

## **Upon animal individuality / Thomas H. Huxley.**

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Each of these carries a single ovum, from which the first form is again developed.

The *Salpa mucronata*, which is thus produced from the *Salpa democratica*, is just as highly organized as the latter. It has as complete a circulatory, nervous, and digestive apparatus, and moves about and feeds as actively; no one unacquainted with its history would dream of its being other than a distinct individual animal, and for such it has hitherto passed.

But the *Salpa mucronata* has exactly the same relation to the *S. democratica* that the free-medusiform egg-producing body of *Physalia* or *Velella* has to the *Physalia* or *Velella*; and this free-medusiform body is homologous with the fixed medusiform body of *Diphyes*; which again is homologous with the semi-medusiform, fixed body of a *Tubularia* and with the egg-producing process of the *Hydra*.

Now as all these bodies are homologous with one another, one of two conclusions is possible; either, considering the *Salpa mucronata* to be an individual, we are logically led to look upon the egg-producing process of *Hydra* as an individual also, which seems absurd.

Or starting with the assumption that the egg-producing process of *Hydra* is a mere organ, we arrive at the conclusion that the *Salpa mucronata* is a mere organ also: which appears equally startling.

The whole question appears to turn upon the meaning of the word "individual."

This word the Lecturer endeavoured to shew always means, merely, "a single thing of a given kind."

There are, however, several kinds of Individuality.

*Firstly*, there is what may be called *arbitrary* individuality, which depends wholly upon our way of regarding a thing, and is therefore, merely temporary: such is the individuality of a landscape, or of a period of time; a century for instance.

*Secondly*, there is an individuality which depends upon something else than our will or caprice; this *something* is a fact or law of co-existence which cannot be materially altered without destroying the individuality in question.

Thus a Crystal is an individual thing in virtue of its form, hardness, transparency, and other co-existent qualities; pound it into powder, destroy the co-existence of these qualities, and it loses its individuality.

*Thirdly*, there is a kind of individuality which is constituted and defined by a fact or law of succession. Phenomena which occur in a definite cycle are considered as one in consequence of the law which connects them.

As a simple instance we may take the individuality of the beat of a pendulum. An individual beat is the sum of the successive places of the bob of the pendulum as it passes, from a state of rest to a state of rest again.

Such is the individuality of living, organized beings. Every or-



ganized being *has* been formless and will again be formless ; the individual animal or plant is the *sum* of the incessant changes, which succeed one another between these two periods of rest.

The individual animal is one beat of the pendulum of life, birth and death are the two points of rest, and the vital force is like the velocity of the pendulum, a constantly varying quantity between these two zero points. The different forms which an animal may assume correspond with the successive places of the pendulum.

In man himself, the individual, zoologically speaking, is not a state of man at any particular moment as infant, child, youth or man ; but the sum of all these, with the implied fact of their definite succession.

In this case, and in most of the higher animals, the forms or states of the individual are not naturally separated from one another : they pass into one another, undistinguishably.

Among other animals, however, nature draws lines of demarcation between the different forms ; thus, among insects the individual takes three forms, the caterpillar, the chrysalis, and the butterfly. These do not pass into one another insensibly, but are separated by apparently sudden changes ; each change being accompanied by a separation of the individual into two parts. One part is left behind and dies, it receives the name of a skin or cast ; the other part continues the existence of the individual under a new form.

The whole process is called Ecdysis : it is a case of what might be termed *concentric* fission.

The peculiarity of this mode of fission is ; that of the two portions into which the individual becomes divided at each moult, one is unable to maintain an independent existence and therefore ceases to be of any importance ; while the other, continues to carry on all the functions of animal life and to represent in itself the whole individuality of the animal. From this circumstance there is not objection to any independent form being taken for, and spoken of as the whole individual, among the higher animals.

But among the lower animals the mode of representation of the individual is different and any independent form ceases, in many cases, to represent the whole individual ; these two modes, however, pass into one another insensibly.

The best illustration of this fact may be taken from the development of the Echinoderm, as it has been made known by the brilliant discoveries of Professor Müller.

The Echinus lividus stands in the same relation to its Pluteus, as a butterfly to its caterpillar ; in the course of development only a slight ecdysis takes place, the skin of the Pluteus becoming for the most part converted into the skin of the Echinus.

But in Asterias, the Bipinnaria which corresponds with the Pluteus, gives up only a portion of its integument to the developed Asterias ; the remaining and far larger portion lives for a time after its separation as an independent form.



