British National Hydrogen Bubble Chamber

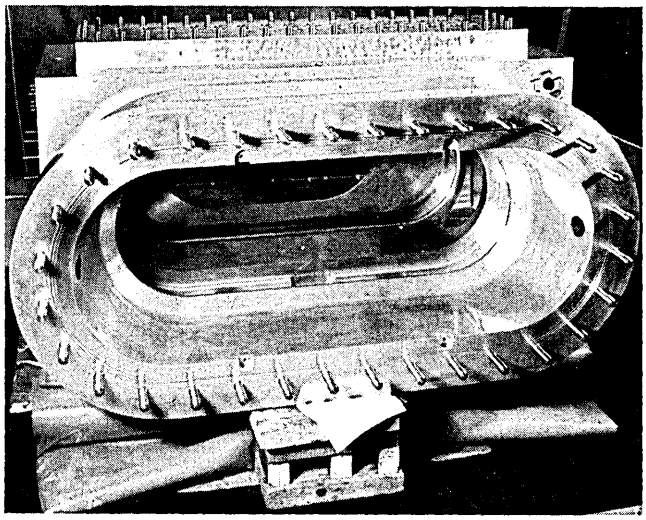

photo AERE, Harwell

The chamber body of the British national hydrogen bubble chamber with the window retaining flanges attached. These items were made from a single forging of an aluminum alloy containing 3% magnesium and weighing 13½ tons. The chamber top plate can also be seen.

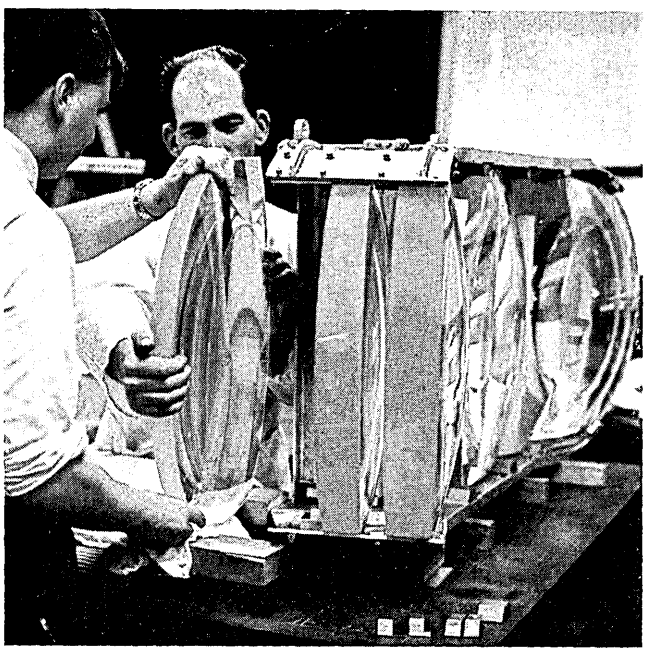

photo AERE, Harwell

The assembly of three triplet condensers for dark-ground illumination of the British national hydrogen bubble chamber.

photo AERE, Harwell

The magnet yoke of the British national hydrogen bubble chamber during assembly. This is made from a low carbon steel and as indicated weighs 240 tons.

