fledged science. At the beginning of this period, astrophysics was almost non-existent. Thus the first lecture printed here is Airy's discourse on the forthcoming solar eclipse of 1851. This was the first to be observed in detail by astronomers, and it led to the long sequence of nineteenth century eclipse expeditions, which raised so many questions concerning the nature of the solar atmosphere —and answered a few of them. At the other end of the time sequence, the last discourse is by another Astronomer Royal, Spencer Jones, on the projected 200-inch telescope: the instrument which better than any other symbolizes modern astrophysics.

These volumes allow us to follow the often complicated development of astrophysical ideas during the past century. Many of the conceptual changes have been remarkable: none more so than in the timescale allotted to the universe. In 1887, Sir William Thomson explained to his audience: "Five or ten million years ago he (the Sun) may have been about double his present diameter and an eighth of his present mean density . . . but we cannot, with any probability of argument or speculation, go on continuously much beyond that". Just about fifty years later Sir James Jeans told his audience: ". . . we find that 5 million million years ago, the Sun was probably many times as massive as now and many times as bright". The current value for the age of the Sun is more or less the geometric mean of these two estimates.

The timescale has been a central question in astronomy throughout the nineteenth and twentieth centuries; other areas, less subject to intense scrutiny, have experienced fluctuations in fashion. Dewar's experiments on the gaseous constituents of meteorites—reported by him to the Royal Institution in 1886—were for many years the best of their kind: it is only in the past two decades that there has been a renewed interest in this type of investigation. Similarly, there have been varying fashions in ideas: Balfour Stewart's discourse (1867) on the Sun as a variable star refers to the part played by the planets in influencing the behaviour of sunspots. This suggestion was revived, albeit in modified form, just a century later, in the 1960s. In view of the current British plans for the development of infrared astronomy, Piazzi Smyth's preliminary site-testing in Teneriffe (reported to the Royal Institution in 1858) may also come in useful after a lapse of a century. Smyth, happily, was enthusiastic about the site. "Then how truly serene and quiet, and transparent, too, was the air above our 8,900 foot elevation; for, on erecting our telescopes, not only was each star, high or low, seen with an exquisite little disc and nearly perfect rings, but the space-penetrating power was extended with the same instrument and same eye from the 10th magnitude at the sea level, to the 14th."

These two volumes are fascinating, if rather expensive, and can be recommended both for serious and for bedtime reading. Misprints in the body of the text cannot, of course, be blamed on the publishers, because these are photographic reprints. But the blurb describes the editor, Sir Bernard Lovell, as having been president of the Royal Astronomical Society in 1964; he is in fact the current president.

A. J. MEADOWS

RADIO ASTROPHYSICS

Radio Astrophysics

Nonthermal Processes in Galactic and Extragalactic Sources. By A. G. Pacholczyk. (Series of Books in Astronomy and Astrophysics.) Pp. xxi + 269. (Freeman: San Francisco and Folkestone, September 1970.) 122*s*.

A LARGE body of observational data is available for the 10,000 or so radio sources now known. These include, among other parameters, measures of source spectra, energy flux, size and polarization. Before this material can be interpreted in terms of the physical conditions within the sources, it is necessary to have a well understood theory of the emission mechanism. Indeed, the synchrotron mechanism in which radiation is generated by relativistic electrons gyrating in a magnetic field is believed to be an adequate theory for the majority, if not all, of the galactic and extragalactic continuum radio sources.

Dr Pacholczyk has written a useful text on the emission processes in radio sources. He has concentrated on the synchrotron process for which he has provided a thorough introduction. The effects on the emission by the surrounding plasma are included as are the effects of electron scattering on the emitted synchrotron radiation. A well chosen bibliography is included at the end of each chapter.

A new range of non-thermal processes have recently been recognized in spectral line sources. The most studied of these are the regions of anomalous emission from OH and H_2O molecules in interstellar space. Brightness temperatures of up to 10^{13} K have been measured which are enormously in excess of the kinetic temperatures which exist in these regions and are interpreted as originating in maser action where a weak background signal is amplified in the cloud of interstellar molecules to these high intensities. Line-narrowing, temporal variability and a high degree of circular polarization are trade marks of this type of emission.

It is probably a sign of the rate of advance technically and the associated rate of new discoveries in radio-astronomy that this subject is scarcely touched on in Pacholczyk's treatment. A major branch of non-thermal radio emission mechanisms has been deliberately excluded from this work, namely, the various radio emission mechanisms known to operate in the atmosphere of the Sun. The reason for this latter omission in not so clear, because these mechanisms provide excellent examples of emission mechanisms other than the synchrotron process.

In all, I find this a welcome book bridging the gap between the extensive theoretical treatments and the wide range of observational data. As an aside, it is interesting to find Pacholczyk, a theoretical astrophysicist, falling prey to the observational astronomers' and space-scientists' nightmare—confusing the senses of polarization which an antenna receives and transmits. An antenna receives and transmits the same sense of circular polarization as is adequately demonstrated in Kraus's *Radioastronomy*.

R. D. DAVIES

THE FACE OF THE MOON

Geology of the Moon

A Stratigraphic View. By Thomas A. Mutch. Pp. 324. (Princeton University: Princeton, New Jersey; Oxford University: London, August 1970.) 165*s*.

PROFESSOR MUTCH, a stratigrapher who has worked at the US Geological Survey's Center of Astrogeology at Flagstaff, is well qualified to discuss lunar stratigraphy. His book is not, however, as specialized as the subtitle might indicate. The author appeals to all the important aspects of lunar geology, albeit on a superficial level. The text is relatively free from prejudice and, together with the general lack of great depth of treatment, combines with the well-chosen illustrations to provide an excellent students' introduction to the geology of the Moon.

Two introductory chapters on aspects of history of the subject and the Moon's orbit and figure are brief and more adequate treatments will be found elsewhere. The third introductory chapter deals, again briefly, with photographic documentation of the Moon and the results drawn from some of the physical methods (such as optical and thermal) used to examine the lunar surface. Key charts identify the locations of the Lunar Orbiters' photographic coverage (but neither cardinal points nor coordinates are