

THE DIMENSIONAL FRAMEWORK OF THE NATURAL SCIENCES

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We may define the natural sciences as the study of the regularities observed in normal human sense perception, thereby excluding sub-normal and supra-normal experiences, if such exist, as well as judgments of value that imply non-sensual premises. The exclusion of sub-normal perceptions is effected by rejecting incompetent or unreliable experiments and fantastical assertions unsupported by well-attested evidence. We tend to overlook the rigorous selective process that leaves for serious consideration only the work of an elite of experimenters and theoreticians. From the other side, the scientist cannot avoid value judgments, but his method does not help him either to construct or to criticize them. Furthermore, the scientist is forced to disregard assertions made only upon the basis of subjective experiences, not susceptible by their nature of independent verification. I shall use the word 'phenomena' in a special sense to designate all experience that can be communicated by some form of ostensive definition, e.g., by describing the experiment to be performed and the steps to be followed in its interpretation.

Phenomena can be analyzed into three elements: epistemological, ontological and normative. In the present context these words are to be used with meanings more restricted than in classical metaphysics. The epistemological element in phenomena is the spontaneous or intentional arising of correspondences between two processes, namely, the sense experiences of the scientist, and his mental and linguistic apparatus. Such correspondences can arise independently of consciousness, and can be stimulated by cybernetic mechanisms.¹

All that is knowable in phenomena is 'function'. Knowledge is thus functional correspondence. It does not and cannot tell us anything about being. The ontological element in experience emerges from the discovery² that phenomena display different levels of organization, or grades of existence. It is this discovery that has made possible the specialization which is one of the principal instruments of natural science. It can be called the *doctrine of the relativity of being*. Ontological gradations cannot be known. We have been accustomed since Kant to accept that being cannot be the predicate of a judgment. It is necessary to give this a relativistic interpretation, which is possible by recognizing on the one hand that knowledge can be of function only, and on the other that being itself is relative. We cannot 'know' the being of an electron, or that of a crystal, or a cell, or a vertebrate animal, but we have an immediate intuition that they stand upon different levels. Several problems prove to be meaningless when we recognise that they consist in asking questions about *being* in a form that could only be answered in terms of *function*. Such are the questions: 'What is energy?' 'What is life?' 'What is mind?' The relativity of existence is not a metaphysical principle but a phenomenal datum. Each of the scientific disciplines, such as dynamics, physics, chemistry, colloid science, cytology, embryology, zoology, psychology, deals with a particular stratum of existence. We can extend and

perfect our knowledge of each stratum, but our knowledge stops short at the question as to what 'is' the subject matter and what 'are' the entities that we study in each case.

The recognition in phenomena of the two elements of function and being does not complete the analysis. There remain the over-riding regularities that I call 'normative' in the sense that we discover them in all experience, and through this discovery can affirm the possibility or impossibility of phenomena and the truth or falsehood of synthetic propositions. Alternatively, we can say that, when we *understand* the normative element in experience, we can make truth judgments about the regularities that appear to emerge from our observations and experiments. In this sense, we can speak of the normative element as 'the framework' within which all phenomena must be ranged in order to escape rejection as fictitious, illusory, abnormal, or supra-normal.

Framework can be defined as the totality of universal determining conditions applicable to all phenomena upon all levels of existence. These conditions are more or less the categories or metaphysical first principles. To avoid association with other metaphysical schemes, I shall use the terms 'presence', 'actualisation', 'potentiality', and 'correspondence', to denote the four fundamental determining conditions to which every phenomenon must conform if it is to be an authentic manifestation of normal experience.

(i) PRESENCE

Every authentic phenomenon is present for some form of experience. Space is the determining condition of presence. We are aware of presence through our senses (especially sight and touch) by way of surfaces, localizations, configurations, intervals, volumes, paths and so forth. Every whole has its own presence, and therefore determines its own space. Every collection of wholes determines the composite space which is their common presence. Mathematicians, physicists and philosophers do no more than add precision to the primitive intuitions of presence that are shared by all sentient beings.

(ii) ACTUALISATION

Actualisation is fixation by selection. Any given whole is the bearer of indeterminate possibilities. Actualisation is relative to a state of consciousness, but it is a condition of all authentic phenomena. An unactualized possibility is not a phenomenon. Actualization is successive and in various ways conservative, recurrent and irreversible. Time is the determining condition of actualisation. Every whole has therefore its own time. For any collection of wholes there is a composite time. Universal time is not absolute but relative to the most comprehensive collection of wholes that can be perceived or inferred from normal experience.

(iii) POTENTIALITY

Every phenomenon presents itself to our experience with possibilities of actualisation. Eternity is the determining condition of all possibilities. Possibilities are relative to the gradation of existence. They range from determinism to freedom. Different possibilities can coexist in a given whole. Potentiality is instantaneous, multivalued, ordered, discrete, invisible, and so forth. By invisible is meant that potential differences are not given directly in sense perception, but inferred. The discreteness of eternity is recognized in the absence or paucity of intermediate forms between different levels of organization. Phenomena to be authentic must satisfy the determining conditions of eternity, for actualization without potentiality is an abstraction. The determining conditions of eternity are inferred from all the data of natural science, but especially from statistics, thermodynamics, nuclear physics, colloid science, genetics and embryology, insofar as these sciences have to take into account the possibilities concealed behind the visible process.

(iv) CORRESPONDENCE

Phenomena exhibit correspondences allowing recurrent structures to be observed and recognised. By virtue of correspondence, phenomena can be analysed, classified, named, and hence propositions can be formulated. Correspondence makes possible measurements, principally through the senses of sight and touch. Number is the determining condition of correspondence. Correspondence is the source of classification, order, comparison, and the assignment of truth values to synthetic propositions.

