

Appendix: Science and Philosophy

Philosophies of Science and Scientific Practice

John Locke said that philosophy clears the undergrowth and permits science to grow. Yet many scientists are impatient of philosophy, even when they are lost in the undergrowth and armed with inadequate machettes. They remain impatient even when, in effect, they are doing philosophy themselves. The severance between philosophy and science has grown so deep that it is institutionalised: philosophy is seldom taught in university science faculties.

Many recent philosophers of science such as Morton Beckner and Dudley Schapere have recognised that overarching accounts of knowledge such as positivism and mechanistic materialism are not particularly useful because science is a heterogeneous enterprise. The disciplines we label ‘science’ today share a family resemblance but they involve different thinking styles and different ways of constructing knowledge, as we saw in Chapter 16. These philosophers have focused on the minutiae of actual scientific practice rather than ‘grand theory’. They draw on long traditions in the philosophy of knowledge, but their work (Schapere’s in particular) shows the influence of the history and sociology of science as well. Their investigations are pertinent to all scientists who wish to reflect on the nature of their own work.

The heterogeneity of science is manifest in inconsistencies. In Chapter 13 we described Morgan as inconsistent: he was a mechanistic materialist and an ardent experimentalist, but he believed in crossing-over when the hypothesis had no experimental support. Morgan is by no means alone. Scientists who adopt definite philosophical positions are seldom able to remain consistent.

This point is well illustrated by Einstein, who in 1905 published six papers of which at least three (the photoelectric effect, Brownian motion¹ and the special theory of relativity) were landmarks in the development of modern physics. In his autobiographical notes, Einstein stated that before writing those papers he had been influenced by the philosophical works of David Hume and Ernst Mach. If so, then he was sceptical about the Newtonian-Kantian account of the world, about induction, and about the knowability of ‘things-in-themselves’.

¹ ‘Brownian motion’ is the rapid, random ‘jumping’ movements of microscopic particles suspended in a fluid such as water. The phenomenon was first observed in 1827 by the botanist Robert Brown (1773–1858) in small particles within pollen grains; hence the name.

Mach dismissed the notions of absolute space and absolute time because they have no basis in the evidence of the senses. Einstein's special theory of relativity paper accounted for the non-Newtonian behaviour of objects moving at very high velocities by accepting Mach's position. The new theory replaced Newtonian mechanics in certain applications.² But for the same philosophical reasons, Mach also dismissed belief in atoms; such was his influence that leading chemists of the day such as Oswald also rejected atomic theory. If Einstein had been philosophically consistent, he would have been just as sceptical about atoms as he was about the Newtonian-Kantian idea of absolute space and time. But he was not.

In his paper on Brownian motion, Einstein proved that atomic theory provides the *only* perspective capable of accounting for that phenomenon. The paper ended with an invitation, or challenge, to experimentalists to test his mathematical predictions. Two years later, Perrin did so; atomic theory was firmly established. Einstein had effectively proved the existence of atoms, the 'metaphysical' concept that Mach and his followers had scorned.³

These examples show that for the most eminent of scientists, no single philosophical account of 'science' suffices for all occasions. General philosophical positions can be valuable guides but they should not become straitjackets. We do not blame Einstein for inconsistency. Neither, therefore, should we blame Morgan, or any other scientist in a similar situation.

The Nature of Scientific Theories

Both the aforementioned Einstein papers challenged entrenched beliefs (Newtonian mechanics in one case, and the invalidity of atomic theory on the other). But how *deeply* was each of these beliefs entrenched? According to Kant, a concept is undeniable if it is so fundamental to thought that it seems innate in the mind's structure. Therefore, to challenge a *deeply* entrenched concept is to oppose Kant, i.e. to share the scepticism of Hume and Mach. Hence the extreme phenomenalism of the special relativity paper. In contrast, although atomic theory is a deep issue, it

²Einstein observed (apparently at the age of 16) that Maxwell's equations would give infinite solutions if the observer was travelling at the same velocity as a light wave. That was tantamount to saying that the equations did not apply at that velocity, i.e. no observer could travel at the speed of light. This was the main motivation for the special theory of relativity. The paper was directly relevant to the physics of the time; it explained the unexpected result of the Michaelson-Morley experiment (which effectively disproved the existence of the 'luminiferous aether') and justified the Lorenz-Fitzgerald contraction, an *ad hoc* device for explaining the 'failure' of the Michaelson-Morley experiment.

³Strictly speaking, Einstein had validated Boltzmann's *kinetic theory*, but as phenomenologists such as Mach had pointed out, kinetic theory made no sense if atoms did not exist. In 1908, a year after Perrin's work was published, the phenomenologist Wilhelm Ostwald – previously an implacable opponent of atomism – publicly declared his conversion.

is not ‘part of the mind’s innate structure’. Therefore, the Brownian motion paper was compatible with Kant and failed to show the influence of Hume and Mach. This contrast between ‘deep’ and ‘less deep’ ideas becomes clearer when we consider how theories are constructed and how they change.

The word ‘theory’ can be problematic. For one thing, it is not used consistently even by philosophers or scientists. The most satisfactory brief definition we can offer is: *a set of data, general principles and postulates interlinked by logical or mathematical argument and affording a general means for explaining and predicting a wide range of phenomena*. All major theories conform to this broad definition: Newtonian mechanics, thermodynamics, electromagnetic theory, relativity, quantum mechanics – and evolutionary theory. They are logically coherent conceptual structures founded upon postulates and definitions. They consist of laws of nature, procedures of reasoning and relevant data. They interconnect indefinitely large ranges of observations and experimental results that could otherwise seem unrelated, such as the falling of apples and the orbiting of planets. They are all *dynamic* and continually changing.

Generalisations and principles are fairly uncontentious aspects of theory, but why do we include *data*? The reason is that scientific data are not just *any* data; they are selected. When an object is described in Newtonian mechanics, the relevant properties include mass, position, initial velocity and acceleration. We ignore other properties, which might be important to us in different contexts (e.g. colour, odour, monetary value, whether it is a common or unusual object). *A theory obliges us to consider only certain data and to exclude others*. In Newtonian mechanics, mass and velocity are independent of one another; in relativistic mechanics they are not, and we must speak of the ‘rest mass’ of an object (defined as the mass when its velocity relative to the observer is zero). Thus, what data are relevant, and how they are defined and interpreted, depend on the theory. *Data must be regarded as parts of theory*.

That may seem contrary to intuition, even to common sense. Let us consider an everyday observation statement. Surely ‘the dog is asleep on the sofa’ remains true or false no matter what theories we accept? (We might have different opinions about whether the dog *ought* to be asleep on the sofa, but that is another matter.) However, ‘the dog is asleep on the sofa’ is unproblematic only because we all agree about the use of English words and syntax. If we did not, then two people might argue about whether the statement was true, or whether it meant anything at all.

In Chapter 1 of this book we noted that although ‘science’ is in some respects a special kind of knowledge, it involves the same perceptions, dispositions and mental processes that we use in everyday life. Thus, we may regard our ordinary native language as representing our ‘theory’ of the everyday world. If we use a different language we have a different ‘theory of the world’. Analogously, we may regard a scientific theory as a specialised language for talking about particular *aspects* of the world: different theories are expressed in different ‘languages’. Alternative theories such as Newtonian and relativistic mechanics may make different sense of apparently identical observations.

The psychologist George Kelly epitomised this position in his phrase ‘man as scientist’. According to Kelly,⁴ we start to form mental representations of the world around us during infancy and we continually test those representations against experience and modify them as required. The language in which we talk about daily experience, our own native language, is a dynamic part of that mental representation: it shapes it and is shaped by it. In other words, it behaves just as a scientific theory behaves.

