the boundaries of the system. Reducing the former, we can maintain a relationship adequate to periodic precipitation only by a corresponding reduction in the diameter of the boundary system; thus, in the case of slow movements, periodic precipitations are restricted to narrow tubes, capillaries, and ultimately large surfaces afforded by colloids.

The maxima and minima involved in this relationship find expression in practically all theories of periodic precipitation under such terms as nodes and antinodes, critical points, compression and rarefaction, under- and super-saturation, etc.

In considering the problem of periodic precipitations, we must bear in mind, however, the fact that whilst the fundamental principles of periodicity and its material records are not confined to any state or phase, the actual type and complexity of each periodic precipitation is determined by all the properties of the particular phase of matter involved in the phenomenon. This is specially the case with the colloidal state capable of functioning as either a system's boundary, medium, or component, or even all these rolled together, thus evolving the biological and mineralogical periodic structures in all their ramifications.

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¹ NATURE, 123, 1042, Dec. 19, 1931.

² NATURE, 123, 205, Feb. 6, 1932.

³ Copisarow, *Kolloid. Z.*, 54, 257; 1931: *Chem. News*, 143, 341; 1931: *J. Phys. Chem.*, 36, 752; 1932.

AFTER placing a drop of oil on a smoked glass and observing the system about an hour later, a new observation of periodic structure has been discovered.

The smoked glass under observation carried a continuous carbon film of particles about 0.2 micron in diameter, and the oil drop in slowly spreading caused the previously regular and continuous carbon film to become rearranged into alternately opaque and clear concentric rings or zones underneath the spreading drop. The effect was readily repeatable with other oil drops and smoked slides.

In every case so far observed, the central zone is a dark one, followed by a comparatively narrow, concentric, clear zone. In general, so far as trials yet go, the alternate zones are repeated several times in one experiment.

Whilst the phenomenon at once brings to mind the analogous chemical instance of periodic precipitation, it would seem to be purely physical. Oils of varying viscosity may be used, and the effect is best observed if, after carefully posing one drop of oil on the film, the glass is set down in a perfectly horizontal position. After, say, twenty-four hours, the spread oil film may be removed with carbon tetrachloride without destroying the ring structure formed in the carbon film.

Whilst, in addition to normal periodic precipitation, J. W. McBain¹ quotes work showing that periodic precipitation can occur in the absence of colloids, and E. S. Hedges² records the production of sodium chloride periodic structures without chemical action by salting out from solution, this is a case where periodic structures are formed in the absence of colloids, chemical action, and dissolution. Experiments and observations will be continued.

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¹ NATURE, 123, 1042, Dec. 19, 1931.

² NATURE, 123, 401, Sept. 5, 1931.

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Rate of Ionisation of the Atmosphere

THE calculation of the rate of ionisation of the atmosphere on the basis of the well-known Schweidler recombination law, by G. R. Wait¹ and J. J. and P. J. Nolan,² has shown a large variation in the rate, in the course of the day, at observing stations in Washington, D.C., in the United States, and near Dublin, Ireland. It is of interest to note that the maxima of the diurnal variation curves for these stations agree closely when plotted on Greenwich Mean Time.

The Department of Terrestrial Magnetism, in connexion with its programme of study of atmospheric pollution in relation to ionisation and other atmospheric electric phenomena, has constructed, and installed on the laboratory grounds at Washington, D.C., an apparatus for measuring simultaneously the small ion and large ion content from the same sample of air.

Results obtained with this apparatus permit the calculation of q , the rate of ionisation, with greater accuracy than was possible by the method employed in the previous work by Wait, in which values of nuclei content, obtained on the observatory grounds, were utilised together with values of small ion content computed from conductivity records obtained on the observatory roof. Values of q were obtained for three sets of observations in the free atmosphere on successive days in November 1931. All three days show a maximum value at approximately the same time as that previously found by Wait, as may be seen from the following table:

Values of q on 75° Mean Time.								
Nov. 23.			Nov. 24.			Nov. 25.		
hr.	min.	q .	hr.	min.	q .	hr.	min.	q .
..	..	..	10 00	2.1	..	9 37	2.0	..
..	..	..	10 30	2.9	..	9 59	3.0	..
..	..	..	10 47	3.2	..	10 22	2.7	..
10 54	3.2	..	11 05	2.6	..	10 46	2.4	..
..	..	..	11 27	4.3	..	11 08	3.6	..
11 18	4.0	..	11 49	6.4	..	11 29	6.0	..
11 46	2.9	..	12 08	5.7	..	11 49	3.4	..
12 09	2.7	..	12 26	5.1	..	12 11	2.9	..
..	..	..	13 32	3.3	..	13 46	1.8	..
13 35	1.8	..	14 01	1.2	..	14 11	1.7	..
14 00	1.6	..	..	..	..	14 30	1.7	..
14 25	1.8	..	15 04	1.3	..	14 49	2.0	..
..	..	..	15 26	2.5	..	15 11	1.5	..
15 28	1.5	..	15 46	2.0	..	15 34	1.8	..
15 49	1.5	..	16 07	3.2	..	15 53	1.6	..
16 09	1.6	..	..	..	..	16 14	1.5	..

The maxima in this table are about two to three times as large as the average value of q , and, furthermore, all values, including the maxima, are lower than that which is usually accepted as normal (q about 10) for most localities. Similar results were obtained by J. J. and P. J. Nolan, according to the publication already cited. It is worthy of note that, by using their modified form of the Schweidler equation on the data here discussed, the values of q are trebled and are thus brought to what appear to be more reasonable magnitudes.

Possible explanations for the variations in q have been considered. Barometric records have been examined but no correlation has been found between variations in atmospheric pressure and variations in q . Furthermore, the maximum in q is associated on only one day with a maximum in nuclei content on the other two days it is associated with maxima in small ion content. This would indicate that the maximum in q cannot be explained by the assumption