

Current Topics and Events.

THE announcement of the award of the Nobel prize for medicine for 1922 to Prof. A. V. Hill and Prof. Otto Meyerhof, and for 1923 to Dr. Banting and Prof. Macleod, is gratifying to British research in medical science. The Toronto workers who discovered insulin share with workers at home a common inheritance of scientific tradition; their work has attracted much notice and is well known. The division of last year's prize between Prof. Hill and the professor of physiology at Kiel emphasises the friendly co-operation which has marked their work on muscular contraction since the investigations of Fletcher and Hopkins in 1908. Sir Walter Fletcher, now secretary of the Medical Research Council, was Prof. Hill's tutor at Cambridge and urged him to take up physiology. Work on muscle at that time awaited the elaboration of a new technique of investigation. It was Langley who suggested the line of approach which has since proved so productive in the hands of A. V. Hill, whose modification of the thermopile made possible the investigation of the total heat produced in a muscular contraction, of the time-relations of the heat-production, either "initial" or "recovery," and of the thermal changes associated with the passive lengthening or shortening of the muscle. Oxygen is not used in the primary break-down processes of rest or activity, but only in what, strictly speaking, may be called the recovery processes. Prof. Hill has shown that but for the body's ability to meet its oxygen liabilities in arrears, it would not be possible to make more than the most moderate muscular effort. The muscle "goes into debt" for oxygen on the security of the lactic acid liberated in activity. Mechanical response is probably due to the production of lactic acid during contraction, its sudden appearance changing the electrical and colloidal state of protein interfaces in the muscle. Prof. Hill and his collaborators then passed to the consideration of the efficiency and speed of the recovery process, to the use of the "oxygen debt" as an indicator of the absolute amount of lactic acid present in the body at the end of exercise and to other problems of muscular exertion in man. Meyerhof continued in the use of the calorimetric and chemical methods, his account of the rôle of lactic acid in contraction running parallel to A. V. Hill's. Muscle problems apart, Meyerhof, following Hopkins, has done notable work on the mechanism of oxidation; while A. V. Hill's work on blood-gases and on nervous excitation is also very widely known.

If committees and talk could satisfy the bibliographic needs of the present-day researcher, he would be happy indeed. Even a body no less august than the International Commission on Intellectual Co-operation, instituted by the assembly of the League of Nations, and presided over by Prof. Bergson, has been discussing the question. Meanwhile, the Committee on Bibliography and Publication appointed by the Union of American Biological Societies has presented its first report (*Science*, September 28, 1923). It proposes to publish one comprehensive

series of *Biological Abstracts*, which, at the rate of 6·8 titles to the page, would produce 6000 pages a year. This would be issued in 12 monthly numbers, with a thirteenth, also of 500 pages, for the classified index. The estimated cost of manufacture and distribution is 52,144 dollars, which is to be met by 1000 institutional subscriptions of 15 dollars and 6000 individual subscriptions of 6·20 dollars. These estimates do not include cost of binding (at least 4 dollars per copy per annum), nor do they seem to allow for editorial, bibliographic, and clerical work. Valuable though this volume might be, it would still leave the needs of the systematist to be met by such a work as the "Zoological Record," nor could its classified index, based on brief abstracts, really be what the committee calls "the modern, detailed, searching subject index." The prospect, therefore, is somewhat appalling, and suggests anew that modern scientific authorship will perish under the weight of its own products. But are these 6500 pages, for biology alone, really necessary? Would not an analytic index, competently and honestly compiled, be both less expensive and of greater ultimate value?

MAJOR H. H. KING, writing from the Central Research Institute, Kasauli, Punjab, directs attention to the statement made by Prof. I. P. Pawlow, in his lecture before the International Physiological Congress held in Edinburgh last July, to the effect that he has experimentally demonstrated the inheritance of an acquired nervous character (*British Medical Journal*, August 11, p. 256). The statement, as Major King suggests, is so far-reaching in its significance, that the results of the further experiments now in progress will be eagerly awaited. Up to the time of his leaving Russia, Pawlow's experiments had not demonstrated the direct inheritance of an acquired or "conditioned" reflex in the form of an inborn or "unconditioned" reflex; what he claimed to have shown was that the acquisition, under identical treatment, of a "conditioned" reflex became increasingly rapid in successive generations of mice. It is clear, however, that his results had led him to regard it as probable that eventually, after a sufficient number of generations had been exposed to the training, the period of training needed would fall to zero, and the reflex, acquired in the earlier generations by off-repeated association, would eventually appear as an inborn, unconditioned character. It would be worse than useless at this stage to discuss the possible meaning or mechanism of such a process. We must await the confirmation and full exposition of the facts. But it must, in any case, be regarded as an event of the highest significance that an observer of such pre-eminence, and so intensely objective in his methods, should have been led even to such preliminary conclusions.

