of newly synthesized ground substance would bring about the dispersal of the grains per unit area; thus the actual decrease in the total activity in the cartilage may not be as great as suggested by the grain density.

Mesonephric tissue also picked up some radiosulphate under organ culture conditions, and the activity was still preserved after 2 days' culturing in non-radioactive medium, by which time typical mesonephric tubules were formed. The activity of this tissue, however, was less than that of even the non-chondral components of somites, and far below that of the chondrogenic tissue. This fact demonstrates that the specificity of the uptake of radiosulphate by different kinds of tissue is well maintained in isolated tissue fragments.

Discussion. The uptake of radiosulphate by cells and subsequent movement into matrix have been previously shown in the differentiated cartilage of the adult mouse[10] and of the late chick embryo[11]. The present results indicate that a similar shift of tracer takes place in the initial differentiation of precartilage into cartilage with metachromatic matrix.

No metachromatic substance is detectable in the precartilaginous tissue, and it therefore seems likely that the substance into which the isotope is incorporated is a precursor of the sulpho-mucopolysaccharides of the future matrix. The existence of such a precursor has been suggested from the results of PAS staining[12], while it has also been claimed that chondroitin sulphate does not appear until after cartilage becomes histologically differentiated[13].

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Zusammenfassung

Aufnahme und Verhalten von ^{35}-S-Sulfat wurde in einer Organkultur sich differenzierender Somiten von Hühner- und Mäuse-Embryonen untersucht. Die Vorknorpelzellen zeigten den grössten Isotopeneinbau im Vergleich zu andern mesodermalen Zellen. Nach Vollendung der Knorpeldifferenzierung fand sich das von den Vorknorpelzellen aufgenommene Isotop in der interzellulären Matrix.

[10] S. R. PELC and A. GLUCKSMAN, Exper. Cell Res. *8*, 336 (1955).
[11] H. B. FELL, E. MELLANBY, and S. R. PELC, J. Physiol. *134*, 179 (1956).
[12] A. MOSCONA and H. MOSCONA, J. Anat. *86*, 287 (1952).
[13] H. HOLTZER, Oral communication at UNESCO-Symposium (Edinburgh 1957): *Biological Organisation* (Ed. C. H. WADDINGTON, Pergamon Press, London), in press.

PRO LABORATORIO

An Adjustable Synchronized Electron Flash for Phase Contrast Micrography

The growing use of phase contrast microscopy for the study of brain tissue made a difficulty which was felt in the photographic recording of the pictures obtained. In this form of microscopy, the preparations studied are often not fixed and usually show intense Brownian movement, which may make an extremely short exposure time indispensable. However, this demand is very difficult to meet, since with the same source of light, the pictures have a lower light intensity than those of common microscopy with diaphenous light. Phase contrast microscopy therefore often requires flash exposure with extra strong light intensity. The commercially available flash apparatus for micrography are not suitable for this purpose, because the exposure time cannot be regulated

