and ampere. Agreement between different laboratories is not perfect and every three years each laboratory sends its standard cells and resistors to the BIPM so that they can be evaluated in terms of the "BIPM volt" and "BIPM ohm". For the sake of continuity the stated values of the standards are not adjusted each time these comparisons are made.

As measuring techniques improve and the standards themselves become more stable and reproducible, however, the differences between the units maintained in various countries become more significant. The most recent and precise determinations indicate that the BIPM ohm is within 1 part per million of the correct value while the BIPM volt is probably 11 parts per million larger than the correct value. At an international meeting in October, metrologists agreed that the BIPM volt should be adjusted accordingly. Other countries are making this the occasion to make their own units agree more closely with the BIPM units.

The standard resistance is measured by comparison with the reactance of a mutual inductor used on alternating current at a known frequency. The inductance is calculated from the physical dimensions of the coil. The Metrology Division at the National Physical Laboratory hopes that, by using a capacitor instead of the inductor, it will be able to measure resistance ten times more precisely. The voltage of a standard cell is compared with the potential difference across a known resistor carrying a current from the coils of a current balance. The absolute value of the current is determined in terms of the mechanical force between two conductors carrying the same current.

METRICATION

One Swallow for Summer

ALMOST five months to the day after Mr Anthony Wedgwood Benn, the Minister of Technology, announced in Parliament that the Government would be setting up a Metrication Board as soon as possible, Lord Ritchie-Calder was named on December 19 as its chairman. The appointment of the other board members will not be announced until Parliament has reassembled later this month, which has disappointed officials as well as many industrialists, who feel that the sooner the board is appointed and starts work the better. It seems, however, that Mr H. Cruickshank, the chairman of the construction industry's metrication working party, will belong to the board, while Mr A. H. A. Wynn, the Ministry of Technology's senior official working on metrication, and Mr H. A. R. Binney, director-general of the British Standards Institution, are almost certain to be asked as well.

Lord Ritchie-Calder seems to be everyone's idea of the ideal man for the job, which during the next seven to ten years will entail giving advice to all and sundry on the problems that will arise from adopting a fully metric system of weights and measures. Lord Ritchie-Calder, who said last week that he will start work in March, sees the job as a huge public relations exercise with ramifications in every sphere of life. The problem is simply to persuade people to adopt the metric system voluntarily. Persuading industry should be easy, but persuading consumers and retailers, who are not organized among themselves, is where the difficulties begin. Lord Ritchie-Calder says that he expects the board will encourage the setting up of consumer and retailer groups and councils and exploit all the communications media in its attempt to win over the public.


Lord Ritchie-Calder.

Lord Ritchie-Calder is best known as the former journalist Ritchie Calder, with a flair for explaining science to the layman, who contributed regularly to two now defunct newspapers—the *News Chronicle* and the *Daily Herald*. His political leaning has always been to the left—before the war he led marching strikers. In 1966, when he became a life peer, he accepted the Labour Party Whip in the House of Lords. This accords with what is believed to be the Prime Minister's view that metrication is potentially too political to be left to the technicians.

HONOURS

Scientists Honoured

PROFESSOR P. M. S. BLACKETT, President of the Royal Society since 1965, has at last accepted one of the four life peerages announced this week in the New Year Honours; his wife will no longer be able to make her favourite joke, "Not even the Labour Party can make a Lady of me". Bernard Katz, professor of biophysics at the University of London, and Michael Francis Addison Woodruff, professor of surgery at Edinburgh University, have both been knighted. Also knighted are James William Howie, medical director of the Public Health Laboratory Service; Stephen John Watson, lately professor of agriculture and rural economy at the University of Edinburgh; Derman Guy Christopherson, vice-chancellor at the University of Durham, and Christopher Sydney Cockerell, consultant at Hovercraft Development Ltd.