The Bipinnaria and the Starfish, are as much forms of the same individual as are the Pluteus and Echinus or the caterpillar and butterfly; but here the development of one form is not necessarily followed by the destruction of the other, and the individual is, for a time at any rate, represented by two co-existing forms.

This temporary co-existence of two forms of the individual might become permanent if the Asterias, instead of carrying off the intestinal canal of the Bipinnaria, developed one of its own; and this is exactly what takes place in the Gyrodactylus, whose singular development has been described by Von Siebold.

But the case of the Gyrodactylus affords us an easy transition to that of the Trematoda, the Aphides, and the Salpæ, in which the mutual independence of the forms of the individual is carried to its greatest extent; so that even on anatomical grounds it is demonstrable that the difference between the so called "skin" of the caterpillar, the free Bipinnaria, and the Salpa democratica is not in kind, but merely in degree.

Each represents a *form* of the individual; the amount of independent existence of which a form is capable, cannot affect its homology as such.

The Lecturer then proceeded to point out that the doctrine of the "Alternation of Generations" and all theories connected with it, rest upon the tacit or avowed assumption "that whatever animal form has an independent existence is an individual animal," a doctrine which, he endeavoured to shew, must if carried out, inevitably lead to absurdities and contradictions, as indeed Dr. Carpenter has already pointed out.

There is no such thing as a true case of the "Alternation of Generations" in the animal kingdom; there is only an alternation of true generation with the totally distinct process of Gemmation or Fission.

It is indeed maintained that the latter processes are equivalent to the former; that the result of Gemmation as much constitutes an individual, as the result of true Generation; but in that case the tentacles of a Hydra, the gemmiferous tube of a Salpa, nay, the legs of a Centipede or Lobster must be called individuals.

And if it be said that the bud must have in addition the power of existing independently, to constitute an individual; there is the case of the male Argonaut, which has been just shewn by H. Müller to have the power of detaching one of its arms (a result of gemmation) which then leads a separate existence as the Hectocotylus.

Without a misuse of words, however, no one would call this a separate individual.

In conclusion the Lecturer stated his own views thus:

The individual animal is the sum of the phenomena presented by a



single life : in other words, it is, all those animal forms which proceed from a single egg, taken together.

The individual is represented in very various modes in the Animal Kingdom : these modes pass insensibly one into the other, in nature ; but for purposes of clear comprehension they may be thus distinguished and tabulated.

*Representation of the Individual.*

I. By Successive Inseparable Forms.

*Ascaris*. A. Forms little different = Growth.

*Triton*. B. Forms markedly different = Metamorphosis.

II. By Successive Separable Forms.

1. *Earlier Forms not Independent.*

*Cockroach*. A. Forms little different = Growth with Ecdysis.

*Beetle*. B. Forms markedly different = Growth with Metamorphosis.

2. *Earlier Forms partially Independent.*

*Starfish*.

III. By Successive and Co-existent Separable Forms.

a. *External Gemmation.*

b. *Internal Gemmation.*

A. Forms little different.

All the forms produce eggs.

*Nais*.

*Hydra*.

}

*Gyrodactylus*.

B. Forms markedly different. Last forms only produce eggs.

\* \* Last Forms produced.

Generally :

*Medusa*.

}

*Fluke*.

Locally :

*Salpa*.

}

*Aphis*.

These various modes of Representation of the Individual are ultimate facts. One is neither more nor less wonderful or explicable than another ; any theory which pretends to account for the Successive and Co-existent forms of the Aphis-individual, must also account for the Successive forms of the Beetle-individual or of the Horse-individual — since they are phenomena of essentially the same nature.



When the forms of the Individual are independent it becomes desirable to have some special name by which we may denote them so as to avoid the incessant ambiguity of the two senses of the word individual. For these forms the Lecturer some time ago proposed the name "Zöoid." Thus the Salpa-individual is represented by two Zöoids; the Fluke by three; the Aphis by nine or eleven, &c.

The use of this term is of course a mere matter of convenience and has nothing to do with the question of Individuality itself.

[T. H. H.]

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In the Library were exhibited: —

Leadbeater's Cockatoo; and Australian Birds. [Exhibited by Messrs. Leadbeaters.]

Specimens of the Flora of South Africa, recently brought over by Mr. P. Wicks.

