radar window is limited by the absorption by water and oxygen molecules in the Earth's atmosphere; 70 cm is in the centre of this window, and 3.8 cm is close to the edge. The 3.8 cm observations had a resolution of 2 km, and the 70 cm observations had an aerial resolution of 25 km^2, which is twenty times better than previous results. The results were obtained by Pettengill, Zisk and Catuna at the Haystack Observatory, Massachusetts Institute of Technology and by Thompson at the National Astronomy and Ionosphere Centre, Arecibo, Puerto Rico.

By comparing radar maps with Lunar Orbiter photographs of the same area three basic radar features can be distinguished. They are well defined, named craters, very small un-named craters and, finally, radar anomalies with no apparent optical counterpart. There seems to be an anomalously strong radar return from small craters, which is not necessarily correlated with their apparent size or optical albedo.

The authors conclude that the craters which give large echoes are young, with sharp contours and steep inner slopes. The rough inner surfaces are tilted steeply towards the Earth-based radar, leading to depolarisation of the returned signal. These craters also have excess rock populations caused by the excavation of large quantities of bedrock during formation and subsequent depositions around the crater in a strew field many kilometres across. Meteoric erosion slowly removes the hallow, grinds the rock into fine grain debris and produces a shallow subdued topography, thus reducing the echo strength to the average lunar value. Most of the enhanced echo craters are thought to be Copernican in age. It is concluded that spallation of rocks caused by impacts with sufficient energy to fracture centimetre sized and larger rocks, is a common lunar phenomenon.

One radar anomaly found in the Kepler region is thought to be formed by a large clod of material which was thrown out with the ray material when Kepler was formed. The 70 cm data, with the help of 'ground truth' observations at Apollo landing sites, has enabled the percentage roughness of the lunar surface to be calculated.

Not only are the youngest craters on the Moon strong radar scatterers; they also have enhanced eclipse temperatures (that is infrared anomalies—elevated temperatures which certain areas maintain during the umbral phase of an eclipse). Correlations between radar and infrared maps show that these 'hot spots' can be explained by the thermal behaviour of surface rocks, provided these are 10 cm or larger in size and are greater in number on the surface than at the Surveyor 1 and 3 landing sites.

Analysts celebrate

from T. S. West

THE celebrations of the centenary of the Society for Analytical Chemistry which were held from July 16 to 19, began with a special 'historical' meeting at the Royal Institution in London at which fraternal greetings from 30 kindred societies were presented—most of them from overseas. The scrolls and presentations are now on display for 6 months at the special exhibition "You and Your Analytical Chemist" at the Science Museum in South Kensington.

Sir Alan Hodgkin, president of the Royal Society, described the founding of the SAC on August 7, 1874 in the City Terminus Hotel, Cannon Street and traced the events that had been set in motion by the actions of Professor Theophilus Redwood and his group on that day. The society, which had formerly existed as The Society of Public Analysts (1874-1907), then as The Society of Public Analysts and Other Analytical Chemists (1907-1953), had a membership of 2,000 in 1972 when it had undertaken a joint role with the new amalgamated Chemical Society as the kernel of the Chemical Society's Analytical Division with a membership, in 1974, of 5,000.

Dr G. W. C. Milner, the centennial president of the SAC, highlighted some of the events of the past hundred years and looked forward to the future. The society, with only 2,000 members in its hundredth year obviously stood at the crossroads and was faced with a decision to continue, as before, independently or to amalgamate fully with three other British sister chemical societies (the former Chemical Society, The Faraday Society and the Royal Institute of Chemistry) and become the Analytical Division of the (new) Chemical Society. The presence of more than 3,000 additional 'first choice' members in the Analytical Division of the Chemical Society had influenced the council's decision to recommend full unification to the members at a referendum to be held later this year.

Nitrogen aggregates in diamond

from John Walker

IT has been known for many years that some diamonds contain precipitates ('platelets') on (100) crystal planes which give rise to anomalous features ('spikes') in Laue X-ray photographs. When Kaiser and Bond (*Phys. Rev.*, **115**, 857; 1959) found by mass spectrometry that these diamonds also contained large quantities of nitrogen impurity, it was natural to assume that it was contained in the platelets. Shortly afterwards, in 1962, the platelets were observed in transmission electron microscopy. Everything fitted and everybody was happy.

Six years later Sobolev *et al.* (*Sov. Phys. Doklady*, **12**, 665; 1968) upset the applecart by discovering that the X-ray spikes did not correlate with the total nitrogen content of diamonds, which meant that the platelets contained little if any nitrogen. This raises two questions. Of what are the platelets made and where is the nitrogen? The first question was and is still open, but the second could be partially answered. Electron microscopy can detect features only a few Ångstroms in diameter, and since none had been observed the nitrogen aggregates must be very small—effectively point defects. This deduction has now been confirmed by Turk and Klemens (*Phys. Rev. B*, **9**, 4422; 1974) using thermal conductivity.

Any imperfections in a crystal scatter the phonons (lattice vibrations) and decrease its thermal conductivity. The amount of scattering depends on how big the scattering centres are relative to the phonon wavelength, and since that changes with temperature, so does the scattering. Hence the variation of thermal conductivity with temperature contains information on the size and concentration of defects in a crystal. What Turk and Klemens have done is to calculate the scattering effect of platelets and point defects, and fit their results to the experimental thermal conductivity data of other workers. They deduce for one diamond that only 3% of the nitrogen it contains is in platelets: the rest is in small clusters of eight nitrogen atoms. They have therefore confirmed the conclusions of Sobolev *et al.* using a totally different technique, and the eight-atom cluster would probably be too small to see in the electron microscope, as was expected.

One would now hope that Turk and Klemens could extend their work to many more specimens: for example infrared and visible spectroscopy suggests that there are not one but at least three types of small nitrogen cluster (the so-called N3, A and B defects) in some diamonds. It would be interesting to see if they could be distinguished and their sizes measured.