

"Observations and Reductions" includes the routine work with the reversible transit circle, with which a total of 11,801 transits were observed during the period under review, and 530 observations were also made of the Sun, Moon, the planets and Ceres and Vesta. Of the other nine sections of this programme, reference may be made to "Proper Motions", for the determination of which 68 plates were taken with the astrographic refractor. Owing to the poor condition of the axes of the telescope, which made precise guiding of long exposures very difficult, this programme was not stressed during 1956. After the renewal of the main bearings early in 1957 every effort will be made to complete this programme as quickly as possible. Among matters of interest in "The Radcliffe Section" special mention may be made of the work of Dr. D. S. Evans, who obtained measurable spectra of five regions, in *NGC 253*, using the Newtonian spectrograph. It was possible to identify the nearer edge of this extragalactic nebula and to trace out its spiral arm system, and the spectrograms show that the system is rotating with the arms trailing. It may also be mentioned that a start has been made with the production of an atlas of southern

extragalactic nebulae: this atlas will consist of enlarged prints from selected plates, each plate being accompanied by a short description.

One disconcerting feature is mentioned under "Personal Establishment", which may not, however, be confined in its implications to the southern hemisphere. Only one Observatory officer of those recruited since the War remains on the staff, most of the others having resigned at one time or another to take up more remunerative employment. H.M. Astronomer, Dr. R. H. Stoy, adds the following comment: "This once again emphasizes the many representations that have been made to the Admiralty that the conditions and prospects at present offered are completely unattractive to potential recruits".

Under "Miscellaneous", reference is made to the regular meetings of the Cape Centre of the Astronomical Society of South Africa, and on the second and fourth Saturday evenings of each month members of the Centre have been in attendance, when the weather is fine, to show members of the public celestial objects through the 6-in. telescope. These meetings have been well attended and greatly appreciated by the public.

LINNAEUS

THE Swedish Linnean Society this year celebrated its fortieth anniversary. There are twenty or so Linnean Societies (that of London being the oldest); but the Svenska Linné-Sällskapet differs from the rest in being concerned solely with Linnæus.

The *Årsskrift* for 1956-57 (Vols. 39-40. Pp. 198+24. Uppsala: Almqvist and Wiksells Boktryckeri AB., 1957) is admirably produced. It is surprising how, year after year, a considerable volume is issued throwing further light on aspects of Linnæus's life, writings, associations and period, and this, of necessity, with little reference to the mass of material at Burlington House in London. (Incidentally, this material still needs a good deal of sorting by someone thoroughly competent in Swedish and Latin—and able to read Linnæus's writing—such as Dr. A. Hj. Uggla, secretary and editor of the Swedish Society, who has given such valuable service in this connexion.) The first paper in the present volume is "Linnæus and Cornwall" by Spencer Savage. Its title might lead one to think that Linnæus had contrived to visit the county during his short time in England in 1736, but it refers to his interest in Cornish mineralogy. W. Borlase, vicar of Ludgvan, well known for his "The Natural History of Cornwall", was asked by his friend, John Andrew, then studying medicine at Leyden, to send a "little box" of various ores and mundics apparently to gratify the curiosity of Boerhaave. The minerals sent were shown to Linnæus who, in the opinion of Boerhaave, "understands the nature of all kinds of mettals the best of any one in the World". Gronovius undertook their naming and sent a list following Linnæus's nomenclature. A further collection was forwarded, and, with their names, Gronovius sent a copy of a report he had received from Linnæus on the liquefaction of copper. (A third set of minerals was sent, after Linnæus had left Leyden, but no copy of this was found in Borlase's papers at Penzance and Truro.)

A. J. Boerman writes about Linnæus's candidature for his medical doctorate. To save both time and money, many Swedish medical students took their degree at the University of Harderwijk previous to hearing Boerhaave's lectures at Leyden. Before presenting and defending his thesis Linnæus had to show that his general medical knowledge was of the standing expected of a doctor. It is known that he had written his thesis before leaving Sweden; but the day after arriving at Harderwijk he had to prepare a manuscript for his *Candidatus Medicinae*. The text of what appears to be a fair copy of the Latin original (Linnean Society, London) is given and its English translation. There is certainly much still to be learned about Linnæus's activities in Holland.

The remaining eight principal papers are in Swedish. Carl-Axel Torin writes on Linnæus as 'rusthållare' in the horseguards. At that time landlords, as part of their tenure, had to procure and maintain a number of soldiers for the standing army, and provide them with a small plot of land. The archives of the regiment show that when Linnæus acquired Hammarby in 1758 he was responsible for four dragoons and their horses. During the Seven Years War two of these dragoons lost their lives and Linnæus had much difficulty in replacing them.

A long contribution by Gunnel Hazelius-Berg and Sigurd Wallin deals with Linnæus's wardrobe at Hammarby, with much contemporary allusion. It is amusing to find that the three-cornered hat, covered with pale green silk with a rose-coloured band, so often figured as his Dutch doctor's hat, is simply one of the kind received by the successful candidates for the medical doctorate at Upsala.

