The opening chapters deal exclusively with Australian conditions. Pressure observations are considered first. The mean amplitude of the difference between a number of conspicuous minima and the succeeding maxima in the curves showing the annual variation, amounts to more than seven-hundredths of an inch. When the curves for those stations for which long records are available are compared, they all show a marked similarity, and the important generalisation is arrived at that simultaneous excess or defect of pressure in any one year is a marked feature of the whole Australian continent, and is not restricted to any one particular portion of this area. Coming next to the rainfall observations, an examination of the curves leads to a similar conclusion. Years of low rainfall are, broadly speaking, years of deficiency over the whole continent, and in years of excess the excess is also general. Moreover, a comparison of the rainfall and pressure curves suggests very strongly that periods of high pressure are periods of low rainfall, and *vice versa*. These are generalisations of great importance, for they introduce a great simplification, and correspondingly facilitate the further study of Australian weather conditions. In view of the few data available in proportion to the area considered, a meteorologist, arguing from analogy, might be disposed to regard these as hasty generalisations. The extraordinary variability of rainfall in other parts of the world is well known, and for its adequate study a large mass of information is essential. When the necessary figures are forthcoming we find that even within the narrow limits of our own islands there are very conspicuous differences between the north of Scotland and the south of England. Australian conditions are, however, different. As Dr. Lockyer points out, the weather of the continent is dominated primarily by anticyclones travelling from west to east. In years of high pressure these anticyclones are found to embrace a wider area, and thus the low-pressure systems which skirt their edges and bring rain to the northern districts in summer, and to the southern ones in winter, affect the land area to a smaller extent.

In discussing these questions of correlation, whether it be between variations of the same element at different places or between different elements, Dr. Lockyer uses the similarity between two curves as his standard of measurement. The points of resemblance to which he directs attention are, indeed, striking. At the same time, the reader feels a desire for a more definite expression of the relation between the elements under comparison. When we come to the correlation between the Australian curves and those for other parts of the world, which takes up much of the later part of the work, this becomes more imperative. Thus, on p. 72, after discussing the striking resemblance between the pressure changes at Adelaide and those of Bombay or Batavia, we read, "While the Cordoba curve is nearly the inverse of Adelaide the curve for the Cape seems to be intermediate, being more inclined to be similar to the Australian type of variation than that of South America." The intermediate between two curves which are inverse to one another should be a straight line. If it is meant that the Cape curve follows now the variations of Adelaide and now those of Cordoba, it becomes a matter of importance to have some means of comparing the degrees of similarity in the two cases. Superpose any two arbitrarily drawn curves showing fluctuations of approximately the same amplitude, and we are sure to find that some of the maxima and minima agree. Can we say by how much the correlation between the curves we are discussing exceeds that between curves drawn arbitrarily?

The question of periodicity naturally comes in for discussion. After eliminating a variation of short period by taking means of groups of four years, Dr. Lockyer claims that the smoothed curves for Australia show a periodicity of nineteen years. It is true that there are conspicuous maxima in 1868 and 1897, and minima separated by about the same number of years, but this does not of itself prove a recurring periodicity, and the case is not advanced by drawing a "hypothetical" curve through the points of maximum in which an intervening secondary maximum is disregarded and replaced by a principal minimum. The occurrence of a similar interval between the maxima in the pressure curve for South America, but of other epoch, is suggestive, but the question of the connection between the two continents remains one for further study.

A highly suggestive and interesting chapter on the air movements over the three great land areas of the southern hemisphere points out some interesting similarities between the pressure distribution and the incidence of rainfall of the three continents. The volume also contains an interesting comparison of the flow of the Murray river with the rainfall, and of the frequency of southerly "Bursters" with the variations of pressure. The work thus ranges over a wide field. It offers much that is new, and brings together from a common point of view much information that has hitherto been scattered in a number of individual papers. R. G. K. L.

## POSSIBILITY OF AN EXTRA-NEPTUNIAN PLANET.

M. GAILLOT has contributed an admirable note on this subject to the *Comptes rendus* (March 22). A summary of his calculations is set forth so clearly as to be easy to follow, and if we have one regret it is that he has not published the discordances between observed and tabular positions that necessarily form the basis of his work. We suppose that the *Comptes rendus* do not admit masses of tabular matter, and we wish to express the hope that M. Gaillot will publish this information somehow or other.

A review recently appeared in NATURE (June 17, p. 463) on Prof. W. H. Pickering's calculations. We there maintained that Prof. Pickering's supposed planet "O" could not possibly produce sensible perturbations in Uranus. Now, M. Gaillot and Prof. Pickering both locate their hypothetical planets in the same part of the sky. M. Gaillot's mass is five times that of the earth, or two and a half times that of Prof. Pickering's "O." A reader of the previous review will see that M. Gaillot's planet would, therefore, produce in Uranus inequalities exceeding a second of arc. We suspect that Prof. Pickering has made some numerical mistake in estimating the mass of his planet "O," and, if he can rectify this, we should then have two independent researches in practical agreement. M. Gaillot's result is, however, sufficiently confirmed by the analogy from inner planets developed in the previous review.

The important question now arises, "Are the observed discordances sufficiently large to point unmistakably to some unknown planet?" It is clear that an inequality with a coefficient of one second of arc appears to exist in the observations; but the elliptic constants of the orbit of Uranus are arbitrary, the observations are liable to small errors, and the theory of the action of known planets is not perfect. All this shows how unsafe it would be to assert the real existence of the inequality which would in its turn demonstrate the existence of an unknown planet. We

may draw an analogy from the moon. The real existence of a term with coefficient nearly three seconds and period sixty-four years is now generally admitted in the motion of the moon. This term was first defined in 1904, and the case for its real existence was not a strong one until Prof. Newcomb arrived in 1909 at an almost identical conclusion from the totally different evidence of occultations. The term in the motion of Uranus must therefore be doubtful for the present. We are not entitled to do more at present than hope that it is real, and that a corresponding planet will reward M. Gaillot's admirable work. This doubt is fully admitted by M. Gaillot.