What we observe and recognise depends on the way our minds construe the world, not just on the images conveyed to our brains from our sense-organs. To that extent, we have to agree with Kant. For instance, people from Western culture can interpret a picture showing an array of parallel lines as a staircase (seen either from above or from below). But people from many African cultures cannot interpret the image that way. They do not construe pictorial representations as post-Renaissance Europeans do. Our language and our cultural habits enable us to understand the world but they also *constrain* our understanding. The theories used by scientists are their languages and cultural habits. Theories enable us to understand the part of the world we are studying, but they also constrain our understanding.

Do these considerations help us to make sense of the claim that theoretical ideas in science may be ‘deep’ or ‘less deep’?

Theory Structure and Theory Change⁵

We can picture a theory as an amoeba that lives in a sea of data and grows by engulfing and assimilating all the facts that are compatible with its ‘metabolism’ (its postulates, definitions, laws and procedures of reasoning). Amoebae continually move around, changing their shapes and growing, unless they are dead. Scientific theories are ever-shifting and ever-growing, unless they are dead. Amoebae examine and ingest possible morsels of food by extending pseudopodia. Theories examine and ingest possible morsels of data by extending hypotheses. At its periphery, the structure is very labile. Parts of the surface can be removed and the amoeba (or the theory) will re-seal and carry on as before, more or less unaffected. At the core, around the ‘nucleus’, things are different. Removal or alteration of material here has dramatic effects. The theory is radically changed or killed. This metaphor gives a visual impression of ‘deep’ and ‘less deep’ theoretical ideas.

Bigger and more active amoebae sometimes eat smaller ones. Analogously, two theories might ‘fuse’ to produce a more general one. Newtonian mechanics ingested

⁴The book by Fransella and Bannister (see bibliography) gives a lucid introduction to Kelly’s theory of personality.

⁵The ‘amoeba’ metaphor in this section is based on Willard Quine’s description of scientific theories. The ‘natural selection’ analogue of the evolution of theories is due to Stephen Toulmin. See the bibliography for references.

and assimilated Kepler's account of the solar system. Classical thermodynamics and classical mechanics were combined in statistical mechanics. If two theories or two variants of a theory co-exist they may compete, whereupon the better-adapted one survives. 'Better-adapted' means better able to assimilate and rationalise new data and better equipped to generate testable hypotheses. In the middle of the 20th century, two rival theories of cosmology were current; they came to be known as the 'big bang' and 'steady state' theories. During the third quarter of the century, more and more new data, such as the constant background microwave radiation of the universe, proved incompatible with the steady state theory and consistent with the predictions of the 'big bang'. As a result, the 'big bang' came to be more and more widely accepted while the steady state theory was gradually abandoned. That is not to say that the 'big bang' theory is *true* in any absolute sense; rather, the theory is *useful* in a way that the steady state theory is not.

Theories can no more be adjudged 'true' or 'false' than languages can. But a theory, like a language, might prove more or less useful, and it is the useful ones that survive. We accept, deploy and believe *useful* theories. Thus, we cannot claim that Einstein's theory is true and Newton's false; rather, Einstein's theory is useful in contexts where Newton's theory is not. Nor, more subtly, is Newton's theory a 'special case' of Einstein's, i.e. Einstein's theory reduces to it when certain restrictions are applied. Its foundations and procedural rules are quite different. These theories continue to co-exist because they both remain useful for different purposes.

Experiments

New data, and tests of new hypotheses, depend on observation and experiment. An experiment is a way of making precise observations, not of 'unconstrained nature' but of a situation deliberately constrained so that all relevant variables are known. The ability to design and conduct experiments is as essential for a scientist as a thorough and up-to-date understanding of relevant theories.

A properly designed experiment must be *reproducible*. That is to say, it must give substantially the same results when it is repeated at a different time and place and by other (trained and competent) experimenters. It must also be *valid*: anyone trained in the appropriate field of science must agree that it does just what its designer claims it does. If new techniques or equipment are involved then the experimenter must show that these meet appropriate standards of reliability, independent of times, places and persons. The results of the experiment must be *interpretable*: they must be free of 'interfering variables' and of errors of extrapolation or interpolation. This can be ensured by running *controls*, in which all variables except the one under investigation are kept at the same values as in the experiment itself. It is also important to ensure that a newly-designed experiment is practicable, ethical and economic.

Good experiment design is an art that requires practice. As with drawing or creative writing the basic principles can be taught (though they are not always taught well), but real skill is achieved only after years of effort and of learning from

mistakes. Also – again, as with drawing and creative writing – the capacity for clear and careful observation and for constructive self-criticism are fundamental to the acquisition of technique.

The principles of experiment design and experimental practice have seldom engaged the attention of philosophers to the extent that issues of theory, hypothesis, truth and logic have. This may be an area on which more philosophers of science could profitably focus.

Models

Scientists and philosophers often use the word ‘model’ in reference to matters of both theory and experiment. ‘Model’, like ‘theory’, has a number of meanings in English, most of which are irrelevant to science. For instance, it can denote: a person who poses for a photograph or painting; a preparatory sculpture to aid the design for a finished work; an original unique article of clothing; design or style; or a standard to be emulated. In science, ‘model’ may have one of the following meanings:

- ♦ A (small-scale) representation of structure or device intended to illustrate or test the properties of the real thing. It is sometimes impractical or uneconomical to perform experiments or even to make reliable observations on ‘the real thing’, so the investigators simulate it, for example by computer *models*.
- ♦ An idealised representation of an object or situation. The ‘frictionless surface’ of Newtonian mechanics and the ‘ideal gas’ of classical thermodynamics do not exist in the world of ‘things-in themselves’. They are fictions to which the equations of the relevant theories apply exactly. Their role is to tell us how the real world would behave if it were less imperfect; the real world becomes comprehensible in terms of (usually minor) deviations from such ideals.
- ♦ A simplified representation or description of a complex entity. All details of the real entity are deleted from the description unless they are essential for making sense of its behaviour. An organic chemist, for example, might model a reaction in terms only of the functional groups involved, no matter how complex the rest of the molecule. Functional groups are almost always simple arrangements of few atoms. This practice simplifies the description of the reaction and emphasises similarities with other reactions of the same general type. The pattern might be impossible to discern if *all* the details of the reacting molecules were included.

The developmental psychologist Jerome Bruner wrote interestingly on the subject of models. He pointed out that models may be *symbolic*, *iconic* or *enactive*. In science, a ‘symbolic’ model is manifest in words, mathematical formulae or other abstractions, an ‘iconic’ model in pictures. A gene may be represented as a string of letters, each denoting a nucleotide (symbolic model); the DNA double helix is a familiar visual image (iconic model). The main purpose of ‘enactive models’ is to teach skills; you cannot effectively teach a child to ride a bicycle by words or pictures. In science, enactive models have a key role in teaching students how to design and execute experiments, or to use specialised equipment.

Bibliography

Chapter 1

- Beck WS (1957) *Modern Science and the Nature of Life*. Harcourt, Brace, New York.
- Bronowski J (1978) *The Common Sense of Science*. Harvard University Press, Cambridge, MA.
- Haraway D (1989) *Primate Visions*. Routledge, London.
- Medawar PB (1982) *Pluto's Republic*. Oxford University Press, New York.
- Medawar PB (1985) *The Limits of Science*. Oxford University Press, Oxford.
- Marsak LM (ed) (1964) *The Rise of Science in Relation to Society*. Macmillan, New York.
- Menard HW (1971) *Science: Growth and Change*. Harvard University Press, Cambridge, MA.
- Moore JA (1993) *Science as a Way of Knowing: The Foundations of Modern Biology*. Harvard University Press, Cambridge, MA.
- Santayana G (1962) *Reason in Science*. Collier, New York.
- Turchin VE (1977) *The Phenomenon of Science*. University of Columbia Press, New York.
- Ziman J (1978) *Reliable Knowledge*. Cambridge University Press, Cambridge.