Idol in Granite — Clay heads and Figures, from the Pyramids at Mexico — Mediæval Copper Vase and Spoon — Chinese Compass, and Cup, &c. — Specimen of Ancient Papyrus — Handle of Knife, in carved wood (from Strawberry-hill) — "Eve," in Roman Bronze — Head of a Faun, from Carthage. [Exhibited by Dr. W. V. Pettigrew, M. R. I.]

View of a Mountain Stream, sketched in the Tropics, by P. W. Justyne, Esq.

Greyhounds in Bronze — Inlaid Marble Table from Derbyshire — Two Septaria Slabs from the Oxford Clay — Two Marble Vases copied from the Etruscan — Beautiful Specimen of Gold in Quartz, from South Australia (value £70) — Stereoscope with two slides of Minerals, by Mr. Tennant.

Minerals and other Objects, from the Royal Institution Museum.

Mr. C. Varley exhibited by the Microscope, Embryo Snails, shewing the action of the heart, &c., the circulation of the Sap in the Nitella, and the Trumpet-shaped animalcules.

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## ANNUAL MEETING.

Saturday, May 1.

WILLIAM POLE, Esq. M.A. F.R.S. Treasurer and Vice-President,  
in the Chair.

The Annual Report of the Committee of Visitors on the State of  
the Institution was read and adopted.

Thanks were voted to the President, Treasurer, and Secretary,  
to the Committees of Managers and Visitors, and to Professor  
Faraday, for their services to the Institution during the past year.

The following Gentlemen were unanimously elected as Officers for  
the ensuing year : —

PRESIDENT — The Duke of Northumberland, F.R.S.

TREASURER — William Pole, Esq. M.A. F.R.S.

SECRETARY — Rev. John Barlow, M.A. F.R.S.

## MANAGERS.

William Wilberforce Bird, Esq.  
William Thomas Brande, Esq. F.R.S.  
B. Bond Cabbell, Esq. M.P. F.R.S.  
Capt. Henry John Codrington, R.N.  
J. Griffith Cole, Esq. M.A.  
George Dodd, Esq. M.P. F.S.A.  
Sir Charles Fellows.  
Aaron Asher Goldsmid, Esq.

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George Moore, Esq. F.R.S. F.S.A.  
Frederick Pollock, Esq. M.A.  
Lewis Powell, M.D.  
John Webster, M.D. F.R.S.  
Professor C. Wheatstone, F.R.S.

## VISITORS.

J. G. Appold, Esq.  
J. C. Burgoyne, Esq.  
William Carpmael, Esq.  
Thomas Davidson, Esq.  
Walter Ewer, Esq. F.R.S.  
Augustus Bozzi Granville, M.D. F.R.S.  
F.L.S.  
Col. J. G. Griffith.

Sir John Hall, Bart. F.R.S.  
John Hennen, M.D.  
Edward Kater, Esq. F.R.S.  
Thomas Little, Esq.  
Lord Lovaine.  
Edward Meryon, M.D.  
William Noble Rule, Esq.  
Alfred S. Taylor, M.D. F.R.S.



## GENERAL MONTHLY MEETING,

Monday, May 3.

LEWIS POWELL, M. D. in the Chair.

John George Appold, Esq.

John George Dodson, Esq.

William Wyndham Horner, Esq.

Francis Lloyd, Esq.

Rev. Cyril Page.

were *admitted* Members of the Royal Institution.

Wentworth William Buller, Esq.

Edw. R. Drury, Esq.

Richard Jennings, Esq.

Augustus Oliver Shakspeare

Massey, Esq.

Rev. Frederick D. Maurice,

were duly *elected* Members of the Royal Institution.

WILLIAM THOMAS BRANDE, Esq., F.R.S.L. & E. was unanimously elected Honorary Professor of the Royal Institution.

The Secretary reported, that the Managers had acceded to a proposal from Dr. JOHN CONOLLY to deliver a Course of Twelve Lectures "on Insanity," on Mondays and Wednesdays at 4 o'clock, P.M. commencing on Wednesday, May 5th.

The Presents received since the last Meeting were laid on the Table and the thanks of the Members returned for the same.

## FROM

*Actuaries of Great Britain, Institute of.* — Constitution and Laws of the Institute. 8vo. 1851.

The Assurance Magazine, Nos. 5, 6, 7. 8vo. 1852.

*Architects, Royal Institute of British* — Proceeding for April, 1852. 4to.

*Asiatic Society of Bengal* — Journal, No. 224. 8vo. 1852.

