the graft's surface. The exposed graft became dark and stiff in a few minutes. This symptom was recognized as an initial fading of the whole graft. It turned out, however, that a slip of the grafted skin left under the intact colloidal membrane developed and became covered with white hair; it has survived up to now, i.e. for 220 days, and does not show any symptoms of fading (Table).

In the case of 6 control grafts, transplanted crosswise to mice of the same breed, all the grafts faded between the 6th and 11th day after operation.

In the second experiment, skin grafts were made edgewise on the 3rd day following the last injection of thymic extracts. The skin graft from a black mouse of the C_{57} strain to a white mouse of the A strain had faded by the 10th day after operation. The skin graft from the white mouse of the A strain to the black mouse of the C_{57} strain developed edgewise and became covered with white hair. It has already survived for 280 days and does not show any symptoms of fading.

As regards 10 control grafts made crosswise in male mice of the same breed as the experimental mice, all the skin grafts faded between the 6th and 10th day after operation.

Zusammenfassung. Während 3 Wochen wurden zwei geschlechtsreifen Mäusen Thymusextrakte aus Schweinefrühfrucht subkutan bzw. intraperitoneal injiziert. Implantierte Hautläppchen aus gattungsfremder Maus ergab Einwachsen vom Rande her und dauerhafte Implantate ohne Schwundtendenz.

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Nystagmus and Related Phenomena in *Sepia officinalis*

The statocyst of cephalopods contains not only one or more 'maculae', i.e. statolith-bearing groups of sensory hairs (one in *Octopus*, three in *Sepia*), but also three 'cristae', rows of delicate, unloaded sensory hairs, arranged more or less perpendicular to each other. Whereas the maculae may serve as gravity receptors, the structure of the cristae suggests another function: namely the detection of endolymph movements within the statocyst as caused by active or passive rotation of the animal[1]. In *Octopus*, this view has been confirmed experimentally. On a turn-table, blinded octopuses show clear post-rotatory eye-nystagmus and corresponding after-movements of the head. These post-rotatory reflex movements persist after removal of one statocyst, but they disappear completely after removal of the remaining one[2].

Turn-table experiments of this kind were now performed with cuttle-fish (*Sepia officinalis*). First, an intact animal was put in a rather tightly fitting rectangular glass vessel and fixed in its 'normal' position within the vessel. Care was taken to provide the animal with sufficient fresh sea water for undisturbed respiration. The vessel was placed on a horizontal turn-table. On rotation of the table (by hand), the animal was turned around its vertical axis. The compensatory eye and head movements which occurred during rotation might have been due partly or even entirely to optical stimulation, although the turn-table was surrounded by a grey card-board in order to reduce visual landmarks as far as possible. However, when the rotating turn-table was suddenly arrested and stopped after a couple of revolutions, clear 'after-nystagmus movements' of the head were observed. After clockwise rotation, for example, the animal swayed its head clockwise and this movement was interrupted by two or three relatively slow anti-clockwise 'nystagmus' movements. Weak similar post-rotatory eye movements were also observed. After-reactions of this kind can of course not be due to optical stimulation; visual perception of the resting environment will rather tend to inhibit such post-rotatory reactions, as appeared already in earlier similar experiments with *Octopus*[2].

In addition to experiments with rotation around the animal's vertical axis, the reactions of *Sepia* on rotation around its horizontal axes were investigated. With the animal in its 'normal' position, any rotation around its horizontal axes would involve a change of position with respect to the direction of gravity, and thus additional stimulation of the gravity receptors would occur. In order to avoid this, the glass vessel with the fixed cuttle-fish was tilted by 90° and placed again on the turn-table. In this way the animal was laid on its side, one eye looking upward, the other eye looking downward. Turn-table rotation now made the animal rotate around its transverse axis, whereas no change of position with respect to gravity occurred. Notwithstanding the fact that the animals were kept in a forced, 'abnormal' position during the experiments, they showed typical after-nystagmus movements of the eyes with the well-known slow and quick phases in opposite directions, and similar movements of the whole head. Likewise, on rotation of an animal around its long axis (head pointing upward, 'tail' downward), clear post-rotatory head movements were observed.

Experiments of this kind were performed with three intact specimens of *Sepia officinalis*, measuring 12 to 15 cm in length. It was intended originally to blind the animals previously by cutting their optic tracts in order to eliminate visual orientation. However, after section of one optic tract in a cuttle-fish (anaesthetized in 1.5% urethane in sea water) the animal recovered only temporarily; it swam backwards, circling towards the operated side (asymmetrical locomotion after section of one optic tract is also known from *Octopus*[2]), and died soon after the operation. Since even intact cuttle-fish used to die within a week after arrival at the station, the intention to work with blinded or otherwise operated animals was abandoned. However, the occurrence of post-rotatory reflexes even in cuttle-fish with normal eye-sight stresses all the more the strength of these rotatory stimuli, occurring on turning around all three main body axes. On the basis of what has been found in *Octopus*, there seems little doubt that the stimuli involved arise within the statocysts with their highly developed cristae[3].