Chapter 2

- Barnes B (1974) *Scientific Knowledge and Sociological Theory*. Routledge & Kegan Paul, London.
- Barnes B, Shapin S (eds) (1979) *Natural Order: Historical Studies of Scientific Culture*. Sage, London.
- Basalla G (1988) *The Evolution of Technology*. Cambridge University Press, Cambridge.
- Ben-David J, Clark TN (eds) (1977) *Culture and Its Creators*. University of Chicago Press, Chicago, IL.
- Bloor D (1976) *Knowledge and Social Imagery*. Routledge & Kegan Paul, London.
- Cole M, Scribner S (1974) *Culture and Thought*. Wiley, New York.
- Dunbar R, Knight C, Power C (eds) (1999) *The Evolution of Culture*. Edinburgh University Press, Edinburgh.
- Fehl NE (1965) *Science and Culture*. Chu Ching, Hong Kong.
- Forbes RJ (1955–64) *Studies in Ancient Technology* (9 volumes). Brill, Leiden.
- Gellner E (1974) *Legitimation of Belief*. Cambridge University Press, Cambridge.
- Hawkes J (1973) *The First Great Civilizations: Life in Mesopotamia, the Indus Valley, and Egypt*. Knopf, New York.
- Jarvie IC (1972) *Concepts and Society*. Routledge & Kegan Paul, London.
- Mulkay M (1985) *The Word and the World*. Allen & Unwin, London.

Resnikoff HL, Wells RO (1973) *Mathematics and Civilization*. Holt, Reinhart & Winston, New York.
 Rose HA, Rose SPR (1976) *The Political Economy of Science*. Macmillan, London.

Chapter 3

Canfora L (trans. Ryle M) (1989) *The Vanished Library. A Wonder of the Ancient World*. University of California Press, Berkeley, CA.
 Hare RM (1982) *The Philosophy of Plato*. Oxford University Press, Oxford.
 Lloyd GER (1970) *Early Greek Science; Thales to Aristotle*. Norton, New York.
 Lloyd GER (1991) *Methods and Problems in Greek Science*. Cambridge University Press, Cambridge.
 Macleod R (ed) (2004) *The Library of Alexandria: Centre of Learning in the Ancient World*. IB Tauris, London.
 Ross WD (1959) *Aristotle: A Complete Exposition of His Works and Thought*. Meridian, Cleveland, OH.
 Stahl W (1962) *Roman Science*. University of Wisconsin Press, Madison, WI.
 Waterlow S (1982) *Nature, Change and Agency in Aristotle's Physics*. Clarendon Press, Oxford.

Chapter 4

Arnold T, Guillaume A (1931) *The Legacy of Islam*. Oxford University Press, Oxford.
 Ajram K (1992) *The Miracle of Islamic Science*. Cedar Graphics, Cedar Rapids, Iowa, IA.
 Bakar O (1999) *History and Philosophy of Islamic Science*. Islamic Texts, Cambridge.
 Baldwin JW (1971) *The Scholastic Culture of the Middle Ages, 1000–1300*. Heath and Co., Lexington, MA.
 Benson RL, Constable G (1991) *Renaissance and Renewal in the Twelfth Century*. University of Toronto Press, Toronto.
 Coplestone FC (1955) *Aquinas*. Penguin, Baltimore, MD.
 Crombie AC (1971) *Robert Grosseteste and the Origins of Experimental Science 1100–1700*. Clarendon Press, Oxford.
 Grant E (1996) *The Foundations of Modern Science in the Middle Ages: Their Religious, Institutional and Intellectual Contexts*. Cambridge University Press, Cambridge.
 Huff T (1995) *The Rise of Early Modern Science: Islam, China and the West*. Cambridge University Press, Cambridge.
 Lindberg DC (1992) *The Beginnings of Western Science*. University of Chicago Press, Chicago, IL.
 Nasr SN (1968) *Science and Civilization in Islam*. New American Library, New York.
 Pines S (1986) *Studies in Arabic Versions of Greek Texts and in Mediaeval Science*. Brill, Leiden.
 Riché P (1976) *Education and Culture in the Barbarian West: From the Sixth through the Eighth Century*. University of South Carolina Press, Columbia.
 Russell B (1946) *History of Western Philosophy*, 3rd ed. George Allen & Unwin, London.
 Sarton G (1927) *Introduction to the History of Science*. Carnegie Institution of Washington Publication no. 376, Baltimore, MD.
 Turner HR (1995) *Science in Medieval Islam: An Illustrated Introduction*. University of Texas Press, Austin, TX.
 White TH (1954) *The Bestiary: A Book of Beasts, being a Translation from a Latin Bestiary of the Twelfth Century*. Putnam's, New York.

Chapter 5

- Armitage A (1957) *Copernicus, the Founder of Modern Astronomy*. Thomas Yoseloff, New York.
- Armitage A (1966) *John Kepler*. Faber, London.
- Buchwald JZ, Bernard I (eds) (2001) *Isaac Newton's Natural Philosophy*. MIT Press, Cambridge, MA.
- Dannenfeldt KH (ed) (1974) *The Renaissance: Basic Interpretations*. Heath and Co., Lexington, MA.
- Drake S (1957) *Discoveries and Opinions of Galileo*. Doubleday, New York.
- Drake S, Drabkin IE (1969) *Mechanics in Sixteenth-Century Italy*. University of Wisconsin Press, Madison, WI.
- Dreyer JLE (1890) *Tycho Brahe: A Picture of Scientific Life and Work in the Sixteenth Century*. Black, Edinburgh.
- Eglander D, Norman D, O'Day R, Owens WR (eds) (1979) *Culture and Belief in Europe 1450–1600*. Blackwell, Oxford.
- Hall AR (1983) *The Revolution in Science 1500–1750*. Longman, London.
- Hall AR (1996) *Isaac Newton: Adventurer in Thought*. Cambridge University Press, Cambridge.
- Hallyn F (1990) *The Poetic Structure of the World: Copernicus and Kepler*. Zone Books, New York.
- Henry J (2002) *Knowledge is Power: Francis Bacon and the Method of Science*. Icon Books, Cambridge.
- Kenny A (1968) *Descartes: A Study of His Philosophy*. Random House, New York.
- Lattis JM (1995) *Between Copernicus and Galileo*. University of Chicago Press, London.
- Lindsay D, Price MR (1975) *Authority and Challenge: A Portrait of Europe 1300–1600*. Oxford University Press, London.
- McKnight SA (ed) (1992) *Science, Pseudo-Science and Utopianism in Early Modern Thought*. University of Missouri Press, Columbia, MO.
- Murray A (1978) *Reason and Society in the Middle Ages*. Clarendon, Oxford.
- Pitt JC (1997) *Galileo, Human Knowledge and the Book of Nature: Method Replaces Metaphysics*. Kluwer, Dordrecht.
- Porter R, Teich M (eds) (1992) *The Scientific Revolution in National Context*. Cambridge University Press, Cambridge.
- Rothenstein J (1964) *Francis Bacon: An Introduction*. Thames and Hudson, London.
- Runciman S (1965) *The Fall of Constantinople*. Cambridge University Press, London.
- Shapere D (1974) *Galileo: A Philosophical Study*. University of Chicago Press, Chicago, IL/London.
- Shea WR (1972) *Galileo's Intellectual Revolution*. Macmillan, London.
- Thijssen JMMH, Zupko J (eds) (2001) *The Metaphysics and Natural Philosophy of John Buridan*. Brill, Leiden.
- Urbach P (1986) *Francis Bacon's Philosophy of Science: An Account and a Reappraisal*. Open Court, La Salle, IL.
- Waley D (1964) *Later Mediaeval Europe*. Longmans, Green and Co., London.
- Wallace WA (1991) *Galileo, the Jesuits and the Mediaeval Aristotle*. Ashgate, Aldershot.
- Westfall RS (1980) *Never at Rest: A Biography of Isaac Newton*. Cambridge University Press, Cambridge.
- Wightman WPD (1972) *Science in a Renaissance Society*. Hutchinson, London.
- Williams B (1990) *Descartes: The Project of Pure Enquiry*. Penguin, London.
- Yates FA (1964) *Giordano Bruno and the Hermetic Tradition*. Routledge & Kegan Paul, London.

