 00	1200	Hindukush Mountains	125 (approx.)	Felt in Peshawar
6	Slight	21 41	2090			
7	Slight	19 28	4140		260 (approx.)	
10	Great	7 9	3140	44°·5 N., 27°·0 E., in Rumania (Tentative)		Destructive in Rumania
13	Slight	17 6	1730			
19	Moderate	20 32	4280	In or near Japan		
20	Slight	23 30	1270	Near 36° N., 71° E., in the Hindukush mountains	115 (approx.)	Felt severely in Peshawar
27	Slight	20 12	5430			

MAGNETIC NOTES

The month of November 1940 was magnetically much more disturbed than the preceding month. There were 7 quiet days, 15 days of slight disturbance and 8 of moderate disturbance as against 10 quiet days, 19 days of slight disturbance and 1 of moderate disturbance during the corresponding month of 1939.

The day of greatest disturbance during November 1940 was the 25th and that of least disturbance the 10th. The classification of individual days is shown below.

Quiet days	Disturbed days	
	Slight	Moderate
2, 6, 8, 10, 11, 18, 28.	1, 3, 5, 7, 13, 17, 19, 20, 24, 26, 27, 30.	4, 9, 12, 21, 23, 25, 29

There were three magnetic storms of moderate intensity during the month as compared with one of the same intensity during November 1939. The monthly mean character for November 1940 is 1.03 as against 0.70 for November of last year.

M. R. RANGASWAMI.

ASTRONOMICAL NOTES

The Earth will be at perihelion on January 3, 1941.

Planets during January 1941.—Mercury after superior conjunction with the Sun on January 11, passes into the evening sky, and about the end of the month can be seen low down near the western horizon immediately after sunset. Venus continues to be a morning star and is gradually getting closer to the Sun; it will be visible for about an hour and a half before sunrise. Near the planet, and to the west of it, is Mars which is still faint and not favourably situated for observation.

Jupiter and Saturn continue to be apparently close to each other; the former which is in quadrature with the Sun on January 27, is a conspicuously bright object near the meridian at sunset. On January 10 Saturn will be at one of the stationary points of its geocentric orbit, and will afterwards resume its eastward motion among the stars. It will be in quadrature with the Sun on January 28. The Moon will closely approach the planet to a distance of about half a degree on the evening of January 7.

Algol.—Minima of Algol that can be conveniently observed in India, will occur on January 6, 0^h.5, January 8, 21^h.4, January 28, 23^h.1 and January 31, 19^h.9. The change in brightness is easily noticeable about an hour and a half before and after the times given. T. P. B.

ANNOUNCEMENTS

The Indian Statistical Conference Benares, 1941.—The fourth session of the Indian Statistical Conference will be opened by His Excellency the Governor of the United Provinces at Benares on Thursday, the 2nd January 1941, at 2-30 p.m.

As in previous years the Statistical Conference will proceed with its work in close co-operation with the Indian Science Congress and four joint meetings have been arranged with four sections of the Congress. The Provisional Programme is given below:

2nd January, 2-30 p.m. Opening Ceremony.

3rd January, 11 a.m. Joint meeting with the Anthropology Section of the Indian Science Congress: Discussion on "Correlational Analysis of Anthropometric Material". 2-30 p.m. Session for Applied Statistics.

4th January, 11 a.m. Joint meeting with the Mathematics Section of the Indian Science Congress. 2 p.m. Joint meeting with the Medical Section of the Indian Science Congress: Discussion on "Growth Studies with special reference to Nutrition and Public Health".

5th January, Whole-day Excursion.

6th and 7th January, Reading of Papers.

8th January, 2 p.m. Joint meeting with the Agriculture Section of the Indian Science Congress: Discussion on "Standard Yields of Crops".

The Government of India, the different Provincial Governments, many of the important Indian States and Universities in India have given official recognition to the Conference and are expected in many cases to send delegates.

Members of the Indian Science Congress are cordially invited to attend the Opening Ceremony and all Sectional meetings and Joint discussions. Cards for the Opening Ceremony will be distributed from the Science Congress Office.

Indian Ecological Society. The first meeting of the above Society will be held on Tuesday, 7th January 1941, at 1-30 p.m., at Benares to transact the following business. Exact place of the meeting will be notified at Benares.

(1) Election of Office-bearers for 1941. (2) Discussion of the Constitution of the Society. (3) Discussion about the future programme of the Society. (4) Any other business they may be permitted by the Chairman at the meeting.

