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Aphorisms Concerning Ideas, Science & the Language of Science by William Whewell

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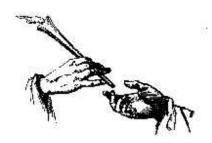
CONCERNING

IDEAS, SCIENCE, AND THE LANGUAGE OF SCIENCE.

BY THE

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Δαμπάδια έχοντες διαδώσουσιν άλλήλοις.

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THE views presented in the following Aphorisms are further developed in the Philosophy of the Inductive Sciences. 1

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I.

MAN is the Interpreter of Nature, Science the right interpretation.

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The Senses place before us the Characters of the Book of Nature; but these convey no knowledge to us, till we have discovered the Alphabet by which they are to be read.

III,

The Alphabet, by means of which we interpret Phenomena, consists of the *Ideas* existing in our own minds; for these give to the phenomena that coherence and significance which is not an object of sense.

IV.

The antithesis of *Sense* and *Ideas* is the foundation of the Philosophy of Science. No knowledge can exist without the union, no philosophy without the separation, of these two elements.

v.

Fact and Theory correspond to Sense on the one hand, and to Ideas on the other, so far as we are conscious of our Ideas: but all facts involve ideas unconsciously; and thus the distinction of Facts and Theories is not tenable, as that of Sense and Ideas is.

VI.

Sensations and Ideas in our knowledge are like Matter and Form in bodies. Matter cannot exist without Form, nor Form

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without Matter: yet the two are altogether distinct and opposite. There is no possibility either of separating, or of confounding them. The same is the case with Sensations and Ideas.

VII.

Ideas are not *trans*formed, but *informed* Sensations; for without ideas, sensations have no form.

VIII.

The Sensations are the *Objective*, the Ideas the *Subjective* part of every act of perception or knowledge.

IX,

General terms denote *Ideal Conceptions*, as a *circle*, an *orbit*, a *rose*. These are not *images* of real things, as was held by the Realists, but conceptions: yet they are conceptions, not bound together by mere *name*, as the Nominalists held, but by an idea.

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It has been said by some, that all Conceptions are merely states or feelings of the mind, but this assertion only tends to confound what it is our business to distinguish.

XI.

Observed Facts are connected so as to produce new truths, by superinducing upon them an Idea: and such truths are obtained by Induction.

XII.

Truths once obtained by legitimate Induction are Facts: these Facts may be again connected, so as to produce higher truths: and thus we advance to *Successive Generalizations*.

XIII.

Truths obtained by Induction are made compact and permanent by being expressed in *Technical Terms*.

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XIV.

XV.

Necessary truths derive their necessity from the *Ideas* which they involve ; and the existence of necessary truths proves the existence of *Ideas* not generated by experience.

XVI.

In Deductive Reasoning, we cannot have any truth in the conclusion which is not virtually contained in the premises.

XVII.

In order to acquire any exact and solid knowledge, the student must possess with perfect precision the ideas appropriate to that part of knowledge: and this precision is tested by the student's *perceiving* the axiomatic evidence of the *axioms* belonging to each *Fundamental Idea*.

XVIII.

The Fundamental Ideas which it is most important to consider, as being the Bases of the Material Sciences, are the Ideas of Space, Time (including Number), Cause (including Force and Matter), Outness of Objects, and Media of Perception of Secondary Qualities, Polarity (Contrariety), Chemical Composition and Affinity, Substance, Likeness and Natural Affinity, Means and Ends (whence the notion of Organization), Symmetry, and the Ideas of Vital Powers.

XIX.

The Sciences which depend upon the Ideas of Space and Number are *Pure* Sciences, not *Inductive* Sciences: they do not infer special Theories from Facts, but deduce the conditions of all theory from Ideas. The Elementary Pure Sciences, or Elementary Mathematics, are Geometry, Theoretical Arithmetic and Algebra.

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XX.

The Ideas on which the Pure Sciences depend, are those of *Space* and *Number*; but Number is a modification of the conception of Repetition, which belongs to the Idea of *Time*.

XXI.

The *Idea of Space* is not derived from experience, for experience of external objects *presupposes* bodies to exist in Space. Space is a condition under which the mind receives the impressions of sense, and therefore the relations of space are necessarily and universally true of all perceived objects. Space is a *form* of our perceptions, and regulates them, whatever the *matter* of them may be.

XXII.

Space is not a general notion collected by abstraction from particular cases; for we do not speak of *Spaces* in general, but of universal or absolute *Spaces*. Absolute space is infinite. All special spaces are *in* absolute space, and are parts of it.

XXIII.

Space is not a real object or thing, distinct from the objects which exist in it; but it is a real condition of the existence of external objects.

XXIV.

We have an *Intuition* of objects in space; that is, we contemplate objects as *made up* of spatial parts, and apprehend their spatial relations by the same act by which we apprehend the objects themselves.

XXV.

Form or figure is space limited by boundaries. Space has necessarily three dimensions, length, breadth, depth; and no others which cannot be resolved into these.

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XXVI.

The Idea of Space is exhibited for scientific purposes, by the Definitions and Axioms of Geometry; such, for instance, as these:—the Definition of a Right Angle, and of a Circle;—the Definition of Parallel Lines, and the Axiom concerning them; the Axiom that two straight lines cannot inclose a space. These Definitions are necessary, not arbitrary; and the Axioms are needed as well as the Definitions, in order to express the necessary conditions which the Idea of Space imposes.

XXVII.

The Definitions and Axioms of Elementary Geometry do not completely exhibit the Idea of Space. In proceeding to the Higher Geometry, we may introduce other additional and independent Axioms; such as that of Archimedes, that a curve line which joins two points is less than any broken line joining the same points and including the curve line.

XXVIII.

The perception of a solid object by sight requires that act of mind by which, from figure and shade, we infer distance and position in space. The perception of *Agure* by sight requires that act of mind by which we give an outline to each object.

XXIX.

The perception of form by touch is not an impression on the passive sense, but requires an *act* of our muscular frame by which we become aware of the position of our own limbs. The perceptive faculty involved in this act has been called *the muscular sense*.

XXX.

The *Idea of Time* is not derived from experience, for experience of changes *presupposes* occurrences to take place in Time. Time is a condition under which the mind receives the impressions of sense, and therefore the relations of time are necessarily