A VALUABLE addition to the collection of old maps in the British Museum has been made by the purchase of a hitherto unknown Italian world map dated 1506. A reproduction of the map is given in the *Geographical*

Journal for October, and in an accompanying article Mr. E. Heawood explains that the author was Contarini, who appears to be quite unknown as a cosmographer, and that Roselli was the engraver and perhaps the publisher. The map may have been produced at Venice, but there is also some evidence that it appeared at Florence. In some respects it is reminiscent of the map of Johan Ruysch of 1508, but in detail there is little close agreement. The resemblance is greater with Waldseemüller's map of 1507, but Mr. Heawood believes that this is due to a use of common sources. In Europe the general outlines, except in the north, are good. The outline of Africa is striking and much better than Waldseemüller, but the interior topography is almost entirely Ptolemaic. There is an extraordinary misplacement of the Blue Nile, derived, Mr. Heawood believes, from some early maps then existing in Italy. The chief interest in the map, however, lies in its being the first to show the result of Columbus' voyages. The priority that passed from Ruysch to Waldseemüller must now be yielded to Contarini. The author was evidently alive to the possibility of South America being a large continent, but there is no indication on his map of any land barrier closing the western seaway to Cathay. The article includes a facsimile of the map.

MR. ALAN G. OGILVIE, who has succeeded Mr. G. G. Chisholm as lecturer in geography in the University of Edinburgh, gave his inaugural address, "Modern Geography as a Study and as an Aid," on October 12. He pointed out that the great volume and complexity of the data comprised by the various natural and humane sciences result in an increasing need for work of correlation and synthesis such as geography performs. In this the data furnished by other workers are discussed by geographers always in relation to place. The study of regional geography is still in its infancy, for complete regional monographs based upon field work exist for only a small part of the earth's surface; and synthetic regional study is the main function for geographical research in the future. In regions largely unsurveyed the compilation of provisional maps can be best carried out by persons well trained in physical geography, and such maps are urgently required by men of science working in relatively unknown areas. Much fruitful investigation will result from the collaboration of geographers with workers in other fields such as geology and biology, archæology and history, economic and social science. Geography along with other sciences can help towards a reasonable and gradual redistribution of the world's population, thus relieving the stress due to overcrowding, by directing the streams of suitable emigrants to lands in which they can flourish.

THE position of the Chemical Hall in the British Empire Exhibition at Wembley next year is in many ways a good one. Visitors to the Exhibition arriving at Wembley Park Station will enter at the north entrance, and the Palace of Industry is on the right-hand side of the main avenue which runs straight to the Stadium—north to south. The Chemical Hall

is in the north-east corner of the Palace of Industry: it is surrounded by two of the 75-foot gangways, and there are three main entrances to it. The exhibits will be grouped roughly in five divisions: (a) Heavy chemicals; (b) dyestuffs and intermediates; (c) fine chemicals; (d) soap and perfumery; and (e) scientific. A scientific committee consisting of the following representatives of scientific societies has been appointed: Mr. J. Baker, Mr. F. H. Carr, Mr. E. V. Evans, and Dr. Herbert Levinstein (Society of Chemical Industry); Dr. J. T. Hewitt and Prof. J. F. Thorpe (Chemical Society); Mr. J. B. Atkinson (Society of Dyers and Colourists); Mr. T. Marns and Mr. E. T. Neathercoat (Pharmaceutical Society); Dr. Stephen Miall (Federal Council); Mr. R. Pilcher (Institute of Chemistry); Commander R. E. Stokes Rees (Institution of Petroleum Technologists); Prof. J. W. Hinchley and Mr. W. J. U. Woolcock (Institution of Chemical Engineers). Mr. Woolcock is serving on all the committees concerned with the scientific side of the Exhibition, in order to act as general liaison officer and to avoid undue overlapping.

