do so their size gradually increases. In greatly enlarged nuclei, the position of nucleolus-like bodies is most often limited to the exterior layer or to the surface of the karyosphere capsule.

Nucleolus-like bodies also occur outside the karyosphere capsule, lying singly in the nuclear sap. They are larger than the bodies connected with the capsule, but like the latter exhibit a highly basophilic character (figure 3). Their relation to the nucleolus-like bodies of the capsule is not clear, but it would seem probable that they are formed from the latter after they have reached a certain size and become detached from the capsule. The basophily of the nucleolus-like bodies connected with the karyosphere capsule or lying singly in the nuclear sap as well as the capsule itself disappears after treatment with RNase.

The loose structure of the karyosphere in the majority of the species examined, the occurrence of multiple nucleolus-like bodies containing RNA and the considerable increase in volume of the germinal vesicles suggested that the oocyte nuclei of Silphidae might be very active in RNA synthesis. However, the results of initial autoradiographic studies with ^{3}H-uridine carried out on the ovaries of S. thoracica and S. sinuata failed to provide support for this suggestion. The distribution of labelling above the oocyte nuclei shows that the nucleolus-like bodies are inactive in RNA synthesis. On the other hand, with the same incubation time, the karyosphere invariably exhibited outstanding uridine incorporation, in both the early (figure 5) and more advanced stages of oocyte growth (figure 6). There can be no doubt that intensive RNA synthesis by oocyte chromosomes of both species of Silpha examined for this, as in the case of oocytes of Bruchidius[13] and perhaps Tenebrio[14], is conditioned by the exceptionally low degree of chromosome condensation. Despite the lack of comparable quantitative data, it would appear that the growth of nuclei in Silphidae oocytes is disproportionately great in relation to the extent of their activity in RNA synthesis. This growth thus most probably results not only from the action of the mechanism involved in activation of RNA synthesis in oocyte chromosomes, but also, and to a major degree, from the action of some other factor which, as in the case of the oocytes of Carabidae, is not connected with this function of the nucleus.

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Influence of an additional magnetic field on hornet nest architecture

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Summary. An additional horizontal magnetic field is lethal for adult hornets and larvae. The juvenile hornets, however, are capable of adapting to the additional magnetic field. They build combs commencing in the regions of high field intensity, and proceeding in the direction of the field intensity decrease.

It was reported by Lindauer[1] that changes in the earth's magnetic field disturb the orientation of dancing bees, and that they commence building combs whose orientation is in accordance with the changed field. Upon 10fold increase in the magnetic field, the bees built cylindrical combs that were fastened to the floor rather than to the roof as is customary[2]. There is also some evidence that ants can sense the earth's magnetic field[3], and that normal fluctuations in the earth's magnetic field influence pigeon orientation[4]. Experiments by Schneider[5] showed that orientation of the beetle Melolontha vulgaris F. is strongly affected by magnetic and electric changes. The aim of the present study was to test the effect of an additional magnetic field on comb construction by hornets.

Material and methods. Young hornets (Vespa orientalis) workers kept in artificial breeding boxes (ABBs) in groups of 5–15 individuals build combs whose dimensions are as described elsewhere[6] and which are connected by pedicles to the roof of the ABB; the cells in such combs face downwards[7,8] with a scatter of 3–14° from the vertical axis, as in normally built combs in nature[9]. Hornets before eclosion or 1–2 days afterwards (juveniles), when subjected to centrifugation, build in the direction of the resultant of the gravitational and centrifugal forces[10], whereas adult hornets (3–7 days old) tend to build in the direction of gravitation alone. These results suggested that the orientation of adult hornets during comb construction is influenced by additional physical factors apart from gravitation. Moreover, in previous experiments[11] it was found that when presented with an inverted comb, the hornets build new cells on its border whose direction is downwards. We were therefore interested to find out whether the hornets will behave in the same way when exposed to the influence of an additional magnetic field.

