lum" patterns, this transformation takes place within relatively late phases of leaf development. If there rises only one second epidermis, it will contain typical stomata and typical mother cells of hairs. In the interior of the leaf, however, these hairs do not develop further. In some cases this second epidermis is situated immediately below the normal one; in other cases it lines the much enlarged air chambers (Fig. 3*b*). In the first instance, the stomata of neither epidermis function. In the second case, the guard cells of the inner epidermis are lifted up under the influence of the high air moisture within the leaf. In most patterns with a double epidermis, one of the chlorenchyma layers is missing.

In some cases most layers of the spongy parenchyma have lost their normal chloroplasts and have changed into an epidermal tissue with intercellular spaces. Stomata were formed at the boundary between this and the normally green parenchyma amid the leaf (Fig. 3*c*). Other similar transformations of palisade parenchyma cannot be identified quite exactly as epidermal tissue because stomata are missing in them.

In the third type of "rhytidiophyllum" the following fact is of greatest interest: a plasmonic alteration, which can be proved as such, does not produce disturbances of normal development as in other cases of cytoplasmic inheritance, but a change of determination takes place. A meristematic tissue that should form chlorenchymatic cells develops instead into epidermal cells. This determination process differs from the normal formation of dermatogen only by the atypical moment of realization and by its abnormal localization. This difference, however, is caused by the time and locality of cytoplasmic segregation. If we start from the well-founded opinion that plasmonic segregation is produced by an unequal distribution of plasmagenes, we then logically arrive at the further conclusion that similar proceedings take place during the determination of the typical dermatogen as well, and that plasmagenes are distributed irregularly during the first cell divisions of the embryo (*4*), in which root and shoot and later on the layers of differentiated tissues are preformed.

Of course, cytoplasmic inheritance, as taking part in the processes of determination, is very difficult to prove by crossing experiments, and in many cases this task is impossible to solve at all. The aforementioned observations, however, show that the hypothesis of the significance of plasmagenes for determination possesses a high degree of probability. This hypothesis can be proved exactly by a more detailed investigation of the behavior of cytoplasm and its inheritance during ontogeny. One then will have to take into account that an analysis of intraindividual patterns is of the same importance for cytoplasmic inheritance as is an analysis of segregating crossings for chromosomal inheritance. Moreover, one should not forget that the fundamental principle of heredity means the identical reproduction and passing on of all genes during vegetative as well as during generative reproduction.

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Role of Fumarate in Formation of Stromata in "Vernalized" Ergot Fungus

It is well known that, for germination of *Claviceps purpurea,* an exposure of several weeks to cold, followed by a short period of exposure at higher temperature, is necessary. According to Kirchhoff (*1*), who studied this question in detail, the effect of cold seems to be similar to that of the vernalization of seeds. In studies of the respiration of germinating sclerotia and fully developed stromata of ergot of rye, I have found that fumarate plays a special role in this process.

The test ergot strain was Hungarian 12. An exposure to 0° to 3°C during 6 weeks was effective, causing 65 to 70 percent of the sclerotia to germinate after 3 weeks at 20°C on a double layer of wet filter paper in petri dishes. The sclerotia that had been treated as described were vacuum infiltrated for 1 hour with distilled water (control) or with $2 \times 10^{-2}M$ fumarate under 20 to 30 mm-Hg pressure. Infiltration with water does not influence the development of stromata, while infiltration with fumarate entirely inhibits the germination. This inhibition can be overcome to some extent by infiltration with $2 \times 10^{-2}M$ succinate. Succinate by itself has no effect on germination.

In order to gain a deeper insight into this question, conventional Warburg respirometers were used for the estimation of oxygen absorption (Q_{O_2}) of the sclerotia and stromata that had been infiltrated with the various compounds described in Table 1. Measurements were carried out on four occasions in triplicate. As shown in Table 1, the fumarate does not inhibit the respiration of sclerotia, while the oxygen consumption of stromata was strongly affected by it. Succinate added in concentrations equal to those of the fumarate is able to renew oxygen uptake to a considerable degree.

Table 1. Effect of fumarate and succinate on the respiration of sclerotia and stromata of ergot fungus.

Infiltration	Q_{O_2}		
	Sclerotia		Stromata
	Control	Cold treated	
Distilled water	25	27	346
Fumarate ($2 \times 10^{-2}M$)	22	25	20
Succinate ($2 \times 10^{-2}M$)	24	26	387
Fumarate + succinate	25	26	276

A consideration of these results has led to the following tentative conclusions and working hypothesis. The respiration of stromata follows a different pathway from that of the sclerotia. An explanation could be given for the inhibitory effect of fumarate on germination by the fact that, in the presence of fumarate, the respiration of stromata is inhibited. On the basis of the compensatory effect of succinate, it may be assumed that an unknown acid metabolism plays an important role in the organization of the stromata of ergot fungus. This is in agreement with the work of Cantino (*2*), who studied the relationship between cellular metabolism and morphogenesis in *Blastocladiella emersonii.*

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Conditioned Inhibition of Respiration and Heart Rate in the Goldfish

Conditioned inhibition of breathing rate and heart rate has been reported for various mammalian species, including man (*1*). Typically, the termination of a light, sound, or some other conditioned stimulus (CS) is repeatedly associated with noxious electric stimulation of some