REPORTS have recently appeared in the Press of great changes in the depths of the South Atlantic. A note in the *Geographical Journal* for October states that the Hydrographer to the Admiralty contradicts these statements. They arose apparently from the existence, which is well known, of a ridge with depths of 480 fathoms about 800 miles from the Cape on the direct route of the cable between St. Helena and the Cape. Repairs to this cable have lately brought into prominence the occurrence of this ridge in contrast with the surrounding depths of 2500 fathoms and upwards.

THE introduction of European animals into Australia has produced a noticeable diminution in the numbers of many of the native species, some of which appear to be on the verge of extinction. In these circumstances the Trustees of the British Museum thought it desirable to acquire examples of the Australian fauna, particularly mammals and birds, and they sent out a collecting expedition for that purpose. The leader is Capt. George H. Wilkins, who was a member of the Stefansson Arctic Expedition and biologist on the *Quest*. The first station chosen for collecting was in southern Queensland, about 350 miles inland; work was carried on in this area from April 25 to June 11, and the specimens obtained there have recently arrived at the Natural History Museum. The second station is in northern Queensland.

THE first number of the new monthly publication, the *Journal of Scientific Instruments*, dealing with the principles, construction, and use of scientific instruments, has appeared. It is produced by the Institute of Physics with the co-operation of the National Physical Laboratory and is a quarto of 32 pages sold at 2s. 6d. There are three articles of considerable length on temperature control for the Pulfrich refractometer and on the measurement of heights by aneroid and of internal diameters of transparent tubes. Shorter articles on a new relay,

a recording drum, a balance in which the fine adjustment is made by a chain hanging from the pan, and a recording katathermometer, followed by two pages of notes and reviews, complete the part. The character of the articles and illustrations promises well for the future of the *Journal*.

THE twenty-seventh annual meeting and autumn foray of the British Mycological Society was held at Windsor on September 28-October 3. The president, Prof. O. V. Darbishire, dealt generally with the subject of lichens in his address. Lichenologists of the last century, typified in the person of William Nylander (1822-1899), were almost entirely opposed to Schwendener (1829-1919). They felt that his theory of the dual nature of lichens was not true and that the autonomy of the group of lichens was threatened. This old contrast between systematist and physiologist is now almost gone. Systematic lichenology is now in such a state that an appeal is made to lichenologists to work through lichen groups, genera or even species monographically. The difficulty of defining a lichen-species is often very great. This is in part due to the fact that the lichen fungus, anatomically as a rule the predominant partner, in the simple system of symbiotic co-operation existing in the lichen, has thrown overboard the structural traditions of its free-living saprophytic or parasitic ancestors. The result is that the rock-forms of two allied species will in structure often be more like one another than they will be like their respective normal bark-inhabiting parent forms. The evolution of the lichen is proceeding along very definite lines, from the flat crustaceous but areolate, to foliaceous, upright foliaceous, and finally true fruticulose forms. The highest physiological differentiation is reached in such forms as *Cladonia*, where we get stem and dorsiventral leaf clearly separated. Other papers were contributed on "Epidemic Plant Diseases," by Mr. F. T. Brooks; "The Fungi found growing in a Blackbird's Nest," by Sir H. C. Hawley; and an account by Mr. J. Ramsbottom of "An unpublished Monograph on Discomycetes by M. C. Cooke." Mr. J. Ramsbottom was elected president for 1924, Miss G. Lister vice-president, and Messrs. W. J. Dowson and C. J. Sharpe to the council.

THE autumn meeting of the Society of German Chemists was held at Jena on September 26-29, and about six hundred members were present in spite of the present difficulties. No festivities of any kind took place, except the performance of Goethe's play, "Stella." The following were among the subjects of scientific lectures in a very full programme:—Prof. Dr. Neuberg: Review of recent research in fermentation chemistry, and demonstration of methods of determining the direction of fermentation and fixing intermediate products. Prof. Lemmermann: The position of Germany as regards supply of artificial fertilisers; the prospects of enlarging the yield to such an extent that Germany can grow her food supply at home. Experiments were described for partially replacing phosphoric acid by colloidal silicic acid. Dr. Edeleanu: Description of the process

