genes may be explained according to the hypothesis of JACOB and MONOD[17] and BRITTEN and DAVIDSON[18, 19]. The different distribution of hormonic content during plant differentiation[20, 21], the changes in light and diet (because the root, for instance, is growing in the absence of light and receives food from the cotyledons in the early stages of its development, whereas later it receives food from the soil) may all be important factors contributing to the changes which have been observed. The dramatic changes of carboxylesterasic pattern of root nodule (Figure 3) may be due to the polyploidy of the nodule cells[22]. On the other hand, the *Bacteria* (Rhizobiaceae), which always live symbiotically in the root nodules may release some esterasic bands into them. In the root nodules of *Lotus pedunculatus*, however, only quantitative changes in esterase pattern were observed[23].

Riassunto. Il modello elettroforetico delle carbossilesterasi solubili nel corso dell'ontogenesi del *Medicago scutellata* è stata studiata con elettroforesi orizzontale su gel-amido. Il modello di ogni organo esaminato include una somma di molteplici forme molecolari di carbossilesterasi, la maggior parte delle quali è sottoposta a considerevoli alterazioni nel corso dell'ontogenesi della pianta.

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Patras (Greece), 3 July 1974.

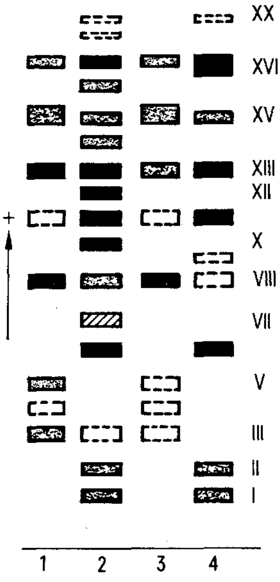

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Fig. 3. Electrophoretic patterns of carboxylesterases from root nodule of *M. scutellata*. Nos. 2 and 4, extracts from root nodules of 30 and 90 days of age respectively. Nos. 1 and 3, extracts from roots of 30 and 90 days of age respectively.

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The Anatomy and Innervation of the Ecdysial Glands of the Mature Larva of Castor Silk Moth, *Philosamia ricini* Hutt.

Ecdysial glands have been described in a large number of insects and one of the issues on which workers disagree is whether or not the glands are innervated. Those who describe innervation also differ greatly among themselves. ARVY and GABE[1], WILLIAMS[2], SRIVASTAVA and SINGH[3] in *Tenebrio molitor, Hyalophora cecropia* and *Papilio demoleus* respectively have reported innervation whereas SRIVASTAVA[4] in *Tenebrio* and HERMAN and GILBERT[5] in *Hyalophora cecropia* find no trace of nerves in the glands. Apart from Lepidoptera, detailed structure of the glands has not been described, except by HERMAN and GILBERT[5] in *H. cecropia*.

This paper describes the structure and innervation of the glands in a well-known experimental Lepidopteran *Philosamia ricini* Hutt. 3–4-day-old 5th instar larvae were used for the study. The glands were dissected out, fixed and stained with haematoxylin-eosin, paraldehyde fuchsin, lacto-aceto-orcein or methylene blue.

Each gland consists of a cluster of cells lying immediately dorsal to the prothoracic spiracle inwards of the lateral longitudinal tracheal trunk (Figure 1). Anterior, posterior, median and lateral branches radiate irregularly from the cluster and the glands are thus spread in the prothoracic segment and reach the anterior part of the mesothoracic segment. The cells of the anterior branch reach close to the prothoracic ganglion and run along with the prothoracic anterior nerve (pan, Figure 5), branches of which innervate it. The posterior branch is comparatively smaller but reaches the anterior region of the mesothoracic segment. The cells of the ventral strands lie in close association with the transverse nerve of the prothoracic ganglion. The shape and size of the gland cells of the central mass, as well as those of the branches, vary greatly. They are block-like, conical or elongated (Figure 2). The distal cells of the branches are mostly triangular, with the ends drawn out. The smallest cells occur in the distal part of the gland. The gland cells are enclosed in a thin, acellular, closely applied membrane (Figure 3). From the ends of the strands it is drawn out as long filaments attached to the neighbouring tissues or adjacent