Nils Sylvén gives a catalogue of the plants of Linnæus's native parish, collating his data with those given by Linnæus, and Assar M. Lindberg, recording the tradition that three ecclesiastical families in Småland—Lindelius, Tiliander and Linnæus—took

their names from a large lime tree at Jonsboda, shows that both Linnæus's father, and Tiliander, the father's uncle, so derived their names, but not Lindelius. The tree disappeared about 1823, but its site is still pointed out. Olaf Svanberg writes on "Pan Svecicus". Linnæus, in his Dalecarian journey in 1734, noticed how horses avoided certain plants. This prompted a study of which plants were eaten by various domestic animals, and twenty years later he formed a team of about thirty students to make observations; in 1749 he published a list of 600 species ("Pan Svecicus"). Prof. Svanberg has carried out an investigation on similar lines, and has established that lymphadenosis, a disease among cattle in one district of Sweden, is caused by calves eating *Ranunculus acris* which is now left standing in the fields.

Hugh Osvald discusses Linnæus's 'hay-seed'. During practically the whole of the eighteenth century Swedish agriculturists suggested the introduction of foreign plants as a means of improving fodder. Linnæus stated that a Swedish plant, *Medicago falcata*, would serve this purpose; but, in spite of his prestige, his suggestion was not generally accepted. Recently this plant has been crossed

with other species of the same genus with the object of producing a fodder suitable to Swedish conditions.

A. Hj. Uggla publishes a series of letters from the younger Linnæus to Abraham Bäck, his father's most intimate friend, written in 1778, the year after his death. They contain the son's answers to questions put while Bäck was writing his commemorative address for the Academy of Science. They are of great value in throwing light on Linnæus's character and ideas and also give an impression of the difficulties the son had in following his father as professor, without his standing.

A number of smaller papers on points concerning Linnæus and the Society add to the picture of lively interest.

There is an English summary of the principal contents. A most valuable supplement is an index to the content of the forty volumes of the yearbook, which contains a wealth of information that will prove invaluable when a reasoned account of Linnæus as a scientist, his influence on the development of ideas, and his personality is attempted.

J. RAMSBOTTOM

APPLIED PROBABILITY

"APPLIED Probability" is an exceedingly valuable collection of papers badly mistitled*. In no sense could the first three contributions (by Lévy, Doob and Feller) be regarded as essays in applied mathematics. Thus, Lévy's paper, ostensibly about Brownian motion, studies an abstraction of that phenomenon involving $(2p + 1)$ -dimensional 'time', which would not be appropriate for the description of the physicists' Brownian motion even when $p = 0$. This comment is not intended to be uncompromising; rather the reverse. The reviewer only regrets that many who would find interest and even inspiration in this book will leave it unopened because of its unfortunate title.

To return to Lévy's paper, a fascinating and apparently very difficult problem is suggested by the series of papers by Lévy, of which this was the first to be written (though not the first to appear). Let E_n be real n -dimensional Euclidean space (or Hilbert space, when we write $n = \infty$), and let $d(x,y)$ denote the distance between the points x and y in E_n ($\|x-y\|$, if $n = \infty$). Then it is known that a Gaussian random function $f(x)$ can be constructed in such a way that

$$\mathcal{E}(f(x) - f(y)) = 0; \quad \text{var}(f(x) - f(y)) = d(x,y)$$

If A is a set of points in E_n , and if the values of $f(x)$ for x in A are given, then Lévy writes $\mathcal{E}(\dots | A)$ and $\text{var}(\dots | A)$ for the corresponding conditional means and variances of various random quantities. In particular, if S_t is the surface of a sphere centred at the origin in E_n and of radius t , and if K_t is the region outside S_t , Lévy considers the quantities

$$\text{var}(f(0) | K_t) = c_{nt} \text{ and } \text{var}(f(0) | S_t) = c_n t$$

* Applied Probability. (Vol. 7 of Proceedings of Symposia in Applied Mathematics of the American Mathematical Society.) Pp. v+104. (London: McGraw-Hill Publishing Company, Ltd., 1957.) 37s. 6d.

which plainly depend on t in the manner indicated and on the dimensionality n . When n increases, c_n and $c_n t$ both decrease, and it is asserted that

$$\lim_{n \rightarrow \infty} c_n = c_\infty = 0; \quad \lim_{n \rightarrow \infty} c_n t = c_\infty' = 1 - 2^{-1/2}$$

Now $f(x)$, as a random variable having a finite variance, can be identified modulo a suitable equivalence with a point in the Hilbert space of random variables having a finite expected square; thus, in the case $n = \infty$, we can think of $f(\cdot)$ as mapping one Hilbert space into another in such a way that

$$\|f(x) - f(y)\| = \sqrt{\|x-y\|}$$

The existence of such square-root mappings is well known and some of their surprising properties have been studied¹. One of the results of Lévy which has been noted above suggests that the following geometrical relation ought to hold for square-root mappings of the kind just described: $f(0)$ lies in the closed linear variety spanned by $f(K_t)$. If this could be proved directly, much insight would be gained into the studies Lévy has made of such many-parameter 'Brownian motions'.

The papers by Doob and Feller may both be regarded as contributions to generalized potential theory. Doob's paper summarizes results which have already been reported by him in detail elsewhere² and which are concerned with solutions to abstract problems of the Dirichlet type directed by the following key idea: the boundary is to be approached in such a way that the instantaneous motion at any point is controlled by the harmonic measure. There is a slight link with Lévy's paper in that in some simple concrete situations the trajectories will be those of one-parameter Brownian motion. Doob's paper is again one of a long series; the latest has just appeared in the Russian probability journal *Teoriya Veroyatnostei*. Feller might be said to be