Proceedings of the Royal Society of Edinburgh. Owing to the national necessity for exercising the strictest economy in paper, and in order to reduce the expense of printing and publication, the Royal Society of Edinburgh has decided that, as from Vol. LXI, 1940-41, the *Proceedings* shall be published in two series, viz., "A" (the Mathematical and Physical) including Astronomy, Chemistry, Mathematics, Metallurgy, Meteorology, and Physics; and "B" (the Biological including Anatomy, Anthropology, Botany, Geology, Pathology, Physiology, and Zoology). Fellows of the Society and Institutions with which the Society exchanges publications will benefit under this arrangement by having, in smaller compass, papers dealing with the subjects in which they specialise.

No change is proposed in the present form or in the arrangement for the distribution of the Society's *Transactions*.

The Obituary Notices of Fellows, Proceedings of Meetings, List of Fellows, Prizes, etc. formerly published as APPENDICES at the end

of each session's volume of *Proceedings* will, under the new scheme, be published separately, and will be sent normally to all Fellows and to those exchanges specially desiring to receive them.

Chronica Botanica.—The International Plant Science News magazine, established in Holland in 1935, is being published fortnightly in the U.S.A. from October 7, 1940 onwards (annual subscription, \$7.50, foreign and domestic, post free). It will continue to publish articles, discussions, digests, communications on the scientific, methodological and practical aspects of all branches of pure and applied plant science, news from institutions and societies, personalia, book reviews, queries, etc.

The "New Series of Plant Science Books" is being continued in the U.S.A., three volumes will be ready soon. Our first American List will be issued early this winter together with the annual questionnaire of *Chronica Botanica*. We will continue our Addressbooks and World List when international circumstances permit.

All correspondence, botanical specimens, journals, etc. for Dr. and Mrs. Verdoorn should now be sent to *Chronica Botanica*, P.O. Box 151, Waltham, Massachusetts, U.S.A.

Manufacture of Aluminium in India.—The Government of India, by a resolution, announce that "in view of the fact that the production of aluminium in this country is an urgent war necessity, the Government of India are pleased to give an assurance to all who wish to undertake the manufacture in India that, provided their affairs are conducted on sound business lines they will be given such measure of protection against unfair competition from outside India after the war as may be necessary to enable them to continue their existence."

Our attention has been drawn to an error in respect of the cost of the book "Science in War", review of which has appeared in *Current Science*, Vol. 9, No. 11, p. 508, the price of the book is 6d. and not 6sh.

* * *

We acknowledge with thanks the receipt of the following:—

"Allahabad Farmer," Vol. 14, No. 5.

"Journal of Agricultural Research," Vol. 60, Nos. 8-12.

"Agricultural Gazette of New South Wales," Vol. 51, Part. 9.

"Indian Journal of Agricultural Science," Vol. 10, Part 5.

"The Nagpur Agricultural College Magazine," Vol. 15, No. 1.

"Journal of the Annamalai University," Vol. 10, No. 1.

"Journal of the Indian Botanical Society," Vol. 19, Nos. 1-3.

"Contributions from The Boyce Thompson Institute," Vol. 11, No. 4.

"The Journal of Chemical Physics," Vol. 8, Nos. 8-9.

"Journal of the Indian Chemical Society," Vol. 17, No. 8.

"Experiment Station Record," Vol. 83, Nos. 1-3.

"Indian Forester," Vol. 66, Nos. 11-12.

"Indian Farming," Vol. 1, Nos. 9-11.

"Bulletin of the Indian Central Jute Committee," Vol. 3, Nos. 7-8.

"Review of Applied Mycology," Vol. 19, Parts 8-9.

"Indian Medical Gazette," Vol. 75, Nos. 10-11.

"The Merck Reports," Vol. 49, No. 4.

"Journal of Nutrition," Vol. 20, Nos. 2 and 4.

"American Museum of Natural History," Vol. 46, No. 2.

"Nature," Vol. 146, Nos. 3694-97 and 3703.

"Journal of Research" (National Bureau of Standards), Vol. 25, Nos. 1 and 3.

"Canadian Journal of Research," Vol. 18, No. 8.

"Sky," Vol. 4, No. 11.

"Lingnan Science Journal," Vol. 19, No. 4.

"Science and Culture," Vol. 6, Nos. 5-6.

"Ceylon Journal of Science," Vol. 3, Part 1 (Anthropology).

"Indian Trade Journal," Vol. 138, Nos. 1790-98.

"Indian Journal of Veterinary Science and Animal Husbandry," Vol. 10, Part 3.

"Journal of the Royal Society of Arts," Vol. 88, Nos. 4568-69.

"Report of the Executive Committee of the Council of the University of Rangoon."

"Chemical Analysis of Kolhapur Waters," by J. W. Airan and S. V. Shah.