of refining certain kinds of petroleum (such as Rumanian and Californian) containing a large amount of unsaturated and benzoic hydrocarbons by liquid sulphurous acid, and of the apparatus constructed for this purpose by the Borsig Works. This process permits the manufacture of a good burning oil and the production of the other components of the petroleum in their original condition. Prof. Dr. Stock deplored the poor financial condition of experimental chemistry at the German high schools, and remonstrated against the reduction of this most important branch of chemical education. Prof. Dr. K. Hess: Review of recent researches on cellulose. The simple cellulose molecule is represented by $C_6H_{10}O_5$, as stated by Prof. Green thirty years ago. Detailed investigation of the cuprammonia solution of cellulose has proved this to be correct. Prof. Linck: A new proposal for the working-up of the magnesium chloride waste liquors in potash works. In ten sections more than eighty lectures were given on various problems of pure and applied chemistry, industrial law, education, etc.

THE annual report of the Meteorological Committee to the Air Council for the year ended March 1923 has just been issued; this is the sixty-eighth year of the Meteorological Office. Of recent years much development and extension has occurred consequent on the necessary investigation of the upper air for the requirement of aircraft and for naval and military purposes. Most public meteorological work is now absorbed under Government management, and without doubt this tends greatly to the advancement of meteorology. The system of wireless weather reports from ships in the Atlantic is said to be extremely efficient, the whole of the work on the ships is voluntary, and no "ships' charges" are made by the Marconi Company. Some return is made for this voluntary help by broadcasting two messages a day specially prepared by the Office for the shipping approaching our western coasts. About 500 ships regularly and voluntarily send returns in connexion with the work undertaken by the Marine Division, and discussions of use to seamen are actively maintained. The Forecast Division is on the alert to take advantage of every opportunity to ensure improvement in the accuracy of the forecasts. In addition to the European observations, data are received daily from 29 stations in the United States, from Iceland and Greenland, and occasionally from the steamship *Maud* of the Norwegian Polar Expedition. Forecasts are prepared three times each day for issue to the Press and special week-end forecasts are prepared on Thursday and Friday. The Climatological Division deals with all information bearing on climate. Upper air observations entail much work, and the British Rainfall Organisation is entirely under the control of the Meteorological Office.

SIR HUMPHRY ROLLESTON has been appointed a physician-in-ordinary, and Mr. E. F. Buzzard physician extraordinary, to the King.

MR. T. SHEPPARD, of the Hull Municipal Museums, and Dr. T. W. Woodhead have been elected honorary

life members of the Leeds Naturalists' Club and Scientific Association, in recognition of their work in Yorkshire.

DR. J. H. JEANS will deliver the Van der Waals memorial lecture at the meeting of the Chemical Society to be held at the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.1, on Thursday, November 8, at 8 P.M.

SIR OLIVER J. LODGE will deliver his presidential address to the Röntgen Society on "X-rays and the Atom," at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2, on Tuesday, November 6, at 8.15 P.M. Tickets of admission can be obtained from the Hon. Treasurer of the Röntgen Society, 33 Newton Street, W.C.2.

SIR ARCHIBALD GARROD, Regius professor of medicine at Oxford, is to deliver the Harveian oration of the Royal College of Physicians of London in 1924. Dr. C. Singer will deliver the FitzPatrick lectures on November 6 and 8, at 5 P.M., on "The History of Anatomy," and Mr. Edmund Gosse the Lloyd Roberts lecture on "Personal Relations between Medicine and Literature," on Tuesday, November 20, at 5 P.M.

DR. ANDREW BALFOUR has been appointed by the transitional executive committee, under the chairmanship of the Minister of Health, to be Director of the School of Hygiene which is to be established in London. The foundation of the School, which was referred to in NATURE of July 28, p. 149, was made possible by a gift of two million dollars by the trustees of the Rockefeller Foundation.

SIR J. FORTESCUE FLANNERY has accepted the invitation of the Council of the Junior Institution of Engineers to become president of the Institution in succession to Capt. H. Riall Sankey. His induction will take place at a meeting to be held at the Royal Society of Arts on Friday, December 7, when he will deliver his presidential address, "Marine Propulsion during fifty years." Tickets for the meeting may be obtained from the Secretary of the Institution, 39 Victoria Street.