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[3] The work was supported by grants from the Centre National de la Recherche Scientifique (Paris) and the Netherlands Organisation for the Advancement of Pure Research (Z.W.O.). I am indebted to Dr. P. Bougis and his staff of the Station zoologique at Villefranche for putting animals and apparatus at my disposal.

Zusammenfassung. Intakte Exemplare von *Sepia officinalis* zeigen nach Drehung um alle drei Hauptachsen Augen- und Kopfbewegungen vom Typus des «Nach-Nystagmus». Diese postrotatorischen Reflexe können nicht optisch ausgelöst sein; sie beweisen vielmehr das Vorhandensein eines echten Rotationssinnes. Es wird angenommen, dass dieser auch hier seinen Sitz in den Statocysten mit ihren hochdifferenzierten Cristae hat.

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Phenobarbital Markedly Increases Liver Weight in Walker Carcinosarcoma Bearing Rats

The present work is founded on some recent observations by CONNEY et al.[1]. These authors demonstrated an increase of liver size in weanling rats after a four days treatment with phenobarbital. The increase of liver size was combined with an increased liver protein content and the increased activity of some liver microsomal drug metabolizing enzymes[1,2]. According to our observations, these increases are less intense in adult rats[3,4].

Some observations of ANNAU et al. show that in tumour bearing rats and mice there is an increase of liver weight and of mitotic activity[5]. Similar results were observed in tumour-bearing mice by MALMGREN; the same author could also observe an increase of mitotic activity by simple injection of tumour homogenate[6]. PASCHKIS et al. observed that the liver regeneration was enhanced in the presence of a growing tumour[7]. It appeared evident that in the tumour-bearing rats there is some growth promoting factor(s). Therefore we supposed that tumour-bearing rats might be more sensitive to the phenobarbital effect on the liver enlargement, like growing rats.

In fact, in the present work evidence is given that adult rats bearing Walker carcinosarcoma 256 have a remarkable sensitivity toward liver enlargement induced by phenobarbital.

Male rats of the Sprague-Dawley strain weighing about 200 g were used. The animals were inoculated subcutaneously with Walker carcinosarcoma 256 in the lateral abdominal region. After 18 days, rats bearing well developed tumours were selected and a group of tumour-bearing rats and of controls were treated with phenobarbital (90 mg/kg, i.p.). 48 h later all the rats were killed and the whole liver was weighed. The determination of liver protein, DNA and RNA was carried out, using respectively the methods of LOWRY et al. and SCHNEIDER[8,9].

The results are given in Tables I and II.

Phenobarbital produces only a 5% increase of the liver weight in normal rats, while in the tumour-bearing rats the increase is 28% ($P < 0.001$). As regards the ratio of liver weight for 100 g of body weight, there is a 26% increase in the tumour-bearing rats ($P < 0.001$) against a 6% only in normal rats. Protein, DNA and RNA con-

Tab. I. Effect of phenobarbital on liver weight of normal and Walker carcinosarcoma 256 bearing rats

	Number of rats	Phenobarbital treatments	Body weight (g)	Tumour weight (g)	Liver weight (g)	$\frac{\text{Liver weight} \times 100}{\text{Body weight}}$
(1) Normal rats	14	—	289 ± 3.8		13.0 ± 0.43	4.52 ± 0.13
(2) Normal rats	14	+	284 ± 4.2		13.6 ± 0.41	4.79 ± 0.16
(3) Tumour bearing rats	13	—	286 ± 4.8	17.5 ± 2.4	13.6 ± 0.46[a]	4.76 ± 0.19[a]
(4) Tumour bearing rats	13	+	292 ± 4.5	19.4 ± 2.5	17.4 ± 0.58[a]	5.98 ± 0.24[a]

[a] Significance (4–3) $P < 0.001$

Tab. II. Effect of phenobarbital on protein, DNA and RNA concentration in livers of normal and Walker carcinosarcoma 256 bearing rats

	Phenobarbital treatment	Number of rats	Protein content (mg/g liver)	DNA content (mg/g liver)	RNA content (mg/g liver)
(1) Normal rats	—	9	167 ± 2.5	2.02 ± 0.08	9.80 ± 0.36
(2) Normal rats	+	9	174 ± 3.2	1.91 ± 0.10	11.28 ± 0.58
(3) Tumour bearing rats	—	8	163 ± 3.0	2.15 ± 0.12	10.12 ± 0.60
(4) Tumour bearing rats	+	8	165 ± 3.8	1.98 ± 0.10	10.77 ± 0.51

All differences are statistically not significant.

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