Chapter 6

- Bradbury S (1967) *The Evolution of the Microscope*. Pergamon, Oxford/London.
- Cushing H (1943) *A Bio-Bibliography of Andreas Vesalius*. Schuman's, New York.

- Hooke R (1665) *Micrographia*. Royal Society, London.
- Espinasse M (1962) Robert Hooke. University of California Press, Berkeley, CA.
- Fuchs T (trans. Grene MG) (2002) *The Mechanization of the Heart: Harvey and Descartes*. Boydell and Brewer, Rochester, NY.
- Graubard M (1964) *Circulation and Respiration: The Evolution of an Idea*. Harcourt, Brace & World, New York.
- Gregory A (2001) *Harvey's Heart, The Discovery of Blood Circulation*. Icon Books, Cambridge.
- Kuhn TS (1970) *The Structure of Scientific Revolutions*, 2nd ed. University of Chicago Press, Chicago, IL.
- Pagel W (1983) *New Light on William Harvey*. Transaction Publishers, Piscataway, NJ.
- Rapson H (1982) *The Circulation of the Blood*. Frederick Muller, London.
- Scott JF (1976) *The Scientific Writings of René Descartes*. Taylor & Francis, London.
- Siegel RE (1968) *Galen's Systems of Physiology and Medicine*. S. Karger, Basel.
- Wilson C (1995) *The Invisible World: Early Modern Philosophy and the Invention of the Microscope*. Princeton University Press, Princeton, NJ.

Chapter 7

- Barnes J (ed) (1995) *Cambridge Companion to Aristotle*. Cambridge University Press, Cambridge.
- Downey G (1962) *Aristotle: Dean of Early Science*. Franklin Watts, New York.
- Gotthelf A, Lennox J (eds) (1987) *Philosophical Issues in Aristotle's Biology*. Cambridge University Press, Cambridge.
- Gotthelf A (ed) (1985) *Aristotle on Nature and Living Things*. Philosophical and Historical Studies. Mathesis, Pittsburgh, PA.
- Pellegrin P (1986) *Aristotle's Classification of Animals. Biology and the Conceptual Unity of the Aristotelian Corpus*. University of California Press, Berkeley, CA.
- Preus A (1975) *Science and Philosophy in Aristotle's Biological Works*. Georg Olms, New York.

Chapter 8

- Fellows OE, Milliken SF (1972) *Buffon*. Twayne, New York.
- Foster M (1901) *Lectures on the History of Physiology during the Sixteenth, Seventeenth and Eighteenth Centuries*. Cambridge University Press, Cambridge.
- Gloyne SR (1950) *John Hunter*. Livingstone, London.
- King LS (1963) *Growth of Medical Thought*. University of Chicago Press, Chicago, IL.
- King LS (1970) *The Road to Medical Enlightenment 1650–1695*. Macdonald, London.
- Leicester HM, Klickstein HS (1952) *A Source Book in Chemistry 1400–1900*. McGraw-Hill, New York.
- Lindeborn GA (1968) *Herman Boerhaave: The Man and his Work*. Methuen, London.
- Pagel W (1958) *Paracelsus: An Introduction to Philosophical Medicine in the Era of the Renaissance*. S. Karger, Basel.
- Partington JR (1957) *A Short History of Chemistry*, 3rd ed. Macmillan, London.
- Spellman WM (1997) *John Locke*. Macmillan, London.
- Terrall M (2002) *The Man Who Flattened the Earth: Maupertuis and the Sciences in the Enlightenment*. University of Chicago Press, Chicago, IL.
- Vartanian A (1960) *La Mettrie's 'L'Homme Machine': A Study in the Origins of an Idea*. Princeton University Press, Princeton, NJ.

- Wheeler LR (1939) *Vitalism: Its History and Validity*. Witherby, London.
- Wolf A (1952) *A History of Science, Technology and Philosophy in the Eighteenth Century*, 2nd ed. Allen & Unwin, London.
- Woolhouse RS (1983) *Locke*. University of Minnesota Press, Minneapolis, MN.

Chapter 9

- Appel T (1987) *The Cuvier-Geoffroy Debate: French Biology in the Decades Before Darwin*. Oxford University Press, Oxford.
- Baker JR (ed) (1988) *The Cell Theory: A Restatement, History and Critique*. Garland, New York.
- Bennett J (1971) *Locke, Berkeley, Hume: Central Themes*. Clarendon, Oxford.
- Berlin I (ed) (1956) *The Age of Enlightenment*. Books for Libraries Press, Freeport, NY.
- Blackmore JT, Itagaki R, Tanaka S (2001) *Ernst Mach's Vienna 1895–1930: Or Phenomenalism as Philosophy of Science*. Kluwer, Dordrecht.
- Bowie A (1993) *Schelling and Modern European Philosophy: An Introduction*. Routledge, London.
- Guyer P (1987) *Kant and the Claims of Knowledge*. Cambridge University Press, New York.
- Eccles JC (1979) *Sherrington, His Life and Thought*. Springer, Berlin, MA/New York.
- Ellington JW (1985) *Kant's Philosophy of Material Nature*. Hackett, Indianapolis, IN.
- Faber RJ (1987) *Clockwork Garden: On the Mechanistic Reduction of Living Things*. University of Massachusetts Press, London.
- Guyader H (trans. Grene MG) (2004) *Étienne Geoffroy Saint-Hilaire, 1772–1844: A Visionary Naturalist*. University of Chicago Press, Chicago, IL.
- Harris H (1999) *The Birth of the Cell*. Yale University Press, London.
- Holmes FC (1974) *Claude Bernard and Animal Chemistry*. Harvard University Press, Cambridge, MA.
- Hunemann P (ed) (2007) *Understanding Purpose: Kant and the Philosophy of Biology*. University of Rochester Press, Rochester, NY.
- Hyland P (2003) *The Enlightenment*. Routledge, London.
- Kemp J (1968) *The Philosophy of Kant*. Oxford University Press, New York.
- Knight DM (1998) *Science in the Romantic Era*. Ashgate, Aldershot.
- Letwin SR (1965) *The Pursuit of Certainty: David Hume, Jeremy Bentham, John Stuart Mill*. Cambridge University Press, Cambridge.
- Popper KR (1959) *The Logic of Scientific Discovery*. Hutchinson, London.
- Richards R (2002) *The Romantic Conception of Life: Science and Philosophy in the Age of Goethe*. University of Chicago Press, Chicago, IL.
- Rothschuh KR (1971) Du Bois-Reymond. In: Gillespie CC (ed) *Dictionary of Scientific Biography*, vol. IV, pp. 200–205. American Council of Learned Societies, Charles Scribner's Sons, New York.
- Sigerist HE (1932) *The Great Doctors: A Biographical History of Medicine*. Books for Libraries Press, Freeport, NY. (Contains a short biography of Müller.)
- Turner RS (1972) Helmholtz. In: Gillespie CC (ed) *Dictionary of Scientific Biography*, vol. VI, pp. 241–253. American Council of Learned Societies, Charles Scribner's Sons, New York.
- Viëtor K (1950) *Goethe the Thinker*. Harvard University Press, Cambridge, MA.
- Wright JP (1983) *The Sceptical Realism of David Hume*. Manchester University Press, Manchester.

Chapter 10

- Child CM (1941) *Patterns and Problems of Development*. University of Chicago Press, Chicago, IL.
- Davidson EH (1986) *Gene Activity in Early Development*, 3rd ed. Academic, New York.
- De Pomerai D (1985) *From Gene to Animal: An Introduction to the Molecular Biology of Animal Development*. Cambridge University Press, New York.