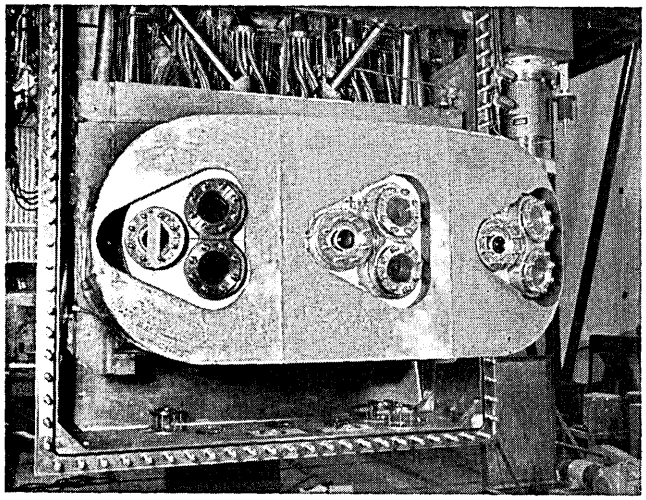

photo AERE, Harwell

The British national hydrogen bubble chamber with thermal radiation shield in position. This shield, which is cooled by pumping liquid nitrogen (temperature 78°K) around pipes attached to it, is fabricated from stainless steel sheets electroplated with copper to reduce the emissivity.

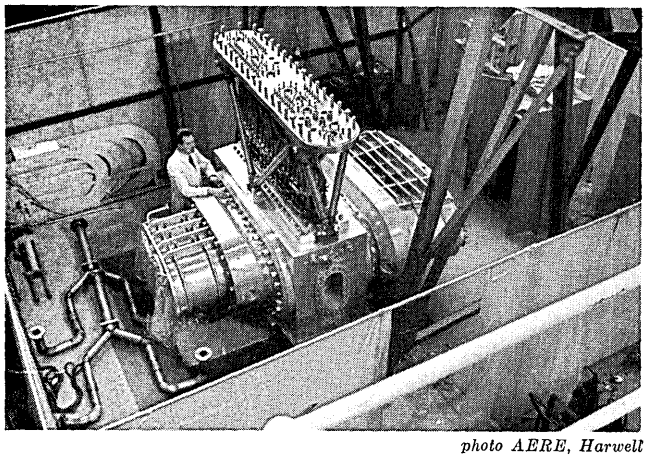

photo AERE, Harwell

View of the assembled British national hydrogen bubble chamber. The forty-eight pipes of the expansion system, the chamber suspension, and the top plate of the vacuum tank, through which all pipelines and electrical services are taken, can be seen.

