

and give valuable information about nuclear level structure and beta-decay systematics.

The session was chaired by Paul Lorrain (president, Canadian Association of Physicists). The chairman and two of the speakers made some of their introductory remarks in French, adding a bilingual touch to a Canadian session held in Montreal.

R. E. BELL, *Program Chairman*

### American Astronautical Society (B1)

Six papers of the program (29 December 1964) evoked a lively discussion and question period. Four were by men engaged in some of the most vital of the current space programs and two by men working in important earth satellite programs.

As we prepare for deeper penetration of space the environments of the moon and planets are scrutinized as never before. The opening paper described these environments, as revealed by the best available and most pertinent scientific information, from the point of view of the planning and design of missions to the moon and planets. With the likelihood that we shall see the first men on the moon by 1970, the focus of attention is beginning to shift to Mars. The Douglas Aircraft Company has examined the various factors influencing the vehicle requirements for a manned mission in the 1975-85 period. Spacecraft of minimum weight in earth orbit could be launched at suitable times during this decade, and long-duration missions of 800 to 1000 days would result. Missions in the early 1980's may last as long as 360 to 600 days but would be at some disadvantage because of the concomitant increased solar activity.

Both layman and expert must marvel at the precision of calculation and the sophistication of accomplishment by which the trajectory of a spacecraft bound for a distant planet can be corrected, shortly after launch, to ensure a perfect rendezvous. A contribution by the Jet Propulsion Laboratory expounded the mathematical theory of optimal control and estimation by which such corrections to the trajectory are calculated. A second paper from JPL explored the merits of a combination of gas-chromatography and mass-spectrometry in the detection and identification of life-related compounds on other planets, with mini-

mum speculation about the "life" itself.

The Alouette, designed and built in Canada and launched by NASA in September 1962, is still monitoring electron density and cosmic ray particle concentrations in the upper ionosphere. Two more satellites are planned to extend this international cooperation. The first will use the spare flight model of Alouette I, modified to overcome known deficiencies; the second, ISIS-A, will be completely new. The experiments to be conducted and the instrumentation to do them were described and explained. Canada is also cooperating with the United States in the construction and operation of a communication satellite system. A ground station is under construction in Nova Scotia for experiments with communication satellites launched by the United States and also for the accommodation of the first COMSAT Corporation satellite due for launching in March 1965. The design compromises and construction difficulties were graphically described in a talk by the project engineer in the Canadian Department of Transport.

John Green (Litton Systems, Canada, Limited) was general chairman and presided over the morning session. Edward van Driest was program chairman and presided over the afternoon session.

The papers presented at this meeting, sponsored by the American Astronautical Society, the NASA Office of Space Science and Applications, and the American Physiological Society will be published as volume 2 of the AAS Science and Technology Series under the title *Towards Deeper Space Penetration*.

JOHN J. GREEN, *General Chairman*

### American Meteorological Society (B2)

The American Meteorological Society (B2) and the Royal Meteorological Society Canadian Branch (B6) held jointly a program (29 December 1964) which consisted of invited papers in meteorology. The AAAS Physics Section (B) was a cosponsor. The program was arranged by Walter F. Hitschfeld (McGill), who also presided.

Three fundamental aspects of the atmosphere and their relationship to each other were reviewed. R. M. Goody (Harvard) asserted that almost all the theoretical problems of radia-

tive transfer in the atmosphere have been solved, and the solutions are ready to be applied with renewed rigor to dynamic problems. He illustrated this by applying radiation theory in three instances: Rayleigh convection, turbulent heat transfer, and the 26-month oscillation. Results in these cases were significant and revealing.

J. S. Marshall (McGill) in discussing the McGill weather radar system illustrated how we may hope—with new methods of radar presentation—to incorporate radar observations into real-time forecasting and into the fundamental problem of the interaction of cloud-thermodynamic processes with dynamic processes on the synoptic scale. Radar can, for instance, record in real time the distribution of water substance with height in the atmosphere, averaged over the entire area covered (say 100,000 miles square). Such information presumably can be used to deduce the transport of energy by convection and latent heat to specific heights in the atmosphere.

Both of the previous contributions (energy transfer by radiation and convection/latent heat) were seen by Philip D. Thompson (NCAR) to be vitally helpful in the most serious problems in the present program of numerical weather prediction. The third major difficulty to adequate numerical modelling of the atmosphere—the lack of data—is being attacked with measuring equipment which will be installed on constant-level balloons. Orbiting satellites will interrogate the balloons about temperature and pressure, and transmit the data as a whole to central receiving stations.

The symposium thus closed on a happy note. By accident or by design, the most formidable obstacles to the construction of good numerical models of the atmosphere are under active consideration, or solutions are even now available for adaptation to such models.

P. E. MERILEES, *McGill University*

### Canadian Aeronautics and Space Institute (B3)

Two sessions on upper atmospheric physics were sponsored by the Canadian Aeronautics and Space Institute (B3). These sessions were organized by the Aeronautics Section of the Institute, and were held on 30 December 1964.

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## American Astronautical Society (B1)

John J. Green

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