The determining conditions can be applied to the study of phenomena in the form of a reference framework consisting of five independent directions and the series of real and imaginary numbers. All conditions of presence can be represented by numbers associated with three independent directions. Actualisation can be associated with a direction independent of those of presence, and the series of imaginary numbers. Potentiality can be represented by a fifth independent direction, and the series of imaginary numbers. In each case the numbers can be associated with intervals, defined as the relationship between the presences of two wholes each in a unique state of actualisation and potential.³ The three dimensions of presence will be called *space*, that of actualisation *time* and that of potential *eternity*. Intervals can be real (space-like) or imaginary (time-like or eternity-like) or complex (mixed). Phenomena can thus be adequately represented in a geometrical scheme of three real and two imaginary dimensions. Intervals can then be given a homogeneous interpretation in a manner analogous to that of Minkowski's 'absolute world'.⁴

The conception of a five-dimensional framework for the representation of phenomena has attracted little attention even among those philosophers, who are well aware of the implications of Einstein's relativity and Planck's quantum hypothesis. It is therefore necessary to give a brief account of five-dimensional theories.

⁵ Prince Louis de Broglie, writing in 1927 of the fifth dimension in physics, said: "The variations of this fifth variable escape entirely from our sense perception. So the two points of the universe which have the same values of the four variables, space and time, but different values for the variable X^0 are for us indistinguishable the one from the other. We are, as it were, enclosed in our four-dimensional space-time manifold and all that we perceive is the projections on to this spacetime of the points of the five-dimensional universe".⁶

Fridthjof Økland has put forward an interpretation of the biological sciences in terms of a fifth dimension, and this has been further developed by Brochmann.⁷

It must be emphasized that we do not 'know' the framework determining conditions in the same way as we know function. "*Si non rogas intelligo*" applies not only to time but also to space, eternity and number. We experience phenomena as present, actualising, potential and corresponding, and we could not conceive them otherwise. No synthetic proposition regarding sense experience can be valid which does not satisfy the determining conditions. In this sense they are categoreal and differ from the regularities that we observe in the functional mechanism of the world, and that constitute the content of our knowledge. We *know* only the functional element in phenomena. We *experience* but do not know the existential element. We neither know nor experience the universal determining conditions, but we can never escape from them.⁸ They have to be *understood*.

For a fuller account of the views briefly summarised in the present paper, reference must be made to my forthcoming book, *The Dramatic Universe* (Hodder & Stoughton, London).⁹ In this book I have shown that a consistent account of the natural sciences upon all levels of organization can be given in terms of a set of hypotheses as to the nature of the entities studied in each case - all within the framework of eternity, time, space and the determining condition of number. Moreover, this scheme enables us to bring the natural sciences into harmony with the meta-phenomenal intuitions of art and religion.

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ENDNOTES

1 Cf. D. M. MacKay, *Mind-Like Behaviour in Artifacts*, Brit. Jnl. for the Phil. of Sc., Vol. 2, p. 105, and M. Polanyi, *The Hypothesis of Cybernetics*, ibid. p. 313.

2 The discovery is made by every child, but it was first clearly formulated in Western thought by Aristotle in the *ἐπὶ τὰ ζῷα ἱστορίαι* and especially the *περὶ ζώων γενέως*.

3 Wholes can be reduced to point events by the method of extensive abstraction, Cf. A. N. Whitehead, *The Concept of Nature*, 1920 pp. 74-98.

4 H. Minkowski: *Raum und Zeit*, address to 80th Assembly of German Natural Scientists and Physicians at Cologne, 21st September 1908.

5 The introduction of a fifth independent dimension into the framework of physical science was first proposed by Kaluza in 1921 following a suggestion of Hermann Weyl. Later Klein showed that a fifth dimension orthogonal to space-time would serve to represent the material wave equation of de Broglie. Rosenfeld, Flint and others have further developed a five-dimensional physical theory. Sir Arthur Eddington used five independent dimensions in his famous *a priori* derivation of the universal constants. Bennett, Brown and Thring showed that a consistent electro-dynamical theory could be derived from a five-dimensional curvature-free representation manifold. (*Proc. Roy. Soc.* 1949, Vol. 198, pp. 39-61).

6 L. de Broglie, *Jl. Phys. Radium*, 1927, Vol. 8, p. 65.

7 Georg Brochmann, *Mankind and Eternity*, Oslo 1951. In this book several chapters are devoted to an examination of five-dimensional theories in which the fifth dimension is identified with the direction of eternity.

8 It is more or less in this sense that Whitehead is to be understood when he says that “the metaphysical first principles never fail of exemplification. We can never observe the phenomenal world taking a holiday from their sway”. (*Process and Reality*, p. 4). Philosophers have not fully realised the need to discard a harmful legacy of Greek thought which treats space as existing though void. Epicurus refers to space as *χώρα*, *τόπος* and also as *το κενόν* but he refers to it as *‘αναφής φύσις*, i.e. ‘imperceptibly existing’ and Lucretius (*De Rerum Nat.* i. 427) to *locus ac spatium quod inane vocamus*. This is typical of the confusion of the ancients about the notion of space as a receptacle, from which unfortunately we have not yet freed ourselves. We have to recognise how strongly such faulty conceptions have influenced our thinking for more than 2,000 years. We must understand, once and for all, that space, time and eternity do not ‘exist.’

9 Cf. also J. G. Bennett’s *The Crisis in Human Affairs* (Hodder & Stoughton 1947) and *What are we Living For?* (1949).