To test the influence of uniform and nonuniform magnetic fields on comb construction by hornets, we designed a square cross-section coil of 28×28 cm^2, with a winding length of 100 cm. The coil consisted of 1500 turns which were wound uniformly on a plywood frame and further encased in plywood. At a 40 V input voltage, the maxi-

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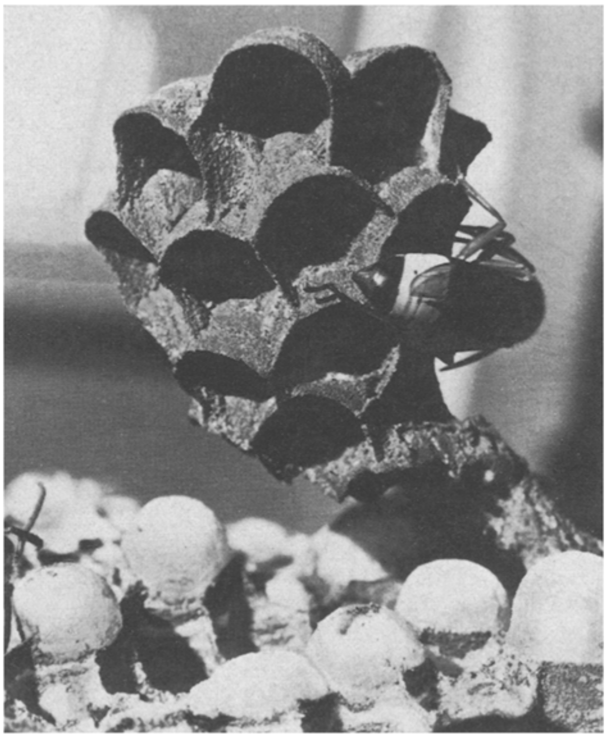

mum current in the coil was 1.34 A. The dissipated power was consequently 53.6 W, which caused a 6 °C temperature increase inside the coil and a 0.5 °C increase on the coil casing's surface, thus yielding an inside coil temperature of about 36 °C. The coil's axis was oriented along the magnetic meridian, while the longitudinal component of the magnetic field (Hc) inside the coil was directed against the horizontal components of the earth's magnetic fields, i.e. from North to South. Outside the coil, Hc lined up with the horizontal components of the earth's magnetic field, which in Tel-Aviv is about 0.33 Oersted. The values of the magnetic field vector H at different points both inside and outside the coil were computed according to Biot-Savart's law, which gave the following formula for a coil like ours, i.e., with a negligibly thin winding $H = \int \frac{\bar{J}s \times \bar{R}}{4\pi R^3} ds$ where $\bar{J}s$ is the equivalent surface current density, $\bar{R}$ is the vector pointed from the 'source point' to the 'field point', and the integration is performed over the surface of the coil's winding. When the current is 1.36 A Hc inside the coil is 23.3 Oersted (Oe). Outside the coil, at a distance of 1–5 cm, Hc is only 0.6–0.3 Oe.

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A knob-like comb built upwards by Vespa orientalis workers over an inverted comb. The ABB was placed on the coil. The additional horizontal magnetic field varied with the height from 0.6 to 0.3 Oe.

Effects of additional static magnetic fields on hornet behavior and comb building

Breeding conditions		Natural (control)	Additional horizontal static magnetic field Uniform Strong: 23.3 Oe	Uniform Weak: 1.3 Oe	Nonuniform Weak: 0.3–0.6 Oe
Longevity of test hornets	a) Entered as adult (more than 3 days old)	Normal[12]	1–2 days	1–2 days	2–4 days
	b) Entered as juvenile (1–3 days old)	Normal[12]	2–3 days	5–7 days	Almost normal
	c) Entered as pre-imagine	Normal[12]	Normal	Normal	Normal
Building activity		20–30 workers construct a comb in 5–10 days	a), b) None. c) Cells without a pedicle on the glass walls and tubes	a) None. b), c) Normal	a), b) None. c) Cells and comb with pedicles constructed in 5–10 days
Pedicle orientation		a), b), c) Vertically downwards	a), b), c) No pedicles	b), c) Vertically downwards	c) Vertically upwards and at different angles to the horizontal plane
Comb (cells' axes) orientation		a), b), c) Vertically downwards with a scatter of 6–14°	c) Vertically downwards with a scatter of 10–30°	b), c) Vertically downwards with a scatter of 6–30°	c) Random. Average direction in the horizontal plane. Cells tend to point in the direction of the magnetic field decrease
Number of cells		a), b), c) 20–200	c) 1–8	b), c) 20–60	c) 1–60. There were isolated single cells
Type of cells		Worker cells during June–August, Queen cells during September–October	b), c) Worker cells mixed with irregular cells of various dimensions	b), c) Worker irregular cells	b), c) Irregular cells
Larvae		Develop normally	Larvae did not survive 4th or 5th instar	Larvae did not survive 4th or 5th instar	Larvae survive the 5th instar but died mostly before eclosion

The vertical component of the coil's field in two-thirds of the coil's length adjacent to its middle cross-section is negligible and so is the transverse component.