- Gasking EB (1967) *Investigations into Generation. 1651–1828. History of Scientific Ideas.* Hutchinson, London.
- Gilbert SF (2006) *DevBio: A Companion to Developmental Biology*, 8th ed. Sinauer, Sunderland, MA.
- Gould SJ (1977) *Ontogeny and Phylogeny.* Harvard University Press, Cambridge, MA.
- Horder TJ, Witkowski JA, Wyle CC (eds) (1986) *A History of Embryology.* Cambridge University Press, Cambridge.
- Kumé M, Katsuma D (1988) *Invertebrate Embryology.* Garland, New York.
- Oppenheimer JM (1963) *Essays in the History of Embryology and Biology.* MIT Press, Cambridge, MA.
- Roe SA (1981) *Matter, Life and Generation: 18th Century Embryology and the Haller-Wolff Debate.* Cambridge University Press, Cambridge.

Chapter 11

- Belloni L (1975) Redi. In: Gillespie CC (ed) *Dictionary of Scientific Biography*, vol. XI, pp. 341–343. American Council of Learned Societies, Charles Scribner's Sons, New York.
- Bulloch W (1960) *The History of Bacteriology*, 2nd ed. Oxford University Press, London.
- Dobell C (1932) *Anthony van Leeuwenhoek and His Little Animals.* Bale and Danielsson, London.
- Farley J (1977) *The Spontaneous Generation Controversy from Descartes to Oparin.* Johns Hopkins University Press, Baltimore, MD.
- Gasking E (1967) *Investigations into Generation 1651–1828.* Johns Hopkins University Press, Baltimore, MD.
- Harris H (2002) *Things Come to Life.* Oxford University Press, Oxford.

Chapter 12

- Bowlby J (1990) *Charles Darwin: A New Life.* Norton, New York.
- Bowler P (1974) *Fossils and Progress: Paleontology and the Idea of Progressive Evolution in the Nineteenth Century.* Science History, New York.
- Bowler P (2003) *Evolution: The History of an Idea*, 3rd ed. University of California Press, Baltimore, MD.
- Burchfield J (1975) *Lord Kelvin and the Age of the Earth.* University of Chicago Press, Chicago, IL.
- Burkhardt R (1977) *The Spirit of System: Lamarck and Evolutionary Biology.* Harvard University Press, Cambridge, MA.
- Cloyd EL (1972) *James Burnett, Lord Monboddo.* Clarendon, Oxford.
- Corsi P, trans. Mandelbaum J (1988) *The Age of Lamarck: Evolutionary Theories in France, 1790–1830.* University of California Press, Berkeley, CA.
- Dalrymple GB (1991) *The Age of the Earth.* Stanford University Press, Stanford, CA.
- Dean DR (1992) *James Hutton and the History of Geology.* Cornell University Press, Ithaca, NY.
- Desmond A, Moore J (1991) *Darwin.* Michael Joseph, London.
- Gillespie CC (1959) *Genesis and Geology: The Impact of Scientific Discoveries upon Religious Beliefs in the Decades before Darwin.* Harper & Row, New York.
- Hodge MJS, Radick G (eds) (2003) *The Cambridge Companion to Darwin.* Cambridge University Press, Cambridge.
- Hull D (ed) (1973) *Darwin and His Critics: The Reception of Darwin's Theory of Evolution by the Scientific Community.* University of Chicago Press, Chicago, IL.
- Jordanova LJ (1964) *Lamarck.* Oxford University Press, London.
- King-Hele D (1968) *The Essential Writings of Erasmus Darwin.* MacGibbon and Kee, London.

- Ospovat D (1981) *The Development of Darwin's Theory: Natural History, Natural Theology, and Natural Selection*. Cambridge University Press, Cambridge.
- Ryan A (1974) *J. S. Mill*. Routledge & Kegan Paul, London.
- Shanahan T (2004) *The Evolution of Darwinism: Selection, Adaptation, and Progress in Evolutionary Biology*. Cambridge University Press, Cambridge.
- Sheppard T (1920) *William Smith*. Brown & Sons, Hull.
- Young RM (1985) *Darwin's Metaphor: Nature's Place in Victorian Culture*. Cambridge University Press, Cambridge.

Chapter 13

- Allen GE (1978) *Thomas Hunt Morgan: The Man and His Science*. Princeton University Press, Princeton, NJ.
- Bowler PJ (1983) *The Eclipse of Darwinism: Anti-Darwinian Evolution Theories in the Decades Around 1900*. Johns Hopkins University Press, Baltimore, MD.
- Bowler PJ (1989) *The Mendelian Revolution*. Athlone, London.
- Darden L (1991) *Theory Change in Science: Strategies from Mendelian Genetics*. Oxford University Press, New York.
- Dunn LC (1965) *A Short History of Genetics: The Development of some of the Main Lines of Thought, 1864–1939*. McGraw-Hill, New York.
- Jacob F (1973) *The Logic of Life: A History of Heredity*. Pantheon, New York.
- Mackenzie M (1981) *Statistics in Britain, 1866–1930*. Edinburgh University Press, Edinburgh.
- Moore J (1981) *The Post Darwinian Controversies*. Cambridge University Press, Cambridge.
- Nyhart L (1995) *Biology Takes Form: Animal Morphology and the German Universities 1800–1900*. University of Chicago Press, Chicago, IL.
- Olby RC (1966) *The Origins of Mendelism*, 2nd ed. Schocken Books, New York.
- Sapp J (1987) *Beyond the Gene: Cytoplasmic Inheritance and the Struggle for Authority in Genetics*. Oxford University Press, New York.
- Stern C, Sherwood ER (eds) (1966) *The Origins of Genetics. A Mendel Source Book*. W. H. Freeman, San Francisco, CA/London.
- Sturtevant AH (1965) *A History of Genetics*. Harper, London.
- Vitezslav O, trans. Flynn S (1996) *Gregor Mendel: The First Geneticist*. Oxford University Press, New York.

Chapter 14

- Bendall DS (ed) (1983) *Evolution from Molecules to Men*. Cambridge University Press, Cambridge.
- Dobzhansky T, Ayala F, Stebbins GL, Valentine JW (1977) *Evolution*. W. H. Freeman, San Francisco, CA.
- Ghiselin MT (1969) *The Triumph of the Darwinian Method*. University of California Press, Berkeley, CA.
- Glick T, Kohn D (eds) (1996) *On Evolution: The Development of the Theory of Natural Selection*. Hackett, Indianapolis, IN.
- Kimura M (1983) *The Neutral Theory of Molecular Evolution*. Cambridge University Press, New York.
- Laubichler M, Maienschein J (eds) (2007) *From Embryology to Evo-Devo: A History of Developmental Evolution*. MIT Press, Boston, MA.

- Mayr E (1991) *One Long Argument: Charles Darwin and the Genesis of Modern Evolutionary Thought*. Harvard University Press, Cambridge, MA.
- Mayr E, Provine W (eds) (1998) *The Evolutionary Synthesis: Perspectives on the Unification of Biology*, revised ed. Harvard University Press, Cambridge, MA.
- Moore JA (1972) *Heredity and Development*, 2nd ed. Oxford University Press, New York.
- Provine WB (1971) *The Origins of Theoretical Population Genetics*. University of Chicago Press, Chicago, IL.
- Provine WB (1986) *Sewall Wright and Evolutionary Biology*. University of Chicago Press, Chicago, IL.
- Smocovitis VB (1996) *The Evolutionary Synthesis and Evolutionary Biology*. Princeton University Press, Princeton, NJ.
- Sober E (1984) *The Nature of Selection: Evolutionary Theory in a Philosophical Focus*. MIT Press, Cambridge, MA.