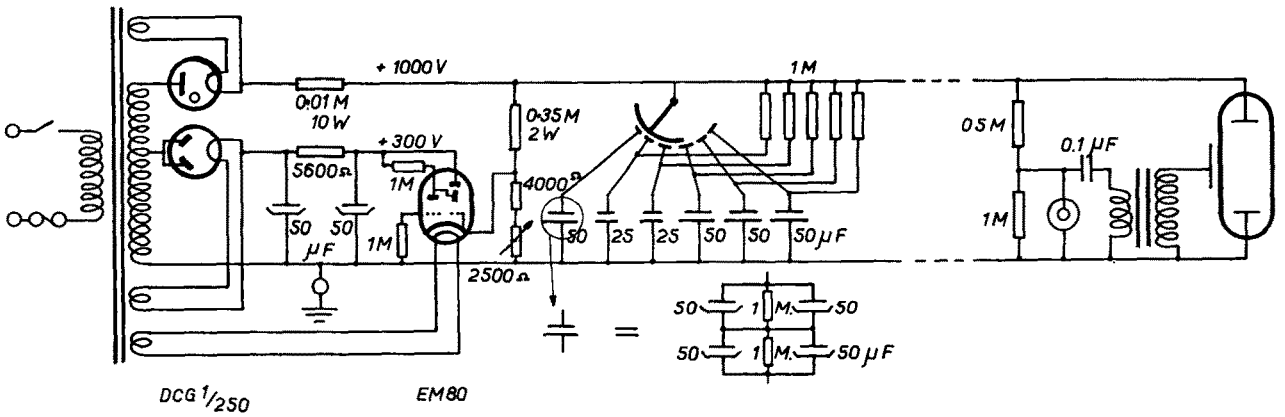

Fig. 1.—Wiring scheme of an electron flash for phase contrast microscopy

A double rectifier delivers two voltages one of + 1000 V and another of + 300 V with regard to a common negative pole. Between the output of + 1000 V and earth, a set of condensors is connected with a total capacity of 50 μF. With the aid of a switch, one to six condensors of 50 μF can be added in parallel. To prevent sparks, which occur when unloaded condensors are added to the original set by means of the switch, the positive pole of each condensor is connected via a resistor of 1 MegOhm with the wire of the + 1000 V. In this way all condensors are charged to + 1000 V, except very shortly after the discharge.

Between earth and the sparking plug of the electron flash bulb, the secondary coil of a high voltage transformer is connected. The primary coil of this transformer is connected in series with a condensor of 0·1 μF and in parallel with a resistor of 1 MegOhm, which is part of a resistor bridge of 1·5 MegOhm between 0 and + 1000 V. One of the poles of the condensor has now in this way a potential of 2/3 × 1000 V. The resistor of 1 MegOhm can be short-circuited through a switch, at which moment the potential of this condensor drops suddenly from + 1000 V to 0 V. This discharge causes sufficient potential to ignite the flash bulb. In this circuit, the discharge of the condensors causes an amount of light which is approximately proportional to the total capacity of the condensors.