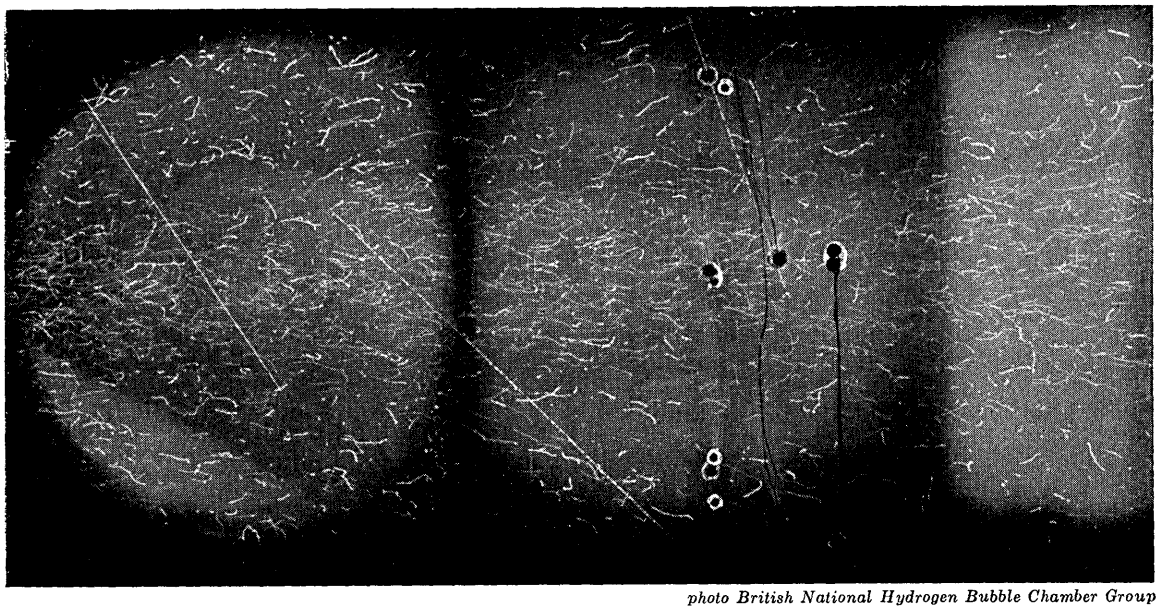

photo British National Hydrogen Bubble Chamber Group

A photograph taken during the test run of the British national hydrogen bubble chamber in January 1963. The liquid hydrogen was made sensitive to charged particles at 26.8°K by lowering the pressure by about 3 atm. The short tracks are low-energy electrons produced by a pulsed beam of γ rays originating from a Co^{60} source. The longer straight tracks were produced by cosmic rays (probably muons). The black disks and wires are copper-constantan thermocouples used to measure the temperatures of the windows during cooldown. Heavy background is due to chalk dust on optics collected during vacuum leak testing and to air frost due to failure of differential pump in H_2 shield.

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reader in interpreting the planetary images. Most of the Mars photographs are from the Lowell Observatory collection, but a number of very good photographs from other observatories are included as well.

Finally, a map of the planet is included inside the back cover so that it can be unfolded and viewed directly beside each plate in order to identify named features.

The plates are the real heart of the book. They show in detail the regular seasonal changes, blue and yellow clouds, and both short- and long-term alterations in the surface markings. All the major phenomena of the Martian surface and atmosphere are illustrated distinctly and described clearly. Here we have a permanent record of great value, showing the principal periodic, sporadic, and secular changes that take place on Mars. It is truly a photographic history of the planet, and deserves the careful scrutiny of every serious planetary worker.

Several of the plates deserve special comment. Plates VII, VIII, and XXXV show the remarkable changes in the northern hemisphere between longitudes of 220° and 280° over the past sixty years. This area has changed so strongly that one wonders whether any surface feature is truly permanent. Plates X, XI, and XVI show an almost clocklike regularity in the seasonal changes at different oppositions. A series of six plates, beginning with number XXVIII, displays the complexity of the "blue clearing" phenomenon.

Plates XXXVII and XXXVIII compare several visual observers' drawings with photographs taken at or near the same time, and expose the unreliability of visual observations. Slipher says that "The visual observations have been of great help in the representation of the fine structure, such as sharpness, width and regularity of boundary lines or canals. On the other hand many markings are quite satisfactorily shown by the photographs which were not noticed in the visual observations . . . Whatever visual observations disclose concerning existence or nonexistence of the more difficult canals and oases is obviously of little value." (pp. 142–144). Considering the gross distortion of easily photographed features in the drawings—which show a strong tendency to simplify the complexity of the surface, and to straighten or smooth out irregularities—one wonders whether any weight at all should be given to visual descriptions of still finer and more difficult detail.

Plate XLVII is an actual photographic print, entitled "Photo Evidence of Lines (Canals) on Mars". The smallest resolvable spots on the photographs are about 3 degrees in diameter, while the "canals" on Slipher's map are about 1° wide. Thus, while one can see from the photographs that "something is there" where Slipher draws his major canals, the photographs do not disprove the idea that the "canals" can be resolved into a series of disconnected spots, and are not truly line-like in character: the necessary information (i.e., the high-frequency Fourier components of the brightness distribution) is missing. (At the best oppositions, 1° on Mars corresponds to 0.2 sec of arc, which is about at the diffraction limit of a 50-cm aperture.) It appears that the canal controversy is still undecided on the basis of impersonal observations, but the problem now concerns the detailed nature of these markings rather than their existence.

There are a fair number of misprints, but most are no more serious than the frequent substitution of "Lucus" for "Lacus". Two important errors are the reference to Plate VI instead of VIII in the text accompanying Plate XXI, and the apparent omission of "not" from the end of line 26, p. 162. But such errors do not diminish the importance of this definitive summary of the photographic study of Mars. The reader may disagree with the author's conclusions, but he will find that the pictures speak for themselves, and that a careful study of the photographs is more instructive than any text could be.

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