Chapter 15

- Allen C, Lauder G (eds) (1993) *Nature's Purposes*. MIT Press, Cambridge, MA.
- Crick F (2004) *Of Molecules and Men*. Prometheus Books, New York.
- Mayr E (1972) *The Growth of Biological Thought: Diversity, Evolution and Inheritance*. Harvard University Press, Cambridge, MA.
- Monod J (1970) *Chance and Necessity*. Random House, New York.
- Nagel E (1979) *Teleology Revisited, and Other Essays in the Philosophy and History of Science*. Columbia University Press, New York.
- Taylor R (1966) *Action and Purpose*. Prentice-Hall, Englewood Cliffs, NJ.
- Woodfield A (1976) *Teleology*. Cambridge University Press, Cambridge.
- Wright L (1976) *Teleological Explanation*. University of California Press, Berkeley, CA.

Chapter 16

- Beckner M (1959) *The Biological Way of Thought*. Columbia University Press, New York.
- Bonner JT (1988) *The Evolution of Complexity by Means of Natural Selection*. Princeton University Press, Princeton, NJ.
- Einstein A, Infeld L (1938) *The Evolution of Physics*. Simon & Schuster, New York.
- Farber P (1994) *The Temptations of Evolutionary Ethics*. University of California Press, Berkeley, CA.
- Gould SJ (2002) *The Structure of Evolutionary Theory*. Harvard University Press, Cambridge, MA.
- Hull D (1998) (ed) Ruse M. *Philosophy of Biology*. Oxford University Press, Oxford.
- Jones S (1999) *Almost Like a Whale*. Doubleday, London.
- Maienschein J, Ruse M (eds) (1999) *Biology and the Foundations of Ethics*. Cambridge University Press, Cambridge.
- Ruse M (1973) *The Philosophy of Biology*. Hutchinson, London.
- Sober E (1993) *Philosophy of Biology*. Westview Press, Boulder, CO/San Francisco, CA.

Appendix

- Bruner JS (1971) *The Relevance of Education*. Norton, New York.
- Fransella F, Bannister D (1986) *Inquiring Man: The Theory of Personal Constructs*, 2nd ed. Routledge, London.
- Pais A (1982) 'Subtle is the Lord...' *The Science and Life of Albert Einstein*. Oxford University Press, Oxford.
- Quine W van O (1961) *From a Logical Point of View*, 2nd ed. Harvard University Press, Cambridge, MA. (See especially Essay II, Section 6.)
- Toulmin SE (1972) *Human Understanding: The Collective Use and Evolution of Concepts*. Princeton University Press, Princeton, NJ.

Name Index

A

Abbe, Ernst 138
Abelard, Peter 48
Abu'l Wafa 42
Agassiz, Louis 137
Alcuin of York 34, 45, 47, 51
Al-Battani 39, 60
Albertus Magnus 49
Al-Biruni 39, 43, 51, 58, 59, 64,
68, 78
Al-Fazari 36
Algazel (Al-Ghazali) 43, 44, 51, 115
Al-Jahiz 43, 161
Al-Kashi 39
Al-Khowarizmi 39
Al-Mansur 36
Alexander the Great 30, 36
Anselm of Canterbury 48, 51, 117
Apollonius of Perga 31
Aquinas, Thomas 28, 38–52, 54, 117, 148
Archimedes 23, 27, 31, 34, 47, 63, 66, 156
Aristarchus of Samos 31, 34
Aristotle 5, 7, 21, 23, 26–31, 33–36,
40, 42–44, 47–50, 52, 53, 57–60,
65–68, 71, 72, 75, 76, 78, 79, 83–85,
88–98, 100–102, 105, 106, 109, 111,
113, 117, 120, 129, 132, 133, 135, 143,
145, 147, 148, 161, 162, 170,
208, 210
Arnau de Villanova 42
Ar-Razi (Rhazes) 37, 39, 40, 42, 43, 45, 51,
76, 78, 79
Arrhenius, Svante 159
Augustine 46, 47, 49, 50, 52, 130, 161
Averroës (Ibn Rushd) 200, 203
Avery, Oswald 27, 37–45, 117
Avicenna (Ibn Sina) 37, 42–44, 51, 78,
79, 105,
Az-Zahrawi 40

B

Bacon, Roger 17, 38–41, 45, 51, 53
Bacon, Francis 20, 71, 73, 75, 82, 83, 101,
102, 104, 105, 107
Baer, Karl von 98, 135, 137
Barry, Martin 138
Bastian, Henry 158
Bateson, William 182–185, 187, 190,
200, 201
Beadle, George 200, 201, 204
Becher, Johann 106
Beckner, Morton 229
Bede 45, 51
Beneden, Edouard van 139
Berg, Leo 167
Bergmann, Carl 135
Bergson, Henri 174, 179
Berkeley, George 44, 115
Bernard, Claude 125
Berzelius, Jöns Jakob 108, 112
Bichat, Marie-François-Xavier 110–112, 121,
123–126
Bismarck, Otto von 123
Black, Joseph 18, 19
Blake, William 118
Boerhaave, Herman 100, 101, 103, 104, 106,
110–112, 124, 130
Boethius 34, 35, 45
Bonaventure 49, 58
Borelli, Giovanni 99, 112
Boveri, Theodor 139, 185
Boyle, Robert 39, 68, 70, 105, 112
Brahmagupta 34, 35, 39, 64
Bradwardine, Thomas 60
Brahé, Tycho 64, 65
Bridges, Calvin 188–190
Brongniart, Alexandre 120, 163
Bronn, Heinrich 167
Brown, Robert 229

Brücke, Ernst 123, 124, 139
 Bruner, Jerome 234
 Bruno, Giordano 59, 60, 64, 66, 69, 82
 Buckland, William 130, 163, 166
 Buffon, Comte de 107, 112, 120, 126, 130,
 133, 134, 144, 152
 Buridan, Jean 57–60, 67, 69, 71
 Burley, Walter 60
 Burnett, James; see Monboddo

C

Cannon, Walter 125, 127
 Cardano, Geronimo 39
 Carnap, Rudolf 173
 Carnoy, Jean-Baptiste 138
 Cesalpino, Andrea 78, 79, 82
 Chambers, Robert 166–169, 174
 Chamisso, Adelbert von 150
 Charlemagne 34, 45
 Chase, Martha 203
 Chetverikov, Sergei 197, 200
 Cicero 62
 Cohn, Ferdinand 157
 Colombo, Realdo 40, 78, 79
 Comte, Auguste 107, 172
 Confucius 21
 Conklin, Edwin 143
 Cooke, James 130
 Copernicus, Nicholas 31, 57, 59, 60, 64,
 65, 75
 Correns, Karl 184, 200
 Crick, Francis 179, 200, 203, 204
 Cuvier, George 120, 126, 134, 163, 164,
 168, 171

D

Dalton, John 108, 112, 123
 Darlington, Cyril 197
 Darwin, Charles 92, 93, 120, 158, 159,
 167–172, 174–180, 184, 188, 194,
 199, 210, 224
 Darwin, Erasmus 156, 162–166, 168
 Demetrius of Phaleron 30
 Democritus 21, 22, 30
 Descartes, René 43, 44, 58, 59, 66, 67, 69, 71,
 75, 79, 82–85, 87, 96–103, 107, 111,
 112, 122, 129, 134
 Desmarest, Nicolas 39
 De Beer, Gavin 198–200
 De Vries, Hugo 183–185, 188–190, 200
 Diophantus 31

Dobzhansky, Theodosius 197, 199, 200,
 220
 Dodge, Bernard 201
 Driesch, Hans 139, 141, 143, 188
 Du Bois-Reymond, Emil 121–126, 191
 Dumbleton, John 60
 Dusch, Theodor von 155, 158
 Dutrochet, Henri 124, 125

E

Ehrenberg, Christian 150
 Ehrlich, Paul 40
 Einstein, Albert 4, 59, 117, 229, 230, 233
 Eldredge, Niles 134
 Empedocles 21, 28, 91, 92, 104, 161
 Epicurus 27, 30, 34, 39
 Erasistratos 31
 Euclid 27, 31, 34, 47, 83