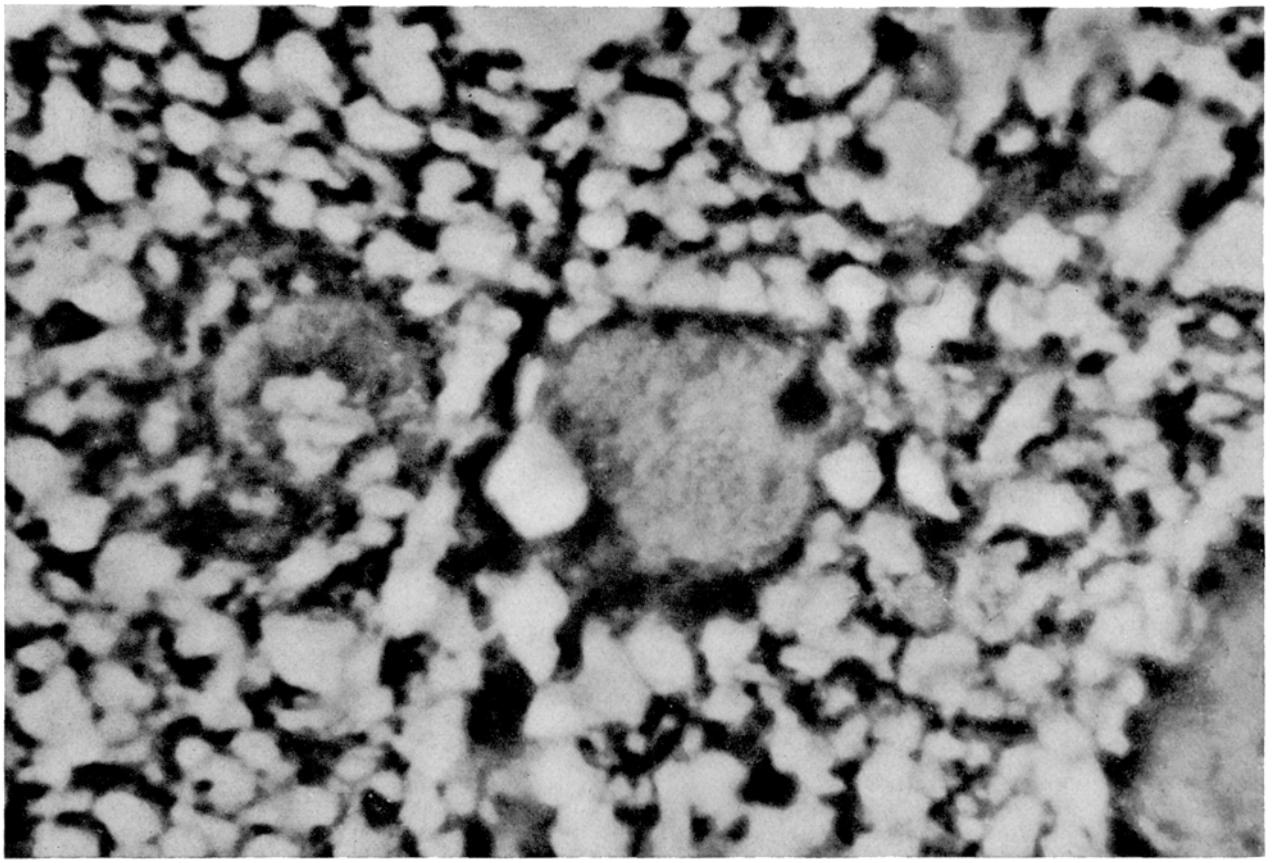

Fig. 2. — Micrograph of freshly prepared nervous tissue of the cerebral cortex of the rabbit taken wih the described apparatus and a Zeiss phase contrast microscope. Magnification 2000 ×

precisely enough (viz. only by changing filters). A flash apparatus was constructed which lacked these and other failures.

Figure 1 shows a wiring scheme of the electron flash. The lamp used for this apparatus is the electron flash tube of the Phys. Techn. Werkstätten Prof. Dr. Ing. Heimann in Wiesbaden (Germany). This lamp can produce more than 7500 lm sec per flash. The lamp is mounted directly under the condensor lens of the microscope. The mirror of the microscope is replaced by a glass slide, which is pervious to the flash light and reflects most of the light from the microscopic lamp in the usual way.

The light intensity is regulated by a series of condensors, which are connected parallel to the flash tube and having values between 1 and 5 times 50 μF. One or several groups of condensors could be discharged, which gave the desired amount of light for the negative of the film. A switch was constructed, which indicated so-called 'flash-factors'.

The Table shows the flash-factors (= position of switch) and the objective-lenses of the microscope. The flashfactors facilitate obtaining negatives with the same density.

Since the ratios of the amount of light for phase contrast lenses were not precisely known, a series of measurements were carried out with a densitometer placed in the tube of the microscope. With the Zeiss phase contrast lenses used, the values measured were approximately inversely proportional to the 2/5 power of the magnification of the objective-lenses. The amount of light necessary to produce the same degree of blackening of the negatives shows, for the objective lenses 10 ×, 40 ×, 100 ×, a ratio of approximately 2:4:5, which led to the choice of the above-mentioned flash-factors. Figure 2 shows a micrograph of freshly prepared nervous tissue of the cerebral cortex of the rabbit taken with the apparatus described (magnification 2000 ×).

Flash-factor (= position of switch)	Objective-lens
1	10 ×
1·5	40 ×
2	10 × phase-contrast
3	100 × oil immersion
4	40 × phase contrast
5	100 × oil immersion phase contrast

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with the technical assistance of H. Overdijk

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Résumé

Description d'un appareil à éclair électronique réglable pour la microscopie au contraste de phase. Le circuit présenté permet de régler électroniquement la quantité de lumière par «flash»; ce résultat est obtenu par une diminution ou une augmentation du nombre de condensateurs de 50 μF, dans le circuit.