to whom I have shown several similar photographs, confirms the foregoing explanation. The photograph was taken at 5000 diameters by means of the super-microscope. F. ROGERS.

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"Bitumen" in Meteorites.

THE statement that is currently repeated as to the existence of bitumen in meteorites does not bear examination. It is based on a number of investigations that were made between 1834 and 1885 on the alcohol- and ether-soluble material obtained by extracting meteoric matter, but no recent work appears to have been done to throw further light on the subject. The weights of the samples examined were so small that quantitative analyses are not very convincing, but an undoubted uniformity of results can be traced.

There has been obtained a hydrocarbon (possibly containing sulphur and oxygen), melting about 114° or 120° C., accompanied by free sulphur and graphite —and this is the material, present in an extra-terrestrial body, that is quoted to-day as evidence for the inorganic origin of terrestrial petroleum.

The suggestion now made is, that the presence of the hydrocarbon is due to the action of water on carbide after the arrival of the meteorite on the earth. The evidence for this is the following :

1. Iron-nickel carbide is found in meteorites.
2. Water poured on to powdered meteorite causes the production of " an alliaceous odour."
3. Phosphide is also present.
4. The water that is usually found in meteorites is considered by authorities not to be original, but to have been taken up at some subsequent time.
5. Soluble carbon compounds have been stated to be completely removed by solvents without preliminary pulverisation of the meteorite sample; that is, they exist in cracks and pores which are just the positions into which water could percolate.
6. Solid hydrocarbons are formed by the action of water on carbides of metals of high valency. These carbides are actually present though in small quantities and not often ; these hydrocarbons are also present in small quantities and not often.

This explanation, if correct, dissipates the present contradictory evidence of the presence of, on one hand :

(*a*) graphite, suggesting crystallisation from an iron magma ;

(*b*) carbide and phosphide, suggesting high temperatures of formation ;

(*c*) an outer skin, indicating the attainment of a high temperature on reaching the earth's atmosphere ; and, on the other hand,

(*d*) of a hydrocarbon of low melting point, absolutely precluding the possibility of a high temperature after its formation. PERCY EDWIN SPIELMANN.

The Athenæum,
Pall Mall, S.W.1, August 6.

Comparison of Wave-lengths with a Fabry and Perot Étalon.

IN the issue of NATURE for June 28, p. 926, Prof. Robertson, discussing the ' Comparison of Wave-lengths with a Fabry and Perot Etalon," points out that for determining fractional orders of interference it is sufficient to measure only the linear diameters of the interference rings. This practice has been used extensively at Mount Wilson Observatory for ten years. It was described in Mount Wilson Contributions, No. 137, *Astrophysical Journal*, 46, 138, 1917, and No. 202, *Astrophysical Journal*, 53, 42, 1921, where full details will be found. It was shown that the method offers marked advantages, such as (1) reduction of labour, (2) smaller probable errors, (3) convenient numerical checks which diminish the chances of mistakes in computation.

It is unfortunate that, on account of the form in which Prof. Robertson expresses the idea of the method, he has committed, inadvertently no doubt, the error of deriving six values of the fractional order from only four observations, and in consequence he finds an incorrect result with too small a probable error.

It seems to me preferable to write the fundamental equation in the form

$$\alpha = 1 - n + cd_n^2$$

where α is the fractional order, n is the number of the ring of diameter d_n, counting the innermost as the first, and c is a constant for all the rings of a given line, depending on the integral order of interference, the focal length of the projector, and the magnification in the spectrograph. It is evident that the two unknown quantities α and c may be evaluated if at least two diameters are measured, and that if q diameters are measured only $q - 1$ independent values of α may be found.

In the practical use of the method for extended investigations, the constant c is derived from a combination of the measurements on many lines, and it becomes legitimate to obtain q independent values of α from q diameters measured on a given line.

HAROLD D. BABCOCK.

Mount Wilson Observatory,
Pasadena, California,
July 23.

A Substitute for the McLeod Gauge.

THE results of our experiments do not confirm Mr. Fleuss's statements (NATURE, July 5, p. 12). Even if the water vapour is always at a pressure less than its equilibrium vapour pressure at room temperature, the McLeod gauge reads low and usually inconsistently. The reason is, of course, to be found in the absorption of water by glass. Water vapour will condense on glass when its pressure is raised, even when the final pressure is no greater than 0·001 mm. ; the amount that condenses increases with the time, so that the reading of the gauge depends on the rate at which the mercury is raised. All this is quite familiar to those who work with modern high vacuum apparatus ; but Mr. Fleuss's statements, if unchallenged, might mislead some who are only beginning to acquire their experience.

NORMAN R. CAMPBELL.
JOHN W. RYDE.
BERNARD P. DUDDING.

Research Laboratories of the General
Electric Company, Ltd., Wembley,
July 28.

Life History of the Pearl Mussel.

DOES any one know what happens to the pearl mussel (*Margaritana margaritifera*) between the glochidium falling off the trout, etc., and the big adult mussel ? No one seems to have seen young individuals, and the ordinary specimens which are found are never less than about 3 inches long and must be several years old. I have lately had another vain hunt for young ones in the Herefordshire Wye, so far as it is accessible by paddling ; presumably they live somewhere in deep water, and not in the shallows where the adults are. The revival of the pearl fishing in recent years may have led some one to work out the life history : its investigation might be a grateful occupation for summer holidays. A. E. BOYCOTT.

17 Loom Lane, Radlett,
July 31.