F

Fabricius, Hieronymus 42, 78
 Fick, Adolf 125
 Fisher, Ronald 193–197, 199, 200
 Flemming, Walther 138, 139
 Ford, Edmund 197
 Franklin, Benjamin 103, 169

G

Galen, Claudius 42–44, 47, 75–80, 84, 95, 91,
 92, 134
 Galileo Galilei 17, 39, 40, 58–60, 65–67, 69,
 71, 75, 79, 80, 82, 83, 96, 100, 102,
 112, 117
 Galton, Francis 178
 Garrod, Archibald 201
 Gassendi, Pierre 39, 67, 69, 75, 79, 88, 101
 Gautama 21
 Geber 36, 37, 42, 104, 105
 Genghis Khan 55
 Geoffroy St Hilaire, Etienne 120, 134,
 137, 164
 Goethe, Johann Wolfgang von 119–120
 Goldschmidt, Richard 191, 192, 196, 197, 199
 Goodsir, John 122, 123
 Gould, Stephen J. 134
 Graaf, Regnier de 98
 Grant, Robert 165, 166, 168, 169
 Griffith, Frederick 200, 202
 Grosseteste, Robert 51, 53
 Gutenberg, Johannes 41

H

Haeckel, Ernst 122, 137, 139, 142, 174, 204
 Haldane, J.B.S. 196–200
 Haldane, John S. 126, 127, 159
 Haller, Albrecht von 101
 Hardy, Godfrey 185
 Hartsoeker, Nicolaas 130, 131
 Harun al-Rashid 42, 45
 Harvey, William 42, 75, 76, 78, 80, 82–85,
 87, 96–98, 100, 101, 104, 106, 107,
 111, 112, 121, 129, 135, 148–150
 Helmholtz, Hermann von 121, 122, 124, 173
 Helmont, Jean-Baptiste van 105, 106,
 112, 148
 Herder, Johann von 122, 165
 Hero of Alexandria 32
 Herophilos 31
 Hershey, Alfred 200, 203
 Hertwig, Wilhelm 138
 Heytesbury, William 60
 Hippocrates 98, 134, 177
 His, William 139, 142, 144
 Hoffmann, Friedrich 99–101, 103, 106,
 107, 111, 112
 Homer 22, 23, 149
 Hooke, Robert 86, 87, 121
 Hörstadius, Sven 144
 Hume, David 44, 88, 115–117, 126, 172, 173,
 229–231
 Hunter, John 97, 104, 111
 Hutton, James 39, 163, 168
 Huxley, Julian 197, 198, 200
 Huxley, Thomas H. 118, 171, 174, 188, 197
 Huygens, Christiaan 88

I

Ibn al-Nafs 40, 76, 78, 79
 Ibn al-Quff 40
 Ibn Bajjah 45
 Ibn Baytar 40
 Ibn Firmas 17, 41
 Ibn Miskawayh 43
 Ibn Yunus al-Masri 40
 Ibn Zuhr 40
 Imanishi, Kinji 170
 Isidore of Seville 34, 35, 45, 47

J

Jameson, Robert 166
 Jaspers, Karl 21
 Jefferson, Thomas 103

Jenkin, Henry Fleeming 175, 177
 Johannsen, Wilhelm 188, 192, 200
 John of Salisbury 52
 Justinian I 30, 35

K

Kankah 36
 Kant, Immanuel 116–119, 125, 126, 172, 208,
 230–232
 Kauffman, Stuart 219
 Kelly, George 232
 Kelvin, Lord (William Thomson) 175
 Kepler, Johannes 40, 59, 60, 65, 69, 79, 233
 Kilvington, Richard 60
 Knoll, Max 19
 Kölliker, Rudolf von 138
 Küchenmeister, Gottlob 150
 Kuhn, Thomas 79, 80, 223

L

Lamarck, Jean-Baptiste de 133, 134, 156,
 158–169, 184
 La Mettrie, Julien Offray de 88, 100–104,
 110–112, 116, 124, 130, 132, 161
 Lao Tze 21
 Lavoisier, Antoine 39, 107–109, 112, 115, 126
 Leclerc, George-Louis: see Buffon
 Leeuwenhoek, Antonie van 87, 88, 98, 130,
 148, 152
 Leibnitz, Gottfried 59, 67, 161
 Leonardo da Vinci 39, 41, 43, 78, 79
 Liebig, Justus von 108, 156
 Linné, Carl von (Linnaeus) 133
 Lister, Joseph J. 88, 111, 121
 Locke, John 101–103, 107, 112, 115–118,
 153, 229
 Loeb, Jacques 125, 188
 Lotze, Rudolf 123
 Lower, Richard 85
 Ludwig, Carl 121, 123–125
 Luther, Martin 63, 64
 Lyell, Charles 163, 168, 171

M

Mach, Ernst 117, 173, 178, 229–231
 Magendie, François 125, 126
 Maimonides 45, 47, 51, 52
 Malebranche, Nicholas 130
 Malpighi, Marcello 86, 87
 Malthus, Thomas 169

Martin, Newell 188
 Maupertuis, Pierre de 134, 144, 161, 162,
 176, 185
 Maxwell, James Clark 218
 Maynard Smith, John 219, 222
 Mayr, Ernst 197–200, 209
 McCarty, Maclyn 200, 203
 McLeod, Colin 200, 203
 Medicus, Friedrich Casimir 107, 111,
 112, 133
 Mendel, Gregor Johann 133, 180–184,
 187, 200
 Mill, John Stuart 172
 Mohl, Hugo von 135
 Monbodo, Lord (James Burnett) 162
 Monod, Jacques 66, 209
 Montgomery, Thomas H. 185
 Morgagni, Giovanni 40
 Morgan, Thomas Hunt 125, 188–192, 194,
 197, 199–201, 229, 230
 Morton, William 40, 229
 Muller, Herman 188, 189, 190, 197, 201
 Müller, Johannes 120–123, 126, 137

N

Nägeli, Karl von 181, 184
 Napier, John 39
 Neckam, Alexander 41
 Needham, John 152–154
 Newcomen, Thomas 20
 Newport, George 138
 Newton, Isaac 39, 40, 57, 59, 64, 67–69, 71,
 83, 86, 88, 101, 102, 112, 116, 118,
 119, 152
 Nicholas of Cusa 59, 60, 65, 68, 69, 79

O

Olivi, Peter John 49
 Oresme, Nicole 58–60, 67–69, 71, 79
 Osborne, Henry 167
 Oswald, Wilhelm 230
 Owen, Richard 166, 168, 171

P

Paley, William 162, 168, 169, 174, 175
 Papin, Denis 20
 Paracelsus 40, 105
 Pare, Ambroise 40
 Pasteur, Louis 109, 112, 115, 125, 126,
 155–159, 217
 Pearson, Karl 178

Perrault, Claude 130
 Perrin, Jean 230
 Philoponus, John 58
 Pinel, Philippe 40
 Plato 21, 25–27, 30, 32, 34, 36, 44, 47, 48,
 52, 72, 90, 95, 102, 130
 Pliny 33
 Plotinus 27, 32, 33, 48
 Popper, Karl 117, 173, 224
 Porphyry 32, 33, 48
 Pouchet, Félix-Archimède 155–158
 Priestley, Joseph 107
 Protagoras 62
 Ptolemy, Claudius 28, 30–32, 39, 47
 Pythagoras 21, 27, 32

Q

Quine, Willard van O. 232

R

Raphael (Raffaello Sanzio) 27
 Raspail, François-Vincent 121, 122, 126, 155
 Redi, Francesco 148–150, 152, 153
 Reichert, Karl 138
 Reil, Johann 110–112, 119, 126
 Rensch, Bernhard 197, 200
 Riolan, Jean (Riolanus) 42, 78, 79
 Roscelin 48
 Rosen, Robert 208, 211
 Roux, Wilhelm 139, 141–143
 Royer, Clémence 158
 Ruska, Ernst 19
 Russell, Bertrand 54