*Astronomical Society, Royal* — Monthly Notices, Vol. XII. No. 4. 8vo. 1852.

*Bell, Jacob, Esq. (the Editor)* — The Pharmaceutical Journal for April, 1852. 8vo.

*Cambridge Philosophical Society* — Transactions, Vol. IX. Part 2. 4to. 1852.

*Chemical Society* — Quarterly Journal, No. 17. 8vo. 1852.

*Civil Engineers, Institution of,* — Proceedings for April, 1852. 8vo.

*Editor* — The Athenæum for March, 1852. 4to.

*Editor* — The Medical Circular for April, 1852. 8vo.

*Ellis, Messrs. (Exeter)* — Map shewing the Time, kept by Public Clocks in Various Towns in Great Britain. (April, 1, 1852.)

*Faraday, Professor* — Text-book of Mechanical Philosophy, by the Rev. R. Walker, M. A., F.R.S., Part I. Mechanics. 16mo. 1851.

Kaiserliche Akademie, Wien: — Denkschriften, Math.-Nat. Classe, Dritter Band, Erste Lieferung. 4to. 1851.

Sitzungsberichte, Math.-Nat. Classe, VII Band; 3, 4, 5 Heft. 8vo. 1851-2.

Phil.-Hist. Classe, VII Band; 3, 4, 5 Heft. 8vo. 1851-2.



*Faraday, Professor* — continued :

*Archiv für Kunde Österreichischer Geschichtsquellen*, VII Band ; 1 und 2 Heft. 8vo. 1851.

*Notizenblatt*, Nos. 19 — 24, 1851 ; — Nos. 1, 2, 1852. 8vo.

*Monumenta Linguae Paleoslovenicæ e Codice Suprasliensi*, edidit F. Miklosich. 8vo. Vindobonæ, 1851.

*Versuch einer Geschichte der Pflanzenwelt*, von Dr. F. Unger. Wien, 1852.

*Systema Helminthum auctore Carolo Mauritio Diesing*. Vol. II. Vindobonæ, 1851.

*Her Majesty's Government* (by Sir H. De la Beche) — *Records of the School of Mines and of Science applied to the Arts*, Vol. I. 8vo. 1852.

(By Col. Edw. Sabine) — *Magnetical and Meteorological Observations at Hobarton*, Vol. II. 4to. 1852.

*Holdsworth, A. H. Esq.* — *Holdsworth's Water-Bulkheads*, for reducing the Temperature and Arresting Fire in Ships or Vessels. 8vo. 1852.

*Hon. East India Company* — *Bombay Meteorological Observations for 1847*. 4to. 1851.

*Horticultural Society of London* — *Journal*, Vol. VII. Part II. 8vo. 1852.

*Lovell, E. B. Esq., M.R.I. (the Editor)* — *The Monthly Digest for April, 1852*. 8vo.

*North, John, Esq., F.R.S., M.R.I.* — *The Anatomy of the Human Gravid Uterus exhibited in figures ; by William Hunter*. (Published by the Sydenham Society.) fol. 1851.

*Oliveira, B. Esq., F.R.S., M.R.I.* — *Human Life, the Phenomena of the Divine Nature and Capacity for Perfection ; by οἱ δύο Ἀδελφοὶ Χειρουργοὶ*. Part I. *The Material Life*. 16mo. 1852.

*Phillipps, Sir Thomas, Bart., F.R.S., M.R.I.* — *The Cambridgeshire Visitation, by Henry St. George, 1619, from MSS. Phillipps No. 63*. Edited by Sir T. P. Bart. fol. 1840.

*The Visitation of Middlesex begun in the year 1663*, by William Ryley, Esq. Lancaster, and Henry Dethick, Rouge Croix, Marshals and Deputies to Sir Edward Bysshe, Knt. Clariencieux King of Arms. fol. 1820.

*Oxfordshire Monumental Inscriptions* (from the MSS. of Anthony à Wood, Dr. Hutton, and Mr. Hinton.) fol. 1825.

*Royal Society of London* — *Transactions for 1851, Part II*. 4to. 1852.

*Proceedings*, No. 76. and Vol VI. No. 11. 8vo. 1851-2.

*Scoffern, John, M.B., F.S.A. (the Editor)* — *The Chemical Record for April, 1852*. 4to.

*Statistical Society of London* — *Journal*, Vol. XV. Part I. 8vo. 1852.