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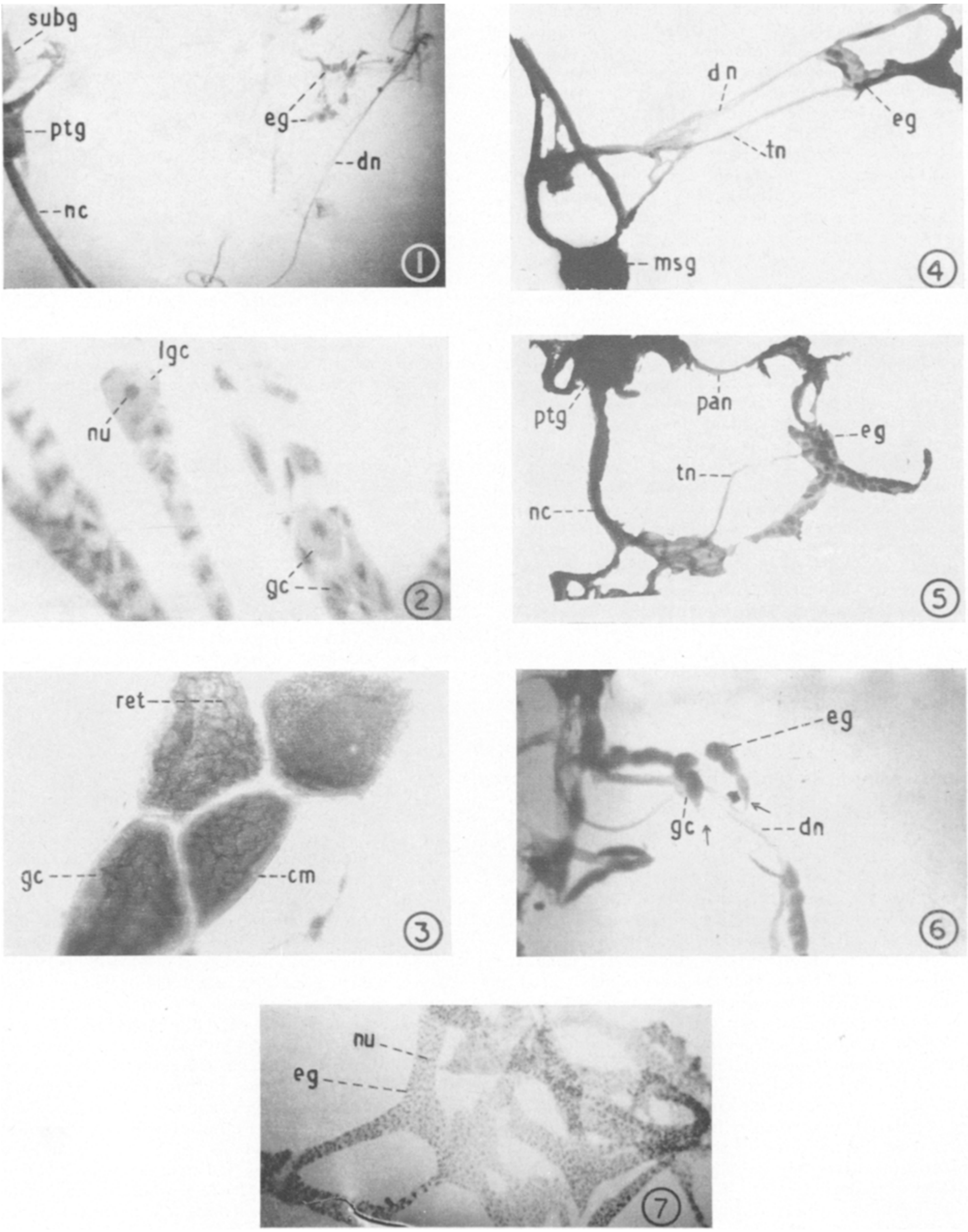

Fig. 1–7. Whole mount of mesothoracic dorsal nerve (dn) innervating the ecdysial gland (eg). nc, nerve cord; ptg, prothoracic ganglion; subg, suboesophageal ganglion. 2. A portion of ecdysial gland showing variation in the shape and size of the gland cells (gc) and their nuclei (nu). 3. Gland cells showing acellular cell-membrane (cm) and a reticulum (ret) covering them. 4. Whole mount of mesothoracic ganglion (msg), prothoracic transverse nerve (tn), mesothoracic dorsal nerve (dn) and their connections with the ecdysial gland (eg). 5. Whole mount of prothoracic ganglion, prothoracic anterior nerve (pan), prothoracic transverse nerve and their connections with the gland. 6. Whole mount of a portion of ecdysial gland and mesothoracic dorsal nerve. Note fine branches of the nerve entering two of the gland cells (arrow). 7. Whole mount of entire ecdysial gland. Note the variations in the shape and size of the gland cells and nuclei.

clusters of gland cells. Tracheal and nerve branches are so closely applied to the gland cells that the nuclei of tracheal epithelial cells and nerve cells are frequently found on the surface of the gland cells, or between them, and sometimes these nuclei even appear to be embedded in the gland cell. The cytoplasm of the gland cells is smooth and non-vacuolar, at least in the stages examined. Fine branches of the prothoracic anterior nerve (Figure 5, pan) which arises from the interganglionic connectives between the suboesophageal and prothoracic ganglia, prothoracic transverse nerve (tn) and mesothoracic dorsal nerve (dn) innervate the ecdysial gland (Figures 4–6) of their side and are occasionally seen entering the cell bodies (Figure 6).