A DISCUSSION on "The Reproduction of Sound by Loud Speakers," arranged by the Physical Society and the Institution of Electrical Engineers, will be held on November 29 in the hall of the Institution of Electrical Engineers. There will be two sessions, 5.30-7 P.M. and 8-9.30 P.M., and during the afternoon visits will be made to the studio of the British Broadcasting Company at Savoy Hill.

FROM the income of the R. 38 Memorial Prize Fund, a sum of twenty-five guineas will be offered as a prize for the best paper received by the Royal Aeronautical Society, on some subject of a technical nature in the science of aeronautics. Other things being equal, preference will be given to papers which relate to airships. The prize is open to international competition. Intending competitors should send their names to the Secretary of the Royal Aeronautical Society, 7 Albemarle Street, London, W.1, on or

before December 31, with such information in regard to the projected scope of their papers as will enable arrangements to be made for their examination. The closing date for the receipt of papers will be March 31.

A PLANT Pathologist is required in the Botanical Division of the Department of Agriculture of the Union of South Africa. The duties of the post will primarily be connected with carrying out pathological investigations regarding the outbreak of disease in tobacco. Candidates must possess a university degree and have taken botany and the allied sciences in the final examination. Forms of application may be obtained from the Secretary, Office of the High Commissioner for the Union of South Africa, Trafalgar Square, W.C.2. The latest date for the receipt of applications for the position is November 20.

AT the statutory meeting of the Royal Society of Edinburgh held on Monday, October 22, the following officers were elected:—*President*: Prof. F. O. Bower; *Vice-Presidents*: Major-General W. B. Bannerman, Dr. W. A. Tait, Principal J. C. Irvine, The Rt. Hon. Lord Salvesen, Prof. J. H. Ashworth, and Prof. T. H. Beare; *General Secretary*: Prof. R. A. Sampson; *Secretaries to Ordinary Meetings*: Dr. A. Lauder and Prof. W. Wright Smith; *Treasurer*: Dr. J. Currie; *Curator of Library and Museum*: Dr. A. Crichton Mitchell; *Councillors*: Prof. H. Stanley Allen, Sir Robert Blyth Greig, Dr. J. Ritchie, Prof. E. MacLagan Wedderburn, Prof. T. H. Bryce, Prof. J. Y. Simpson, Prof. D'Arcy W. Thompson, Sir James Walker, Prof. E. T. Whittaker, Prof. H. Briggs, Mr. W. L. Calderwood, and Prof. T. J. Jehu.

THE annual meeting of the British Association of Chemists was held in the Chemical Department of the University of Birmingham on Saturday, October 27, under the presidency of Dr. Herbert Levinstein, who was re-elected for another year of office. During this meeting the laboratories and workshops of the University were thrown open for inspection and an exhibition of research apparatus and specimens was arranged by the teaching and research staffs of the University. The British Association of Chemists, which was founded in 1917, exists to safeguard the economic and general interests of chemists and to secure wider recognition of the national importance of the profession. The qualifications for admission to full membership are either (1) a university degree or equivalent diploma with one year's practice in applied or teaching chemistry, or (2) a sufficient general education and scientific training with seven years of professional practice. At the present time there are about 920 full members. This Association issues a quarterly Bulletin in which are published the annual report of the Council, the Proceedings of the Association, and other matters appertaining to the material and professional welfare of its members. These activities include an unemployment benefit fund, an appointments bureau, and a legal aid fund.

THE Streatfeild memorial lecture was given at the Finsbury Technical College on October 25 by Mr. E. M. Hawkins, who took analytical chemistry

as his subject. First among the qualifications required in the analyst is accuracy and trustworthiness, to which should be added the ability to decide to what degree of accuracy his results attain. Secondly, there is the need for rapidity to be associated with accuracy, as few students realise the speed of manipulation which is required of them when they obtain a post after leaving college. Thirdly, it is of great importance that students should cultivate the gift of expressing results suitably in a report. Much good experimental work is marred by the inability of the chemist to write up his results in such a way that the bearing of the work can be properly appreciated by those who read the report. The chemist should not be easily moved from an opinion formed after careful consideration of results obtained by patient investigation. In conclusion, the lecturer stated that of the three classes of men practising chemistry, namely, works chemists, public analysts, and consultants, the first class will greatly outnumber the public analysts when trade revives, while consulting chemists will be men of wide experience and high attainments who will be called upon by manufacturers to solve their problems and should be highly remunerated for such work.

