nautical Research Committee to obtain facilities for full-scale experiment on R31, R32, and R33 had failed. He urged as a partial atonement for the sacrifice of the lives of brave men that the remnants of the airship fleet should be devoted to correcting, by full-scale experiments, the knowledge given by model experiments.

The situation with regard to aeroplanes was also said to be unsatisfactory. Prof. L. Bairstow pointed to the prevalence of accidents in aviation, the risks of flying being so great that life insurance companies are not prepared to cover them in a standard policy. This abnormal rate was attributed in part to a number of defects not needing more knowledge for their remedy. The failure of rubber joints in petrol pipes and the breakage of ignition cables were given as instances of easily remediable defects. The danger of such imperfections comes from the necessity for landing at once, when the engine ceases to turn, in country which is often unsuitable. So soon as an aeroplane can take the air it leaves the designer for the user, and its minor defects have not then developed. New design might be encouraged by placing responsibility for such matters on the designer, and not on an Air Ministry staff.

Other causes of failure in flight were said to need more knowledge before they could be removed. All aeroplanes are tricky at low speeds, and it does not accord wholly with fact to attribute an accident to "bad piloting causing the aeroplane to lose flying speed near the ground." Important research work is here called for, the conduct of which may be hindered by an unsuitable organisation as much as by lack of funds. It is reported that the Secretary of State for Air has the matter of the reorganisation of the Air Ministry under review, and has afforded the council of the Royal Aeronautical Society an opportunity for expressing the scientific and technical view of essential requirements for the carrying on of research. It is encouraging to note that Lord Gorell told the Air Conference that "success in the air, whether Service or civil, must depend primarily upon constant scientific research," and that the report of the Geddes Economy Committee, whilst asking for a reduction on the vote for experiment and research, accepts that view.

If research and care in design can reduce the accidents now occurring to one-third of their present amount—a very moderate estimate of early possibilities—the saving of money on flying risks, replacement of aircraft, etc., will very greatly exceed the cost incurred. The position is unusual in the fact that the effects of research on the final product are so clearly seen; such a state is largely due to the infancy of the science, but an important additional element arises from the unparalleled degree of freedom of the motion of aircraft as compared with that of other vehicles.

The Grain of the Photographic Plate.

THE unit of the photographic plate is the single grain of silver salt as it exists in the sensitive film. It is natural, therefore, that after many years and much labour had been devoted to the properties of sensitive films as films, attention should be turned to the unit. A great deal of work has already been done in this direction, but many problems, some of which seem to be of an elementary character, remain to be solved.

On Tuesday, February 14, Prof. The Svedberg, of Upsala, communicated to the Royal Photographic Society two papers containing important results that he has obtained. It is customary in such investigations to dilute the emulsion and so produce a film that contains only a single layer of grains. The characters of the grains are registered by photomicrography, using apochromatic objectives of the maximum practical aperture. As the photography of the grains before treatment must not affect their sensitiveness, Prof. Svedberg used a very deep red light and Ilford special rapid panchromatic plates. After exposure and development the plate may be photographed again, then either the metallic silver produced or the unaffected grains may be dissolved away, as desired, to facilitate the examination of the remainder.

Evidence in favour of the view that the halide grain is either wholly reducible (developable) or not reducible at all is accumulating, and this Prof. Svedberg finds definitely to be the case. By dissolving away the silver grains nothing whatever was left of them, except to the extent of about 1 per cent. of the thousand or so grains observed, which showed traces of incomplete reduction (development).

This independency of the grains is further proved by the unchanged appearance of the undeveloped grains and their unchanged sizes as measured. This holds even when the film is partly solarised by a strong light, when the grains are separated by only 1μ, and whether ferrous oxalate or metol-hydroquinone developer is employed. The author intends to try other conditions to see if, as appears to be the case, these results are general, and that feeding of the reduced silver grains at the expense of the undevelopable grains does not, in fact, take place.

In Prof. Svedberg's second communication he suggests that the larger and the smaller grains in one and the same emulsion are equally sensitive and "are built up of the same kind of light-sensitive material—just as if they were fragments of different sizes from one homogeneous silver bromide crystal." He assumes that by exposure (light action) "developable centres" are produced, and shows experimentally that the distribution of these "centres" takes place according to the laws of chance, so that there is no need to assume a superior sensitiveness of those grains that are made developable. The author is to be congratulated on using the term "centre," which expresses all that is known and is non-committal, rather than "nucleus." Nuclei have been shown to serve, but the crystallisation of sugar on strings is not evidence of the presence of strings wherever sugar crystallises. This by the way.

The present writer in 1911 (Journ. Roy. Phot. Soc., p. 159) showed that by stopping development at a very early stage it was possible to get particles of silver too small to be visible microscopically. They were shown to be present by the colour imparted to the film, and were further demonstrated and measured by adding mercury to them in known and progressive proportions and measuring the enlarged particles. Prof. Svedberg by stopping development at a little later stage gets particles that are just definitely visible microscopically, and shows photographically the relation of these to the original grains of silver haloid. He thus demonstrates that "centres of development" are produced by exposure. A single developable grain may contain one or more (so far up to four) of these "centres." He treats also of other matters, such as the effect of Röntgen rays when used instead of ordinary light

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