but different enough to provide the new enzyme systems necessary for the successful performance of the cell's new stage of growth. Thus a cell would actually never duplicate itself, but would produce a baby cell, with enzyme systems necessary for the production of a cell in the second phase of growth. One phase would then follow the last, being influenced by the parent cell, the immediate environment, and its internal composition. It is then capable of becoming an adult cell very similar to its parent cell, but is not so at birth.

The picture as presented is admittedly incomplete and general, but the observer feels that the weight of the evidence gathered so far, the structural similarities between the nuclear material and the co-enzymes, the presence of co-enzyme splitting enzymes in the cell, and the fact that chromosomes cannot always be found in the nucleus at every stage of growth of the cell, is in favor of some mechanism similar to the one presented here as part of the genetic information–genetic control system.

Although they did not necessarily agree with the views as presented here, I wish to thank Miss MARY SCOTLAND, Dr. ELLIOT MAYNARD, Dr. HAROLD HODGE, Dr. KURT SALOMON, and Dr. LEON MILLER for their sympathetic reading and criticism of this manuscript.

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Résumé

De faits biochimiques connus on peut construire un mécanisme où les fragments nucléotides des co-enzymes nucléotides (ou leurs isomères) servent de «messagers» des cycles métaboliques cytoplasmiques aux chromosomes. De façon similaire, on peut représenter les nucléotides comme se séparant des chromosomes et devenant une partie des co-enzymes dans une phase distincte du développement de la cellule.

On an Unusual Form of Periodic Precipitation

The classical phenomenon of periodic sedimentation called 'Liesegang Rings' is well known and can easily be demonstrated in, for instance, a gelatine-silver-dichromate model[1]. If agar-agar is used as the gel, the effects are basically the same but less well marked unless special techniques are used. Of several factors which may produce this phenomenon 2 are essential:

(1) Soluble chemical constituents which can form insoluble compounds with each other, and (2) a sharp gradient between the concentration of at least two of these substances.

In many cases the most striking results are dependant on the presence of a colloidal substrate, preferably as a gel. A system containing an agar gel and calcium salts, under certain conditions, will produce the peculiar pattern described below.

Experiment.—1·6 g of powdered agar-agar (B.P.) are soaked in 280 ml distilled water for about 2 to 4 h with repeated light stirring. The agar suspension is then gently boiled, with repeated stirring for about 30 to 40 min, until the volume is reduced to the 300 ml mark. After cooling to about 50°C, 10 ml of hot sodium carbonate solution containing 0·1 g of the salt are stewed in. 6 Petri plates are then filled to a depth of 5 mm and the others to a depth of about 10 mm. The plates are left on a cold surface to gel and then two medium granules of anhydrous calcium chloride are placed in the centre of a 5 and 10 mm plate respectively. On the centre of the other plates either 4 to 6 granules are feeded or 2 drops of syrupy ('saturated') calcium chloride solution are pipetted. The plates are then left at room temperature (18 to 22° C) and examined after 6, 12, 18 and 24 h and again after 2 and 3 days. If the results are not convincing then, in a second series of experiments, agar at 1% concentration is used with the same procedure.

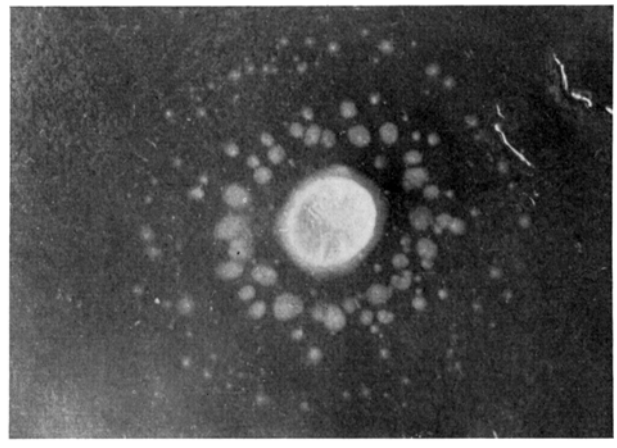

Fig. 1.

Results.—As the appearance of periodic precipitation cannot be predicted with accuracy, the above set up of several plates and procedures is necessary. Usually, the system with the solid calcium granules yields the most characteristic results. The temperature of the room shoult not exceed 20 or 22°C.

Within a few hours circular white patches surround the calcium chloride and these later coalesce into a solid area in which thicker spots may be discernible. Frequently, the sedimentation centre retains its sharp boundary (Figure 1) with a surrounding clear zone. 12–24 h or 2 days later isolated white dots appear in concentric rings around the centre. These small spots remain separated and the distance of concentric rings from each other as well as the size of the dots diminish the further away they are from the original centre. Finally, some of the smaller foci of precipitations become surrounded by 'daughter spots' which also are isolated (Figure 1). The microphotographs (Figure 2 and 3) taken at a magnification of × 30 and × 100, show the true isolation of such small dots, and at the same time, a radial though irregular structure.

When the agar layer is 10 mm or more thick and 4 or 6 granules of calcium chloride are placed partly on the surface and partly deep into the gel, then this phenomenon of isolated spot precipitation develops twice, at the upper and the lower surface of the agar.

Compared with the classical 'Liesegang-Rings', the rhythmic precipitation here described shows marked differences. The former system yields uninterrupted rings, shells or bands, continuous, though separated by clear

[1] E. R. LIESEGANG, *Handbuch der biologischen Arbeitsmethoden* (Urban & Schwarzenberg, Berlin 1929), Abt. 3, Teil B. – J. KLEEBERG, Med. Radiogr. Photogr. (Kodak) *29*, 47 (1953); Gastroenterologia *80*, 313 (1953).

zones. In this agar-calcium-carbonate model the periodic precipitation occurs solely in the form of isolated spots, which, although following the laws of periodicity, remain absolutely separated and isolated from each other.