MESSRS. WHELDON AND WESLEY, LTD., 2 Arthur Street, W.C.2, have just sent out a new catalogue (New Series, No. 9, 1923) of second-hand works on ornithology, compiled with their usual care. It contains nearly 1300 titles, and should be seen by all interested in the subject.

MR. W. H. ROBINSON, 4 Nelson Street, Newcastle-on-Tyne, has just issued catalogue No. 9, 1923, of "Rare and Standard Books" offered for sale by him. Many books of science, voyages, and travels are

included, and there is a very interesting section on "Americana."

MESSRS. H. K. LEWIS AND CO., LTD., 136 Gower Street, W.C.1, have just issued a list of the new books and new editions added to their Medical and Scientific Circulating Library during August and September. As it is practically a list of the medical and scientific books published during the months in question it should be a useful guide to others than subscribers to the library.

PART III. of Sotheran's Catalogue of Science and Technology has just reached us from the publishers (140 Strand, W.C.2). It gives the titles of, and in many cases comments upon, upwards of 1500 works on the subjects of astronomy and astrology, chronology, geodesy, horology, and dialling. Many very rare books are included, among them being a unique star atlas entitled "Uranographia Britannica," published in 1750 and reported to be hitherto unknown. The catalogue should be seen by all who are interested in books dealing with the subjects named.

MESSRS. W. AND G. FOYLE, LTD., 121-125 Charing Cross Road, W.C.2, have sent us a copy of their catalogue (Dept. No. 3, September) of second-hand books, some 700 in number, which they have for disposal. The catalogue is classified under the headings: General Science, Mathematics, Astronomy and Surveying, Mathematical Tables, the New Physics, General Natural History, Anthropology and Ethnology, Evolution, Variation, Heredity, Genetics, Botany, Zoology, Microscopy, Collectors' Manuals, Geology, Palæontology, and Biography. We learn that Messrs. Foyle have recently organised a new department for the supply of books relating to science.

Our Astronomical Column.

NEW COMET.—The first cometary discovery of 1923 was made on October 14, at 13^h 18^m.2 G.M.T., by Mr. Doubiaco at Kasan. The comet was of magnitude 8.0, and its position was R.A. 7^h 46^m 42^s.67; south declination, 20° 37' 31". The daily motion was +6^m 40^s; south, 4° 51'. The rapid motion indicates that the distance from the earth was small.

Unfortunately, owing to delays in Russia, the news did not reach western Europe until October 25, and by that time it may be inferred that the comet had passed below our southern horizon.

TWO LARGE FIREBALLS.—Mr. W. F. Denning writes that on the evenings of October 16 and 17 very fine meteors were seen in the south-west of England. The first appeared on October 16, at 9.28 P.M., and was well observed by many persons in the counties of Gloucestershire, Somerset, and Devon. It gave a brilliant illumination. Its height was from about 63 to 44 miles, and it passed from above Poole, Dorset, to a few miles south-west of Reading. The radiant point was indicated in Aquila at 301°-9°.

The fireball which appeared on the following night, October 17, at 11.57 P.M., was of extraordinary splendour, and created a startling effect upon many persons who were in a favourable position for witnessing its full effect. About ten observations have come to hand from Cornwall, Devon, Gloucester, and

Somerset, and from these it is indicated that the fireball pursued an horizontal flight at an elevation of about 55 miles above the earth's surface. The radiant point was situated in Hercules and not far from the north-western horizon at the time of the meteor's appearance. The illumination it gave was estimated as greater than that of the full moon, and during its flight the nucleus gave a succession of three vivid outbursts of remarkable intensity.

THE SPIRAL NEBULÆ.—Mr. J. H. Reynolds replies in the October issue of the *Observatory* to the articles of Prof. Perrine and Mr. Gifford in the September number. The latter had objected that the number of the spirals approached half a million, which would give an improbably high mass, if they were composed of dust expelled from the Galaxy. Mr. Reynolds notes that many of the small nebulae suspected to be spirals at the Lick Observatory have been shown at Mt. Wilson to be nebulous nuclei of a different character from spirals. The number of known spirals does not exceed 2000.

The great difference of illumination between the nucleus and the outer portions of the spirals is considered fatal to their being external galaxies similar to our own.

Further, the unsymmetrical distribution of the spirals in galactic longitude has to be considered in any discussion of their nature.