"Ces résultats ne doivent être acceptés d'ailleurs qu'avec une extrême réserve. En effet, les différences entre les positions observées d'Uranus et celles qui sont calculées a l'aide de nos Tables ne dépassent guère les limites des erreurs probables des observations augmentées de celles qui résultent des imperfections de la théorie. . . ."

It is noteworthy that, like Prof. Pickering, M. Gaillot bases his hypothetical planet upon Uranus and not upon Neptune. It appears, therefore, that the motion of Neptune is in good agreement with the tables, and that no extra-Neptunian planet can exist of a mass and epoch to produce sensible inequalities in the motion of Neptune since its discovery. This is an important negative result; in fact, if it be assumed that the unknown planet has a mass at least one-third that of Neptune, a considerable part of the ecliptic is excluded from the domain where this planet can possibly be found.

## THE SORBY RESEARCH FELLOWSHIP.

IT will be remembered that the late Dr. H. C. Sorby, F.R.S., of Sheffield, bequeathed a sum of 15,000*l.* to the Royal Society of London to be held in trust for the establishment of a professorship or fellowship for original scientific research, the testator expressly desiring the professorship or fellowship thus founded to be associated with the University of Sheffield. Accepting this trust, the council of the Royal Society appointed a committee to confer with representatives of the University of Sheffield with the view of drawing up a scheme for giving effect to the intentions of Dr. Sorby's will.

A scheme, prepared by this committee for the establishment of a "Sorby Fellowship for Scientific Research" to be associated with the University of Sheffield, has now been approved and adopted by the council of the Royal Society, and by the senate and council of the University of Sheffield. This scheme provides for the administration of the income of the fund by a joint committee consisting of four persons appointed by the council of the Royal Society, one person appointed by the council of the University of Sheffield, and two by the senate of that University.

The object of the fellowship is not to train students for original research, but to obtain advances in natural knowledge by enabling men of proved ability to devote themselves to research; and in making an appointment the committee will pay special attention to the capacity for original work of a candidate, as shown by the work already done by him, and to the likelihood that he will continue to do valuable work. Each appointment will be in the first instance for five years, subject to the control of the committee, but may in special circumstances be prolonged for further periods if the committee is satisfied with the fellow's work.

The fellow will be required to carry out his research, when possible, in one of the laboratories of the University of Sheffield, and provision is made under the regulations for the setting aside of a sum not exceeding 50*l.* a year to form an apparatus fund, from which grants may be made from time to time to the fellow for the purchase of special apparatus and material required in his research. The stipend of the Sorby Research Fellow will probably be about 500*l.* per annum, and it is hoped that the committee will be in a position to make the first appointment to the fellowship early in the coming autumn.

## PROF. T. W. BRIDGE, F.R.S.

WE regret to record the death, on June 30, of Dr. T. W. Bridge, Mason professor of zoology in the University of Birmingham. By his death the University is deprived of one of its oldest and most experienced teachers, and zoological science has lost one of those workers who, under the influence of Balfour and the Cambridge school, have contributed largely both by example and precept to our knowledge of vertebrate morphology.

Prof. Bridge was born in Birmingham in 1848, and after studying science at the Birmingham and Midland Institute, went in 1870 to Cambridge as assistant to Mr. J. W. Clark, then director of the Museum of Zoology. In 1872 he was elected to a foundation scholarship at Trinity College, and appointed demonstrator in zoology under the late Prof. Newton. After his graduation in 1875, he spent six months at Naples working in the zoological station, where, on the advice of F. M. Balfour, he carried out research into the "abdominal pores" of fishes. In 1879 he was appointed professor of zoology in the Royal College of Science at Dublin. In 1880 he became one of the original professors at the Mason College, Birmingham, holding the chair of biology; and when this chair was divided in 1882 he retained the title of Mason professor of zoology and comparative anatomy, and kept the same position when the Mason College became a University in 1900.

The original work carried out by Prof. Bridge dealt chiefly with the osteology of ganoid fish, the "pori-abdominales" of vertebrates, and the air-bladder of Teleosts. The most important of these memoirs are undoubtedly those dealing with the last subject, and the large paper by Profs. Bridge and Haddon, published in the Philosophical Transactions in 1893, on the air-bladder of Siluroids, has become a classic. This work was the first thorough investigation dealing with the structure and physiology of this organ which had appeared since Weber's original discovery and fundamental treatise on the air-bladder published in 1820. In certain Siluroids, Weber found that extraordinary apparatus which still bears his name. He described in a few families the vertebral elements that link the air-bladder with the ear, and concluded that the apparatus subserved the function of hearing in these fish. What was now required was a systematic inquiry into the variation of this mechanism and into the use or uses of it; and it is this monographic treatment that we owe to Prof. Bridge and his collaborator. They investigated 100 species of Siluroids, and concluded that this highly specialised mechanism was employed, not for audition, but for the registration of varying hydrostatic pressures. These memoirs not only advanced our knowledge of this interesting structure, but threw light on many points of ecological interest in connection with other physostomatous Teleosts.

Prof. Bridge's most recent work was his article on fishes in the "Cambridge Natural History" (1904). This article has proved one of the most useful treatises on this subject both to teachers and students. The