CHAPTER 8

THE CORRELATION BETWEEN THE BASIC CONCEPTS

THERE IS A CLEAR interrelationship between the four basic concepts previously discussed which permits us to consider them together and to establish a unified viewpoint. For all four can be seen to represent different parts of the same fundamental problem in biology: the manner in which an entity resolves energetic differences between itself and the environment.

We have seen that, in the framework of fundamental laws governing nature, matter can be considered to correspond to islets of heterotropy opposing the homotropic trend of evolution. Conservation of an existing entity appears to be the principal means by which heterotropy can be achieved. And heterotropy is fulfilled, specifically, through maintenance of the constants of entities as values different from those of the environment.

Hierarchic Organization

The continuous tendency of nature to progress toward maximum homotropy has made the conservation of existing entities a persistently acute problem. The problem posed by the progressively changing environment cannot be solved through changes within entities themselves. Any "adaptation" of the entity itself would affect its constants and, consequently, would be contrary to the fundamental purpose of heterotropy. Nature has resolved the problem in an entirely different way. Since the entity itself must remain unchanged, and yet the influence of the environment must be conteracted, nature has made use of hierarchic organization. Secondary parts, reproducing the immediate environment, are joined to existing entities, often surrounding them and acting as buffers against environmental influences. Through these added secondary parts, hierarchic entities are organized so

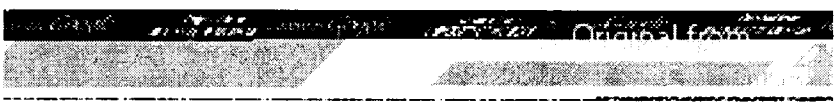
that they reproduce the characteristics of the environment present at the time of their formation. Through this means successively repeated many times, an entity can be kept unchanged, in a medium similar to the original one, despite continuing changes in the environment.

Hierarchic organization thus represents the main mechanism through which the heterotropic achievements, represented by entities, counteract the influence exerted by the homotropic force. Conceptually, hierarchic organization can be seen to represent a form of defense developed in time by entities against a specific factor, progressive homotropic changes in the environment. The successive steps of the hierarchic organization respectively the hierarchic entities, reproduce in short, the evolution of the relationship which has been developed between the entity and the changing world. Hierarchic organization condenses the phylogenetic evolution of this specific part of the defense between the entity and the changing environment. Through this view, we can integrate organization in the general defense, the hierarchic organization being part of the mechanism used against progressing homotropy.

Constituents

In the same manner, we can further integrate into the same defense mechanism the various constituents which form the secondary parts of the hierarchic entities. We have thus tried to correlate these constituents more directly to the successive environments in which entities evolved. We have seen above, how this applies to elements which are common to, and predominant in, both the entities and the environments which correspond to the media in which these entities evolved. Through the correlation between elements which enter into hierarchic organization at various levels, and their positions in the periodic chart, the successive phylogenetic passage from one environment to another has a specific meaning. In media formed by elements with lower atomic weight, the influence exerted by progressive homotropy is less manifest. The changes in the elements as body constituents can be thus also integrated in the same defense mechanism.

Besides the elements, other constituents can be similarly integrated into the defense against the changes of the environment. In the immediate defense process against noxious agents, we have seen the successive intervention of different constituents—enzymes, lipids, lipido-proteins and proteins, in that order. The high degree of individuality and independence of the entities in the hierarchic organization has permitted us to conceive of these constituents as participating with a certain independence for each entity. The presence of all these constituents in each higher biological



entity, which is part of the complex organism, suggests that these constituents entered into the formation of these entities as the result of their intervention in the defense mechanism. Thus, it can be conceived that, in its phylogenetic development, each entity has passed through a succession of defense phases in which specific groups of constituents—enzymatic, lipidic, lipido-proteic and proteic—have been predominant. In actual organization, while all higher entities contain fundamentally the same constituents, different substances are predominant at different levels. This can be explained by the predominance of a particular defense mechanism at a particular level. According to this view, this defense is principally in the first stage, that is, of enzymatic nature, for most endodermic formations. It is in the prolonged lipidic stage for ectodermic formations, lipido-proteic for the reticuloendothelial system, and proteinic for cells. Through these correlations, constituents can be more completely integrated in defense.

The kind of special defense developed for the different levels of organization, through predominant specific constituents, has not been followed by a total discard of the other constituents, which do not have such roles. Instead, the latter have been retained in the entities in smaller amounts and in inactive forms. This confers upon the entity the capacity to mobilize these constituents and use them when the need to respond to an acute emergency arises. Pre-ferments and even ferments in mitochondria; fatty acids and anti-fatty acids bound as esters; lipido-proteins and proteins in various combinations—all these are inactive constituents which can be changed easily into active agents. When fighting a new noxious intervention, an entity will resort to liberating or activating these constituents kept in reserve. Each entity and level of organization does this independently of other entities and levels, yet constituents activated at one level can act at other levels, too. The success or failure of defense especially in its first stages, depends not only on the intrinsic value of the constituents available, but also on the capacity of the afflicted entity to utilize these means by activating them. Although activation processes become strikingly evident in abnormal conditions similar processes seem to be important even in the maintenance of existing entities.

Dualism, as we have seen, characterizes both normal and abnormal physiology. That which is considered "normal" is the result of an alternating intervention of two groups of opposite constituents, producing an oscillatory movement and a dynamic balance. The dualism seen in abnormalities, when one or the other opposed factor is persistently predominant, is related to hierarchic organization and the defense mechanism.

Dualism results from the intervention of two fundamental forces in

nature—homotropy and heterotropy. Even the simplest analyses make evident either the homo- or the heterotropic character for many manifestations and processes. For instance, an ulceration or an enzymatic hydrolysis of a protein has to be interpreted as an homotropic effect while a growing tumoral mass or the synthesis of a protein can be seen as an heterotropic one. For other manifestations, this character appears less immediately evident and it is through further analysis that it can be recognized. Dualism, like the other concepts, thus can be integrated in the defense of entities against an environment progressively changing toward maximum homotropy.

We have used this conceptual fundamental view in studying many problems in biology. It has aided us to formulate helpful working hypotheses. Despite its shortcomings, when applied to particular situations, this basic concept has served as a guide in correlating specific problems with the fundamental laws governing nature. It has also engendered helpful new interpretations of available data. Through the relationship of the four concepts discussed above and the fundamental defense mechanism, we have been able to analyze many problems without reverting to empiricism. Certain of these problems, to whose better understanding this approach appears to have contributed, are discussed in the pages that follow.