Results. The behavior and building activity of hornets subjected to these magnetic fields was studied in 4 experiments. In the first three experiments the current inside the coil was 1.36 A which corresponds to 23.3 Oe, whereas in the fourth experiment the current in the coil was reduced to 0.1 A which corresponds to Hc = 1.7 Oe. Every experiment lasted 16 days, which was long enough to enable hornet workers to build a proper comb[12]. Breeding boxes with 15–25 hornets in each were placed both inside the coil where the magnetic field is uniform and outside the coil where the magnetic field rapidly decreases with the distance from the coil's winding.

The hornets were fed sugar solution, pieces of codfish and hornet or honeybee pupae, and were provided with a clump of soil as building material. 3 ABBs with hornets were kept outside the magnetic field as control. In all 4 experiments, the adult hornets died within 4–5 days without performing any building. The juvenile hornets built at least one comb in each ABB, but in all the ABBs, they were almost motionless during the first 4–5 days, assembled mostly on the wall (or floor) closest to the coil's winding where the additional manetic field was stronger. Building activity of the juveniles began 5–7 days after that of the control hornets. The results are summarized in the table.

In the ABB provided with an inverted comb, the hornets built upwards, constructing a stalk on the surface of the original comb with a knob-like comb on top of it (figure). The openings of the cells were oriented in all directions of the horizontal plane. The queen oviposited in the inverted cells, and the workers attended the larvae eclosing in these cells. As the distance of the new cells from the coil's winding reached 7–8 cm, their openings gradually began to face downwards.

After-effect: Upon switching off the coil's current we placed inside the coil 3 incandescent lamps which dissipated about 70 W and restored the previous temperature. The hornets now continued to build cells whose openings were gradually oriented downwards.

Discussion. These findings suggest that the hornets are affected by an additional magnetic field. In nature, the hornets most probably build under the combined influence of both the vertical component of the earth's magnetic field and the gravitational force, whose directions coincide. An additional horizontal magnetic field is, for some unknown reason, lethal for the adult hornet and larvae. The juvenile hornets, although they are less active and start building later than usual, are capable of adapting to the additional magnetic field, whether uniform or non-uniform, and build combs with irregular cells, commencing in regions of high intensity but proceeding subsequently in the direction of decreasing field intensity. It should be remembered that by the time the hornets start building they are no longer juveniles, and their building is clearly not influenced by gravity force alone. It is not clear as yet why these hornets do not build while in their first days of life, as they usually do in an ordinary environment.

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Binding of indole-acetic acid to cytosol proteins fo embryonic chicken liver

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Summary. ^{3}H-Indole acetic acid bound to cytosol proteins of embryonic chicken liver in vitro to an average capacity of at least 20 pmoles/mg binding protein. The auxin-binding protein complexes could be resolved into 4 major zones by anion exchange chromatography; they sedimented at 3–7 S in sucrose density gradients, and were also heterogenous in agarose gel electrophoresis.

Indole acetic acid (IAA), one of the regulators of plant growth, also occurs in higher animals[1,2] which are able to synthesize it[3]. It has also been shown that the amount of IAA synthesized by chicken embryo increases during embryogenesis[4]. On the other hand, it has been found that auxins promote incorporation of uridine into ribonucleic acids of human leucocytes[5], and Ihl[6] reported the presence in soybean cotyledons of IAA-binding proteins probably acting as translocators of the hormone to the cell nucleus. In this paper we report evidence that IAA-binding proteins exist in the cytosol of embryonic chicken liver; we also present data concerning some properties of IAA-binding protein complexes formed in vitro.

Material and methods. Liver cytosol prepared from decapitated 18-day-old chicken embryos[7] was incubated with 10μCi/ml indole acetic-5-^{3}H acid (29 mCi/mM; Schwartz/Mann, Orangeburg, New York, USA) for 30 min at 25 °C and sieved through a column of Sephadex G-25. Macromolecular fractions containing bound ^{3}H-IAA were pooled, dialyzed overnight, concentrated in Sartorius membrane filter apparatus, and then subjected to analysis by chromatography[8], centrifugation[9] and electrophoresis[10]. Protein was determined by the method of Lowry et al.[11]

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