

Reply

Dear Sir,

We thank Dr Birstein for his discussion of our study which was done when we were at Sendai. We studied the nature and origin of condensation nuclei and concluded that the greater part of cloud and fog nuclei are composed of both hygroscopic and non-hygroscopic substances which originate in combustion and that sea-spray was not a significant source of condensation nuclei. It was also shown that the greater part of the hygroscopic substances contained in the nuclei were not pure sulphuric acid.

Dr Birstein asked us some questions mainly on the techniques of electron microphotographing. We should like to make the following statements:

A. It is clear that in order to obtain any quantitative results, for instance regarding the size distribution of nuclei, the number of droplets which were observed by us was too small. We only studied the nature and origin of the nuclei in which case our samples may be of interest.

B. In fig. (13) filmy substances are observed as if they flew out from the upper part of the large, well-defined dark particle, though it is not so distinct in the reproduction owing to the contraction of the photograph.

However the change in fig. (11) appears due to the poorly focussed electron microscope as Dr Birstein states. In the other figures, namely (2), (4), and (6), such changes are not perceptible. Therefore the original statement should be revised as follows. "Most nuclei retained their original form after wetting, in some nuclei which retained their hygroscopic nature, however, the filmy substance changed its form."

C. Only one cloud sample was obtained in which no nuclei were found neither by the optical nor by the electron microscope. We do not know what kind of nucleus the droplet contained. It may be such a small volatile particle that it has evaporated perfectly by the electron bombardment.

From the theory and the current opinion on condensation, however, it is unreasonable to consider that most nuclei are too small to be detected in the electron microscope.

D. Before we made our observations we had the same opinion as Dr Birstein. However, observations yielded a different result. Through observation of a fuming sulphuric acid droplet by electron microscope we found that the droplet did not change when the intensity of bombardment was about the same as when microphotographing the nuclei. When the intensity became strong or when the time of bombardment was long enough, the droplet evaporated and left a honey-comb-formed image on the collodion film.

E. In the previous paper we only inferred the change of hygroscopicity but not the change of transparency of sea-salt.

We think that Dr Birstein's finding with regard to E is a very interesting and important contribution to our knowledge of nuclei in the atmosphere.

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