SELENOLOGY

Album of the Moon

from our Astronomy Correspondent

THE magnificent photographs of the Moon taken by Borman, Lovell and Anders which have captured the front pages of the newspapers are unlikely to add as much to scientific knowledge as proponents of manned spaceflight would like to believe. This is not to say that the landing of men on the Moon, who will pick and choose interesting pieces of rock to be brought back for examination on the Earth, will not have a considerable scientific payoff. And it is hard to believe that men scrambling about on the surface will not make valuable deductions about the forces which have moulded the Moon's pock-marked landscape. The Christmas flight of Apollo 8 was a daring trail-blazer for this kind of activity to which the scientific community will look forward no less than anyone else. But the photographs of the illuminated part of a narrow strip of the Moon along the lunar equator which are now released will add next to nothing to what was already available in 1966 and 1967. The reason for this is that the Orbiter series of lunar satellites launched by the Americans has already mapped almost 99 per cent of the Moon, with a resolution as good as the Apollo

Looking south at the crater Goclenius, 40 miles in diameter. Goclenius is at latitude 10° south, longitude 45° east.

photographs. Operating at altitudes as little as 40 km above the surface, the Orbiters were equipped with medium and high resolution cameras to take pictures more detailed than those now published. The astronauts' photographs were, it seems, taken with a conventional camera from 110 km.

Following what has been the Russian practice, the Orbiter cameras use film as an intermediate stage rather than direct television transmission. The 200 foot roll of 70 mm film in Orbiter I was processed on board and the result radioed back to the Earth. Roughly 90 per cent of the 211 frames which could be accommodated on the roll of film in Orbiter I were used to map possible landing sites, each frame consisting of one high resolution and one medium resolution picture. The two lenses had a focal ratio of $f/5{\cdot}6$, the high resolution lens was a 600 mm "Paxoramic" and the medium resolution lens an 80 mm "Xenotar". A measure of the success of Orbiter I and its successors launched during 1966–67 is that photographic coverage of the Moon is now better than that of the Earth. The first three Orbiters concentrated on possible landing sites, with resolutions down to one metre in selected areas; subsequent Orbiters are more concerned with mapping the remainder of the surface.

Detail down to 50–100 m seems to be visible on the Apollo pictures so far available, roughly ten times better than ground based observations but not an improvement on the Orbiter results. Any advantage which the Apollo views have is in the availability of the original negatives, rather than at second-hand as was the case with the Orbiter series. This means that the Apollo pictures are likely to show finer gradations of shade. The colour photographs which have now been brought back may not add a great deal either. As a whole, the Moon seems as good an approximation to a grey body as can be found in the solar system. So much has been clear since the attempts at colour photography in the Surveyor programme by automatically inserting a sequence of colour filters in front of the lens of the television camera. An essentially colourless Moon was revealed by the reconstituted colour photograph.

ROCKETRY

Rocket for Apollo 8

Dr D. G. King-Hele writes:

As the sky darkened after sunset on the evening of December 21, 1968, hundreds of people in Britain saw a new object in the western sky, a very bright glow about 1° in diameter near the star Altair. It was a glowing cloud of ionized gas produced by the ejection of rocket propellants from the Saturn IVB rocket that had boosted Apollo 8 into its trajectory towards the Moon less than an hour before. The glow lasted from about 16 h 50 m UT, when the western sky was still light in southern England, until about 17 h 20 m, and at one time was reported to be nearly as bright as Venus. The approximate celestial coordinates were right ascension 19 h 40 m, declination +3°.

After an interval when no glow was visible, further propellants were vented from the rocket, and a new fan-shaped cloud was seen telescopically at 17 h 48 m: this glow was afterwards visible to the naked eye for an hour, about magnitude zero at its brightest. For much of this time the glow remained in the shape of a fan, or the stem of a wine-glass, with the apex, or stem, towards the right. Less than ½° to the right of the apex a small circular glow was visible, about magnitude four at brightest. As seen from southern England the objects moved nearly in a straight line, from right ascension 20 h 16 m, declination +1·2°, at time 18 h 00 m, to right ascension 20 h 43 m, declination −0·9°, at time 19 h 00 m. During this interval the distance of Apollo 8 increased from about 50,000 to about 60,000 km.

A number of satellite observers took this opportunity to make their first observations of objects in deep space. At Cowbeech, Sussex, G. E. Taylor, using his 500 mm reflecting telescope, was able to observe the Saturn IVB rocket flashing to magnitude 9 every 6 s and the Apollo 8 very close to it (within one minute of arc) at magnitude 11 to 12. Although the main glow was caused by propellants ejected from the rocket, the small circular glow may have been created by ionized gas from control jets or waste material released from Apollo 8 itself.

Optical observations of space probes have been made before, and clouds of ionized gas were used as "marker-beacons" by Russian Luna space vehicles. But the