

On the supposed analogy between the life of an individual and the duration of a species / Edward Forbes.

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Forbes, Edward, 1815-1854.
Royal College of Surgeons of England

Publication/Creation

[London] : Royal Institution of Great Britain, 1852.

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37.

1852.

WEEKLY EVENING MEETING,

Friday, May 7.

W. R. GROVE, Esq. M.A. F.R.S. Vice President, in the Chair.

PROFESSOR EDWARD FORBES, F.R.S.

On the supposed Analogy between the Life of an Individual and the Duration of a Species.

IN Natural History and Geology a clear understanding of the relations of Individual, Species, and Genus to Geological Time and Geographical Space is of essential importance. Much, however, of what is generally received concerning these relations will scarcely bear close investigation. Among questionable, though popular notions upon this subject the Lecturer would place the belief that the term of duration of a species is comparable and of the same kind with that of the life of an individual.

The successive phases in the complete existence of an individual are Birth, Youth, Maturity, Decline, and Decay terminating in Death. Whether we regard an individual as a single self-existing organism however produced, or extend it to the series of organisms, combined or independent, all being products of a single ovum, its term of duration can be abbreviated but not prolonged indefinitely, nor can the several phases of its existence be repeated. Conditions may arrest or hasten maturity, or prematurely destroy, but cannot, however favourable, reproduce a second maturity after decline has commenced.

Now, it is believed by many that a species (using the term in the sense of an assemblage of individuals presenting certain constant characters in common, and derived from one original protoplast or stock) passes through a series of phases comparable with those which succeed each other in definite order during the life of a single individual, — that it has its epochs of origin, of maturity, of decline and of extinction, dependent upon the laws of an inherent vitality.

If this notion be true the theory of Geology will be proportionately affected; since in this case the duration of species must be regarded as only influenced, not determined, by the physical conditions among which they are placed; — and, thus, species should characterise epochs or sections of time, independent of all physical changes and modifying influences short of those which are absolutely

destructive. Now, geological epochs, as at present understood, are defined by peculiar assemblages of species, and the amount of change in the organic contents of proximate formations or strata is usually accepted as a measure of the extent of the disturbances that affect them. Yet this latter inference, involving as it does the supposition that the spread and continuity of species in time is dependent upon physical influences, is adverse to the notion of a Life of a Species as stated above.

If we seek for the origin of this notion we shall find that it has two sources, the one direct; the other, indirect. It is not an induction, nor pretended to be, but an hypothesis assumed through apparent analogies. Its first and principal source may be discovered in the comparison suggested by certain necessary phases in the duration of the species with others in the life of an individual, such as each has its commencement, and each has its cessation. Geological research has made known to us that prior to certain points in time certain species did not exist, and that after certain points in time certain species ceased to be. The commencement of a species has been compared with *Birth*, the extinction with *Death*. Again, many species can be shown to have had an epoch of maximum development in time. This has been compared with the maturity of the individual.

Between the birth of an individual and the commencement of a species in the first appearance of its protoplast, the analogy is more apparent than real. We know how the former phenomenon takes place, but we have no knowledge of the latter.

Between the maturity of the individual and the maximum development of a species there is no true analogy, since the latter can easily be proved to be entirely dependent on the combination of favouring conditions, and during the period of duration of a species there may be two or more epochs of great or even equal development, and two or more epochs of decline alternating with epochs of prosperity. The epoch of maximum of a species may also occur during any period in its history short of the first stage. Geological and geographical research equally show that the flourishing of a species is invariably coincident with the presence of favouring and its decline with that of unfavourable conditions. Hence there is no analogy between the single and definite phase of maturity of the individual and the variable and sometimes often repeated epochs of luxuriant development in the duration of a species.

Between the death of the individual and the extinction of a species there is an analogy only when the former event occurs prematurely through the influence of destroying conditions. But in their absence, an individual after its period of vitality has been completed must necessarily die; whereas we have no right to assume that such would be the fate of a species so circumstanced, since in every case where we can either geologically or geographically trace a species to its local or general extinction, we can

connect the fact of its disappearance with the evidences of physical changes.

