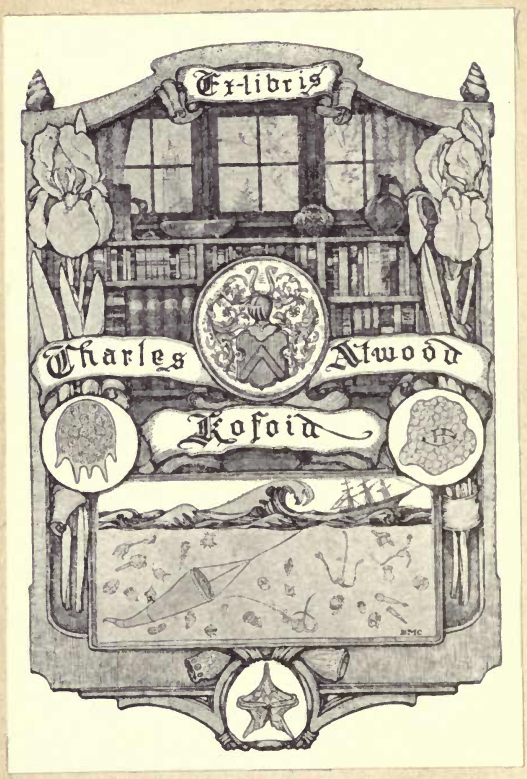
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THE BIOLOGY OF DAILY LIFE.

MY PURPOSE IS SIMPLY TO SHOW THAT A RATIONAL POLICY MUST RECOGNIZE CERTAIN GENERAL TRUTHS OF BIOLOGY; AND TO INSIST THAT ONLY WHEN STUDY OF THESE GENERAL TRUTHS, AS ILLUSTRATED THROUGHOUT THE LIVING WORLD, HAS WOVEN THEM INTO THE CONCEPTIONS OF THINGS, IS THERE GAINED A STRONG CONVICTION THAT DISREGARD OF THEM MUST CAUSE ENORMOUS MISCHIEFS.

HERBERT SPENCER *in The Study of Sociology* (*p.* 346).

DICTAT RATIO (SI QUID EGO HIC JUDICO,) MORBUM, QUANTUMLIBET EJUS CAUSAE HUMANO CORPORI ADVERSENTUR, NIHIL ESSE ALIUD QUAM NATURAE CONAMEN, MATERIAE MORBIFICAE EXTERMINATIONEM IN AEGRI SALUTEM OMNI OPE MOLIENTIS.

TH. SYDENHAM, M.D., *Opera Omnia* (*p.* 26).

[REASON (IF SUCH AN ONE AS I MAY PRONOUNCE ANY JUDGMENT) REQUIRES US TO BELIEVE, THAT, BE THE SYMPTOMS OF IT, WHICH AFFLICT THE HUMAN BODY, NEVER SO SEVERE, DISEASE IS NOTHING ELSE BUT THE EFFORT OF NATURE, ATTEMPTING BY EVERY MEANS THE EXTERMINATION OF THE DISEASE-PRODUCING MATTER, FOR THE HEALTH OF THE PATIENT.]

THE BIOLOGY OF DAILY LIFE

BY

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PREFACE.

To clear the way for the understanding of the line of argument adopted in this little book, I commence with a quotation from Herbert Spencer's *Synthetic Philosophy*, on the scope of Biology.

I do this for two reasons:

1. To present the reader with the fullest and clearest explanation obtainable, of the meaning of the words "Biology" and "Biological."

2. To show what are those principles or conclusions of this science, which Herbert Spencer takes as fundamental or axiomatic, in constructing his system.

I make no use whatever of the Spencerian system in itself. I simply say at the outset of my work, I am justified in taking it as granted that such and such principles may truly be regarded as proved, verified and generally accepted, because they are a portion of those very principles which that great and accurate thinker is content, or rather constrained in constructing his Synthetic Philosophy, to take as axiomatic or fundamental, in the special area of Biology.

The foundations of the Spencerian system are

laid deep, as all the thinking world knows, in this department of science.

Even those who may find fault with the superstructure, cannot deny the reality of its deep foundations.

A few words about the origin of this little work will explain and apologize for certain personal allusions, particularly in the seventh chapter.

Last March, a German professor of chemistry wrote to me from a town in Saxony, asking for an "exhaustive and impartial" account of the system of Mr. Joseph Wallace. This set me to try and explain so far as I could (keeping carefully to the outside of the system itself) the connection between Wallace's discoveries and generally accepted scientific teaching in Chemistry and Biology.

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The Vicarage,
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January, 1890.

THE BIOLOGY OF DAILY LIFE.

THE SCOPE OF BIOLOGY.

FROM HERBERT SPENCER'S SYNTHETIC PHILOSOPHY.

