

it is expected that the laboratory will be fully equipped by the end of April. The X-ray apparatus will contain several novel features. In addition, a number of ancillary researches are being initiated, including the microscopical examination of woods used for panels: it is hoped that this inquiry will produce valuable data for making the description of works in future editions of the catalogue more exact, as well as being a help in the question of attribution.

Large Sunspot Group

A MODERATELY large sunspot group which formed on February 5 has attracted, for its size, an undue amount of notice in the daily Press. The group occupies about 800 millionths of the sun's hemisphere, and a spot of these dimensions will be no uncommon occurrence during the next six or seven years, as the sunspot cycle passes through its maximum in 1938. Actually, a larger group, occupying 1000 millionths of the sun's hemisphere, has already appeared since the last minimum in 1933. This group had its central meridian passage on April 21⁹, 1934 (see the *Observatory* for February 1935, where an account of 1934 sunspot activities will be found). The present spot is, however, not without interest. No spot was detected on a photograph exposed at Greenwich on February 5 at 10^h, but at 11^h a spectroscopic disturbance was seen in the spectrohelioscope, which seems to have been the genesis of the actual spot. On account of cloud, no photoheliogram was taken on February 6, and the spot appeared fully developed on February 7. The spot's latitude is 14° S., and it was born west of the central meridian. Its central meridian passage—if it survives—will take place on March 14 next. The spot is of such a size that it could just be seen by the naked eye if it was on the central meridian. Near the limb, where the spot appears foreshortened, a spot of this size would be invisible. It is interesting to note that the number of naked eye sunspots per annum follows the ordinary sunspot curve very closely, and that the 11-year cycle could well have been discovered by an observer provided only with a smoked glass—and a good climate.

Natural and Artificial Clouds

IN his Friday evening discourse at the Royal Institution on February 8, Sir Gilbert Walker discussed natural and artificial clouds. Apart from cumulus clouds of various types, the causes of the geometrical patterns that are to be seen in the sky must be sought in the behaviour of layers of fluid which are made unstable either by heating them from below or cooling them from above. It has been known for fifteen years that a stationary liquid when unstable develops a polygonal pattern, and that an unstable liquid flowing down a trough forms pairs of vortices rotating in opposite directions, with their axes parallel to the direction of flow, or of shear. Sir Gilbert's pupils have carried these investigations further, and A. Graham used a wind tunnel formed with a heated iron plate as lower surface; its upper surface was a cool glass strip

8 ft. long and 9 in. wide, a third of an inch above the iron plate. When pulled by a motor, this gave variable rates of shear in the air. The former explanation of clouds occurring in long rolls or in a rectangular pattern as caused by Helmholtz waves was shown to be unsatisfactory; and it was verified that while a rapid shear due to motion exceeding one inch a second produces longitudinal cells, one less than a fifth of that rate leads to transverse cells, and an intermediate rate to a rectangular pattern. Various types of longitudinal clouds were discussed, and Sir Gilbert withdrew his former explanation of spirals in these clouds as due to stream lines, showing that there are normally two equidistant spirals like those in a twistdrill, and that these appear to be the two component vortices intertwined. Photographs of clouds were used to demonstrate the formation of a number of patterns of clouds at different heights; and an account was given of the explanation suggested by A. Graham of the paradox that, in the laboratory, liquid rises in the axis of a cell while in air there is descent there. Attention was also directed to the existence of clouds due to instability or the sun; and to the use of clouds of longitudinal and rectangular patterns for long-distance gliding under the name of 'cloud-streets'.

Structure of the Universe

SPEAKING to the Durham University Philosophical Society on February 1 at Armstrong College, Newcastle-upon-Tyne, Dr. Herbert Dingle, assistant professor of astrophysics at the Imperial College of Science and Technology, gave a historical account of the development of our ideas of the structure of the universe. Defining the 'universe' as the whole of physical existence, he pointed out that this apparently general subject demands a treatment which is in many respects unique. The idea of infinity became general with the Renaissance, and this seemed to place the conception of the whole universe beyond the power of the finite mind, until Newton restored the possibility with his implicit concept of universal law which was everywhere applicable. There have been two criticisms of this; a valid objection, that this extension of locally derived law may be incorrect; and an invalid one, based on our imperfect knowledge of atomic processes, which ignores the fact that the laws of a whole can be arrived at without combining the laws of elementary parts. Towards the end of last century, it was argued that the Newtonian law of gravitation was inconsistent with an infinite extension of uniformly distributed matter, of however low a density. Relativity theory, however, made such homogeneity acceptable. The Einstein, de Sitter and expanding universes are widely known nowadays, but Dr. Dingle made it clear that there is nothing esoteric about such theories, and that their underlying principles might have been expected from recent observations even if they had not been discovered when they were. It was stated also that there is no objection to belief in an infinite space, if one is willing to admit that in Einstein's space-time it may be quite beyond physical exploration.