

IV. JOINT DISCUSSION ON TURBULENCE IN STELLAR ATMOSPHERES

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INTRODUCTION

By Prof. M. G. J. MINNAERT, *Chairman*

During the meeting of the I.A.U. at Rome in 1952, three astrophysicists conceived the project of a joint discussion on turbulence in stellar atmospheres. These three, Messrs DE JAGER, PECKER and THOMAS, submitted their plan to Dr Chalonge, Dr Greenstein and myself; each of the initiators suggested a tentative programme. The plan was approved by the Executive Committee, and at the proposition of Dr Greenstein, an organizing committee was appointed, consisting of Dr Schwarzschild (*chairman*), Dr Cowling, Dr Unsöld and myself. From then on, Dr Schwarzschild took the lead, keeping in touch with all of the others but taking care to come to practical decisions. There were quite a lot of difficulties before this little programme was settled; among others, it was really bad luck when Dr Cowling became ill and when we understood that his further co-operation in the active sense would be impossible. But finally the speakers were found, things were arranged; several commissions expressed their interest in the subject and gave their members the opportunity to attend this discussion. Schwarzschild had managed to have me appointed as the chairman of this meeting and he himself took care of assembling the reports of the speakers and the discussion. Dr Pecker acted as a secretary.

One of the highlights of the Dublin meeting has been the presentation of some sections of the solar spectrum, photographed at the McMath Observatory by the joint work of Doctors McMath, Mohler and Pierce. Two of these records are reproduced here, as a striking introduction and illustration to this Joint Discussion on stellar turbulence.

I. MOTIONS IN THE SOLAR ATMOSPHERE

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In this review we confine ourselves to the description of motions in the 'normal' undisturbed parts of the solar atmosphere, excluding the corona and the spots, faculae, flares, surges and prominences.

I. GRANULATION

The most conspicuous feature in photospheric aerodynamics is the granulation. According to the best observations it seems to consist of bright, more or less roundish blotches, surrounded by dark matter. It seems that the description of the granulae as a complex of bright and dark mottles, about equivalent in sizes and areas, cannot be maintained against the best observations, according to which the bright elements seem to be the fundamental ones. Thiessen (1955), observing visually with a 60 cm. refractor and using the full aperture, notes even their polygonal forms, which observation, together with the measured upward and downward motions, may support the idea that the granules are convective elements in the solar photosphere. One of the crucial points in the modern granulation observations is the problem of the true sizes and brightness fluctuations of the granules. This problem will first be discussed.

Sizes of granules

Janssen's classical observations (1896) indicate mean granule diameters between 0".5 and 1".5. On his photographs there are also bigger elements, but it seems that these are generally complexes of smaller ones. Most previous and modern observations confirm these results: Hansky (1905) notes a diameter of 1"; Chevalier (1912) and Keenan (1938, 1939) measure mean diameters of 1".5. More recently Macris (1953), reducing