"In the chapters treating of Organic Matter, the Actions of Forces on it, and its Reactions on Forces, the generalizations reached were these:—That organic matter is specially sensitive to surrounding agencies; that, in consequence of the extreme instability of the compounds it contains, minute disturbances can cause in it large amounts of re-distribution; and that, during the fall of its unstably-arranged atoms into stable arrangements, there are given out proportionately large amounts of motion. We saw that organic matter is so constituted that small incident actions are capable of initiating great reactions—setting up extensive structural modifications and liberating large quantities of power.

"In the chapters just concluded the changes of which Life were made up were shown to be so adjusted as to balance outer changes. And the general process of the adjustment we found resolves itself into this; that if in the environment there are any related actions, A and B, by which the organism is affected, then if A produces in the organism some change *a*, there follows in the organism some change

b, fitted in time, direction, and amount to meet the action B—a change which is often required to be much larger than its antecedent.

"Mark, now, the relation between these two final results. On the one hand, for the maintenance of that correspondence between inner and outer actions which constitutes Life, an organism must be susceptible to small changes from small external forces (as in sensation), and must be able to initiate large changes in opposition to large external forces (as in muscular action). On the other hand, organic matter is at once extremely sensitive to disturbing agencies of all kinds, and is capable of suddenly evolving motion in great amounts. That is to say, the constitution of organic matter specially adapts it to receive and produce the internal changes required to balance external changes.

"This being the general character of the vital Functions, and of the Matter in which they are performed, the science of Biology becomes an account of all the phenomena attendant on the performance of such Functions by such Matter—an account of all the conditions, concomitants, and consequences, under the various circumstances fallen into by living bodies." —(*Principles of Biology*, vol. i., pp. 94 and 95.)

CHAPTER I.

THE LAW OF INTERCHANGE.

It is a long known, well established and now universally acknowledged fact, that the mineral, vegetal, and animal kingdoms bear a definite relation to each other. Plants are intermediary as regards sustenance, between minerals and animals—a necessary link in the chain of being.

This has long been known, and is now a *commonplace*—a household word—of Biological science.

Professor Asa Gray, in his "Structural and Systematic Botany" (New York, 1862), a standard work in its day, says (page 23):

> "Plants live directly upon the mineral kingdom. *They alone convert inorganic or mineral into organic matter;* while animals originate none, but draw their whole sustenance from the organized matter which plants have thus elaborated."

In a standard medical work of the present day (Quain's *Dict. of Medicine*, 1886), Dr. Pavy writes in his article on "Aliment" (p. 81):

> "The aliment of organisms belonging to the vegetable class is derived from the inorganic kingdom. Under the influence of the sun's rays the inorganic principles are applied to growth, and constructed into organic com-

pounds. This constitutes the main operation of vegetable life, and in it we have the source of the aliment of animals, which can *only* appropriate *organic compounds*, and which, either directly or indirectly, derive these compounds from the vegetable kingdom.

"As the solar force, employed in the construction of organic compounds through the agency of the vegetable organisms, becomes locked up in the compound formed, such compound represents matter combined with a definite amount of latent force. In the employment, therefore, of organic matter as aliment by animals we have to look upon it, not only as yielding the material required for the construction and maintenance of the body, but as containing and supplying the force which is evolved under various forms by the operations of animal life."

The position of plants, as a needful link, between the mineral and animal, in the matter of food supply, is, as we see, well known.

To complete the picture it is only necessary to remember the *economy* of Nature, in using over and over again the same materials. Think of the vast army of scavengers, belonging both to the animal and vegetable worlds, which are employed to use up every decomposing particle of vegetable or animal substance, and hasten its resolution into the inorganic state, as water, carbonic acid, ammonia and such like.*

* See "*Fungi*," by Cooke & Berkeley. (Internat. Scient. Series, p. 222.)

We find, as a matter of observation, that the sustenance of those plants which are suited for the food of animals, is itself derived (not from the mineral world *in general*), but most chiefly from those mineral particles which had previously been incorporated into organisms.

This completes the picture. We see the mutual dependence of the three kingdoms, as regards supply upon each other. It is in fact *this very question of supply* which most clearly marks the boundaries of *those* Three Kingdoms, united and yet distinct, which we call animal, vegetal, and mineral kingdoms. This mutual dependence we shall name the "LAW OF INTERCHANGE." But in the following chapters we shall only need to keep in mind that well established and generally acknowledged portion of this Law, which declares that, ANIMALS DRAW DIRECTLY OR INDIRECTLY THEIR WHOLE SUSTENANCE FROM THE ORGANIZED MATTER WHICH PLANTS HAVE ELABORATED.

While this *Law of Interchange* may be well said to be generally acknowledged, yet some more or less obvious deductions or corollaries, consequent upon this law, are either not seen as they ought to be, or are practically disregarded.* Let us consider some of these in the following chapters.

* Any reader may see for himself a remarkable example of this practical disregard of a principle, which at the same time is fully stated in words in this very article on "ALIMENT" in Quain's Dictionary. We have seen it stated (to put the sense of the above quotation shortly): "We have to look upon the organic matter employed as aliment for animals, not only as yielding the *material*, but also as supplying the *force*, &c. This force-supply being derived *from the latent solar force locked up in the com-*