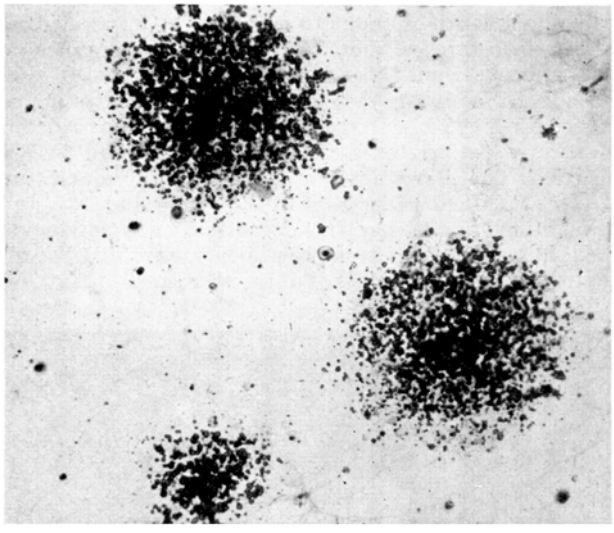

Fig. 2.

Strontiumchlorid and bariumchlorid cannot replace the calciumsalt in this experiment, neither can salts of heavy metals.

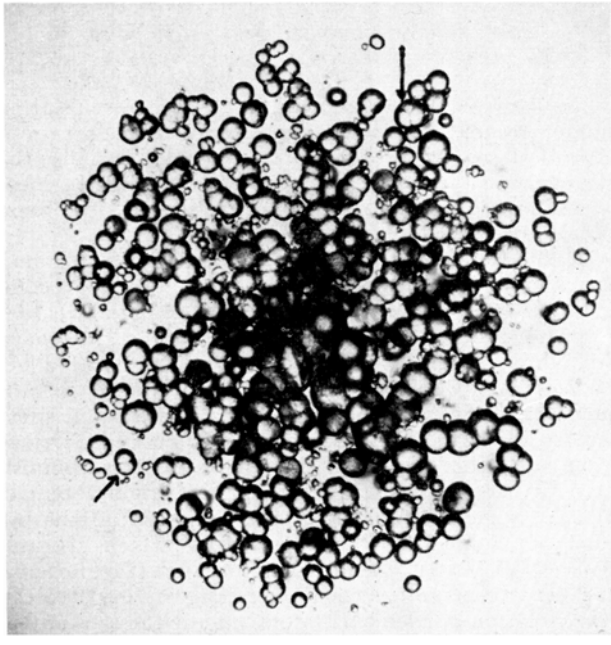

Fig. 3.

In this short communication no detailed explanation will be given. The laws and theories, generally accepted for periodic precipitation, especially in gels can be applied here too. What remains to be explained is the interesting difference from the pattern of the vast majority of the so-called rhythmic precipitation bands or rings or shells.

As a preliminary hypothesis I venture to refer to the properties of calcium carbonate as such, because as has been just mentioned, I failed to demonstrate the same phenomenon with salts of heavy metals or even with barium and strontium salts, the elements of the same periodic column as calcium. Numerous trials within those years have convinced me that it was only possible to produce these results with calcium salts with such a constancy and impressive pictures. Furthermore: looking at details in the photograph Figure 3 (see arrows), one can detect some crystals of spherical shape with special lines. These lines and these small globules resemble exactly the picture known to physicians as calcium-carbonate crystals which may appear in the human urine. I therefore think that these peculiar and specific properties of calcium together with the laws or forces of colloidal periodic precipitation are responsible for this type of pattern.

Minute spherical crystallisations of cholesterol in colloidal media were reported by ORD[2] and SCHADE[3]. HATCHEK[4] published photographs of minute spheres of precipitation in gelatine or agar gels produced by salts of heavy metals or alcaline earthen metals. As far as I have been able to ascertain, however, experiments and results as described here have not previously been published[5].

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Zusammenfassung

Kalciumchlorid und Natriumkarbonat bilden in einem Agar-Gel rhythmische Niederschläge. Aber das entstandene Kalciumkarbonat fällt unter bestimmten Bedingungen hier nicht in den bekannten Liesegangschen Ringen aus, sondern in völlig isolierten kleinen und kleinsten Inselchen. Eine Theorie des Phänomens wird diskutiert.

[2] W. ORD, Proc. Roy. Soc. London (1879).
[3] H. SCHADE, Concretions, *J. Alexander's Colloid Chemistry*, vol. II (1928).
[4] H. HATCHEK, Kolloid-Z. *30*, 255 (1911).
[5] Details of these studies will be published elsewhere.

Zur Frage des Virusrezeptors von perjodat-behandelten roten Blutkörperchen

Die Mucinase-Theorie nimmt an, dass Influenzaviruspartikel nach Anlagerung an mit JO_4-Ionen behandelte rote Blutkörperchen (RBK) sich deshalb nachträglich nicht mehr spontan ablösen können, weil durch die JO_4-Ionen ein angeblich mucinartiger Rezeptor oxydiert wurde und so einer möglicherweise enzymatischen Einwirkung der Viruspartikel nicht mehr zugänglich ist[1].

Der eindeutige Beweis für die Richtigkeit dieser Annahme – die Inagglutinabilität der RBK gegenüber dem agglutinierenden Virusstamm – ist auf direktem Wege nicht möglich, da ja die Viruspartikel von den JO_4-behandelten RBK nicht mehr eluiert werden können.

[1] G. K. HIRST, J. exp. Med. *87*, 301 (1948).