VIII. "The Thermal Expansion of Pure Nickel and Cobalt." By A. E. TUTTON, B.Sc. Communicated by Professor TILDEN, F.R.S.

The Society adjourned over Ascension Day to Thursday, May 18.

"Impact with a Liquid Surface, studied by the aid of Instantaneous Photography. Paper II." By A. M. WORTHINGTON, M.A., F.R.S., and R. S. COLE, M.A. Received March 21,—Read May 4, 1899.

(Abstract.)

This paper is a continuation of a paper under a similar title, published in the 'Philosophical Transactions,' A, vol. 189, 1897.

It was there shown that between the splash of a rough and that of a polished sphere falling the same distance into water, there is a remarkable difference from the first moment of contact. The causes of this difference are now investigated.

The configuration of the water surface below the general level, when a rough sphere enters, is first studied by instantaneous photography, and the origin is traced of the bubble that follows in the wake of the sphere and of the emergent jet which follows its disappearance. The depression or crater formed round the entering sphere is surprisingly deep. This cavity segments, the lower part following as a bubble in the wake of the sphere, while the upper part fills up by the influx of surrounding water, which gathers velocity as it converges towards the axis of the disturbance, and so produces the upward spurt of the jet.

Experiments are described in which some idea of the actual displacements in the liquid has been obtained by letting the sphere descend between two vertical slowly ascending streams of minute bubbles liberated by electrolysis from two pointed electrodes.

It is found that with a gradual increase in the height of fall of a well-polished sphere, the splash changes in character, and that the sphere soon begins to take down air. But the height at which this is first noticeable is largely dependent on minute differences in the condition of the surface, and even on its temperature. It was further found that dropping a smooth sphere through a flame, under certain conditions, invariably alters entirely the course of the splash. This action of the flame is proved to be no action of electrical discharge, and reasons are given for attributing it to the burning off of fine dust which has collected on the surface during the fall.

The influence of dust was proved by dusting one side only of a polished sphere, a proceeding which always results in completely changing the character of the splash on the dusted side.

A satisfactory general explanation of all the phenomena is found in the view that with a smooth sphere, cohesion is operative in guiding the advancing edge of the liquid sheath which rises over and closely envelops the sphere. If the surface is not rigid (*e.g.*, is dusty), or is rough, then the momentum of the sheath carries it, once for all, away from the surface of the sphere, and the subsequent motion is quite different. The persistence of the remarkable radial ribs or flutings observable in the film that ensheathes a smooth entering sphere is completely explained by the assumption of a viscous drag spreading from the surface of the sphere outwards, and these flutings are always absent from any part of the sheath that has left the sphere. Their presence is an indication that there is no finite slip at the solid surface.

Experiments made with water mixed with glycerine show that, up to a certain point, the character of the disturbance is but slightly affected by large changes in viscosity. With pure glycerine, however, a thin film of water absorbed from the atmosphere equivalent to a layer $\frac{1}{20}$ mm. thick, was found completely to change the course of a splash, a striking proof of the importance of the initial motion in determining that which is to follow.

Experiments conducted *in vacuo* prove that the presence of the air has no noticeable influence on the early course of a splash, but that its pressure subsequently prevents cavitation of the liquid under what would otherwise be negative pressures.

The paper concludes with a reference to the remarkable similarity between the splash at the surface of a liquid and that caused at the surface of a hard-steel armour-plate by the impact of a projectile, and with the suggestion that the explanation may be found in the argument of Poynting,* which demands an increase of molecular mobility with increase of pressure.

"An Observation on Inheritance in Parthenogenesis." By ERNEST WARREN, D.Sc., University College, London. Communicated by Professor W. F. R. WELDON, F.R.S. Received March 22, —Read May 4, 1899.

On certain theoretical grounds it has been supposed by Weismann that offspring produced by parthenogenesis exhibit little or no variability. To determine how far this conclusion was warranted by fact, some measurements were made on *Daphnia magna* (Straus).†

* Poynting, "Change of State, Solid-Liquid," 'Phil. Mag.,' July, 1881; see also two very important papers by Tresca on the "Flow of Solids," 'Proceedings of Institution of Mechanical Engineers,' June, 1867, and June, 1878.

† The measurements were made under the microscope with Zeiss's screw-micrometer.