[The Lecturer illustrated these points by diagrams and special demonstrations, selecting for explanation two local cases, the one marine and the other fresh-water; the former taken from the geological phenomena of Culver cliff and the neighbouring bays in the Isle of Wight, of which a beautiful and original model had been communicated by Captain Ibbetson for the purpose, and the latter from his own recent researches (unpublished) on the succession of organic remains in the Purbeck strata of Dorsetshire, conducted as part of the labours of the Geological Survey of Great Britain.]

The second and more indirect source of the notion of *the life of a species* may be traced in apparent analogies, half-perceived, between the centralization of generic groups in time and space, and the limited duration of both *species* and *individual*. But in this case ideas are compared which are altogether and essentially distinct.

The nature of this distinction is expressed among the following propositions, in which an attempt is made to contrast the respective relations of *individual*, *species*, and *genus* to Geological time and Geographical space.

A. The *individual*, whether we restrict the word to the single organism, however produced — or extend it to the series of organisms, combined or independent, all being products of a single ovum — has but a limited and unique existence in time, which short as it must be, can be shortened by the influence of unfavourable conditions, but which no combination of favouring circumstances can prolong beyond the term of life allotted to it according to its kind.

B. The *species*, whether we restrict the term to assemblages of individuals resembling each other in certain constant characters, or hold, in addition, the hypothesis (warranted, as might be shown from experience and experiment), that between all the members of such an assemblage there is the relationship of family, the relationship of descent, and consequently that they are all the descendants of one first stock or protoplast (how that protoplast appeared is not part of the question) — is like the individual in so much as its relation to *time* are *unique*: once destroyed, it never reappears.

But, (and this is the point of the view now advocated) unlike the *individual*, it is continued indefinitely so long as conditions favourable to its diffusion and prosperity — that is to say, *so long as conditions favourable to the production and sustenance of the individual representatives or elements are continued coincidently with its existence.*

[No amount of favouring conditions can recal a species once destroyed — on this conclusion, founded upon all facts hitherto observed in palæontology, the value of the application of Natural History to Geological science mainly depends.]

C. The *genus*, in whatever degree of extension we use the term, so long as we apply it to an assemblage of species intimately related to each other in common and important features of organization, appears distinctly to exhibit the phenomenon of centralization in both *time* and *space*, though with a difference, since it would seem that each *genus* has a *unique centre* or *area of development* in time, but in geographical space may present *more centres than one*.

a. An individual is a positive reality.
 b. A species is a relative reality.
 c. A genus is an abstraction — an idea — but an idea impressed on nature and not arbitrarily dependent on man's conceptions.

a. An individual is *one*.
 β. A species consists of *many resulting from one*.
 γ. A genus consists of more or fewer of these *manies resulting from one* linked together not *by a relationship of descent* but *by an affinity dependent on a divine idea*.

And, lastly,

a. An individual cannot manifest itself in two places at once; it has no extension in space; its relations are entirely with *time*, but the possible duration of its existence is regulated by the law of its inherent vitality.

b. A species has correspondent and exactly analogous relations with time and space,—the duration of its existence as well as its geographical extension is entirely regulated by physical conditions.

c. A genus has dissimilar or only partially comparable relations with time and space, and occupies areas in both having only partial relations to physical conditions.

The investigation of these distinctions and relations form the subject of a great chapter in the Philosophy of Natural History. That Philosophy contemplates the laws that regulate the manifestation of life exhibited in organized nature and their dependence upon and connection with the inorganic world and its phenomena. None teaches more emphatically the difficulties with which man's mind must contend when attempting to comprehend the wisdom embodied in the universe, and none holds out a more cheering prospect of future discovery in fresh and unexpected fields of delightful research.

[E. F.]

In the Library were exhibited:—

Several Cases of Moths, Butterflies, and Beetles, — and various Reptiles, from the Zoological Society.

Specimens of Electro-Plate, in Silver, Bronze, &c. [Exhibited by Messrs. Elkingtons.]