From the literature, it is evident that in several orders the gland cells show a considerable range of variation. In Lepidoptera they are either elongate or lobate or branched structures (Fukada[6], Herman and Gilbert[5], Lee[7], Williams[2,8]). Srivastava[4] believed that there is no correlation between the systematic position of the insect and the site of the gland. It is not syncytial, as reported by Williams[2] in *H. cecropia*.

Williams[2] reported innervation of these glands by 6 nerves (2 each from suboesophageal, prothoracic and mesothoracic ganglia) whereas Herman and Gilbert[5] found small branches of medial nerves from the pro- and mesothoracic ganglia innervating these glands, but found it difficult to demonstrate with whole mounts or stained sections, since only a few nerves supply about 250 gland cells. Srivastava and Singh[3], who have reported the innervation of these glands in *Papilio demoleus*, found that the fibres derive from an anterior nerve arizing from the interganglionic connective between the suboesophageal and prothoracic ganglia, and a posterior nerve which is the transverse branch of the median nerve from the prothoracic ganglion. On the basis of observations from haematoxylin-stained preparations, they reported the occurence of a net-work of the fine branches of the aforesaid nerves, which occupy the intercellular spaces of the glands. In *Philosamia ricini*, a reticular structure covers the gland cells but it does not exist in the intercellular spaces (Figure 3). However, there is no doubt that the gland is innervated by branches of prothoracic anterior, prothoracic transverse and mesothoracic dorsal nerves[9].

Zusammenfassung. Die Zellen der Häutungsdrüse von *Philosamia ricini* werden von einer dünnen azellulären Hülle umschlossen. Sie variieren häufig in Gestalt und Grösse. Feine Ausläufer des prothorakalen Nervus anterior und des transversalen Nerven, sowie des mesothorakalen Dorsalnerven, innervieren die Drüsen.

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Numerical Expression of Individuality of Mammals

Individual differences in various morphological and functional properties are observed in a closed colony of mammals. Leiderman and Shapiro[1] described a biological index of characteristics of individuals in terms of mean square successive difference (MSSD). This index is valuable in discriminating among individual mammals in their somatic responses to ionizing radiation[2]. The index, however, has one disadvantage: dependence upon the absolute value of the biological property which is used to calculate the MSSD. The present report deals with a new index to express ubiquitously the individuality and its comparison with other indeces of individuality.

Our recognition of individuality is based on the various responses to intrinsic and extrinsic stimulants. When the stimulants are practically the same for all individuals in a given population, individuality is expressed as a numerical difference in the responses of the individuals, where the stimulants mean not only special stimulants, i.e., chemical substances, radiation, etc., but also so-called normal environmental conditions during a short period of time.

The individuality index I^2 is expressed as

$$I^2 = \frac{\sum_{1}^{n-1} (f_i)^2}{n-1}$$

where

$$f_i = d_i - e_i,\ d_i = \frac{x_{i+1} - x_i}{x_i},\ e_i = \frac{x'_{i+1} - x'_i}{x'_i}$$

The x_i is an observed value of a given biological property on the i-th day, and x_{i+1} is the value on the next day. The x_i' is the x value calculated from the regression equation refering to the observed x value and i. The d_i, e_i and f_i values have a plus or minus symbol.

If the daily responses of an individual were ideally constant, the observed daily responses must be constant, constantly increasing during the growth period and constantly decreasing with aging. The x' value is assumed to be the daily ideal responses of an individual. The terms in which the variation of daily responses of a given biological property express individuality are described by Bünning[3], as well. The f_i value is the shift of the observed value from the ideal value. For this reason, I^2 means the average of the shifts. By calculating d_i and e_i, one can eliminate the effect of the absolute value on the index.

Five models of individuals, A, B, C, D and E, were under consideration. They had a common given biological property, the responses of which were observed numerically at the same time for 9 days. The models A, B, C and D were made to have the same mean value (3) and the models B and C were made to have the same sample standard deviation value (0.71). The equations to calculate the ideal value were different from each other in 5 models, but the comparison of models did not suffer from this since

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