S

Saint-Simon, Comte de 172
 Santorio, Santorio 104
 Saunders, Edith 187, 189
 Savery, Thomas 20
 Schelling, Friedrich von 118,
 119, 154
 Schleiden, Matthias 122, 181
 Schneider, Friedrich 138
 Schopenhauer, Arthur 154, 174
 Schröder, Heinrich 155
 Schultze, Max 155, 158
 Schwann, Theodor 121, 122, 125, 126,
 155–158
 Sedgwick, Adam 163, 166, 168, 169
 Servetus, Michael 40, 78
 Shannon, Claude 218, 219

Shapere, Dudley 229
 Sherrington, Charles 126
 Siger of Brabant 49
 Simpson, George Gaylord 198–200
 Smith, William 163
 Socrates 25, 26
 Soto, Domingo de 58
 Spallanzani, Lazzaro 152–155
 Spemann, Hans 144
 Spencer, Herbert 166, 167, 171, 173, 174
 Stahl, Georg Ernst 106, 107, 112
 Stebbins, Ledyard 198
 Steenstrup, Japetus 150, 154
 Stern, Curt 190, 192
 Stevin, Simon 39
 Strasburger, Eduard 139
 Sturtevant, Alfred 188–190
 Sulla 30
 Sutton, Walter 185–190, 194, 200
 Swammerdam, Jan 87, 88, 98, 130, 152
 Swineshead, Richard 60
 Sydenham, Thomas 98
 Sylvius, Franciscus 105
 Sylvius, Jacobus 78

T

Tartaglia, Niccolò 39
 Tatum, Edward 200, 201, 204
 Teilhard de Chardin, Pierre 174
 Thabit bin Qurrah 42, 58
 Thales 21
 Theophrastus 95, 105
 Thomson, William; see Kelvin
 Titian (Tiziano Vecellio) 75
 Torricelli, Evangelisto 67, 71, 85, 117
 Toulmin, Stephen 232
 Tschermak, Erich von 184

U

Urban V 66

V

Valades, Didacus 50
 Valentin, Gabriel 135
 Vermeer, Jan 88
 Vesalius, Andreas 75, 78, 79, 112
 Viète, François 39
 Virchow, Rudolf 121, 123, 126,
 137, 155
 Vogt, Walther 123, 135
 Voltaire 102

W

Wallace, Alfred Russel 165, 167, 168, 169,
 171, 178
 Watson, James 200, 203, 204
 Watt, James 18, 19
 Weaver, Warren 218
 Weinberg, Wilhelm 185
 Weismann, August 139, 179, 185, 188
 Weldon, Walter 178, 179, 183
 Whewell, William 117, 118, 169, 172
 White, Gilbert 102
 Whitehead, Alfred North 72
 Whitman, Charles 143
 Wiener, Norbert 218
 William of Ockham 51, 54, 57–60, 115
 Wilson, Edmund 143, 144, 185, 188
 Witelo 40, 59
 Wöhler, Friedrich 108, 109, 112
 Wolff, Caspar 133, 134
 Wren, Christopher 88
 Wright, Sewell 195–197, 199, 200

Y

Yule, George 193

Z

Zeiss, Carl 88, 138
 Zoroaster 21, 35

Subject Index

A

- Aberration
 chromatic 88, 88
 spherical 18, 88
- Abiogenesis, -ic 147, 158, 159
- Abnormality 132, 134, 223
- Absorb, -ption 91, 116
- Abstract, -ion 7–9, 20–22, 25, 38, 60, 104,
 107, 144, 167, 170, 171, 205, 208, 215,
 217, 220, 225, 234
- Académie des Sciences 156
- Academy 25, 30, 34, 35
- Acceleration 29, 43, 58, 60, 231
- Acid 42, 105–107, 155, 203, 204
- Acquired characteristics, inheritance 43, 164,
 165, 177–179
- Activity 63, 120, 122, 162, 217
- Actualise 93, 95, 98, 104, 106
- Adapt, -ation 117, 164, 165, 177, 183, 196,
 211, 213, 233
- Adult 93, 94, 130, 133, 135, 137, 139, 142,
 151, 210, 223
- Aeolipile 32
- Affinity 105, 110, 177
- Age 37–39, 41, 43, 45, 46, 49–51, 53, 55, 57,
 63, 68, 72, 76, 78, 79, 82, 102, 115,
 116, 134, 152, 153, 162, 163, 175, 190,
 210, 217, 225, 226, 230
- Agnostic, -ism 70
- Agriculture, -al 15, 16, 20, 36, 45, 61, 89
- Air 28, 58, 61, 65, 71, 76, 77, 87, 91, 95, 104,
 105, 107, 108, 117, 149, 153, 155–158,
 209–211
- Airborne 155, 157
- Alchemy, -ist, -ical 33, 36, 38–40, 42, 49,
 52, 53, 64, 68, 70, 104–106, 147,
 150, 152
- Alexandria 30–36, 68, 72, 74
- Algebra 35, 39, 184
- Allele 181, 187, 188, 191, 192, 194, 195,
 202, 213
- Allelomorph 187
- Almagest 31
- Alphabet, -ical 21, 32, 38
- Alternation of generations 150, 151, 154
- Aluminium 108, 109, 217
- Americas 14, 61, 69
- Amino acid 201
- Amoeba 232
- Amorphous 122, 155
- Amphibian 136, 143, 153
- Amsterdam 183
- Analogy 2, 3, 72, 152, 193, 194, 212, 216, 219
- Analysis 20, 25, 45, 54, 67, 68, 106, 110, 123,
 178, 195, 210, 211
- Anaphase 140
- Anatomy 10, 34, 35, 38, 42, 73, 75, 80, 85,
 90, 119–121, 123, 124, 130, 137, 171
- Ancestor 4, 64, 136, 137, 143, 171, 174, 178,
 204, 205, 221
- Ancestry 136, 178
- Angel 43, 50, 148
- Anima 91, 95, 96, 106
- Animal 4, 23, 43, 47, 50, 54, 55, 76, 78, 80,
 84, 85, 87, 89–93, 95–100, 103, 104,
 106–108, 120–122, 124, 133, 135,
 137–140, 142, 143, 147, 148, 150, 153,
 161–166, 170, 171, 198, 201, 204, 207,
 211–213, 218, 223, 226
- Animal chemistry 106, 107
- Animalcule 152, 153
- Animal spirits 85, 96, 97, 100, 103, 107
- Animate 4, 5, 47, 84, 103
- Animism, -istic 59
- Anomaly 76, 78–81
- Antioch 34–36
- Ape 43, 90, 162, 171, 227
- Arab, -ic 31, 33–38, 42, 44, 47

- Archaeopteryx* 174
 Archæus 105, 106
 Archetype 166
 Arginine 201
 Aristocrat, -acy 23
 Aristotelian, -ism 27, 29, 32, 35, 42, 45, 48,
 49–52, 57–60, 62–68, 70, 71, 75, 78,
 82, 85, 89, 95–98, 100, 101, 103, 106,
 107, 119, 126, 132–134, 145, 148, 152,
 162, 163, 167, 170
 Army 15
 Art 16, 26, 75, 118, 156, 233
 Artefact 13, 23, 208, 212, 213
 Artery 76, 77
 Arthropod 150
 Articular 136
 Artisan 54
 Assort, -ment 183, 187, 189
 Assume, -ption 14, 54, 62, 71, 79, 101, 104,
 116, 123, 130, 167, 177, 178, 185, 188,
 195, 196
 Astrolabe 43
 Astrology 15, 16, 32–34, 38, 45, 49, 58,
 70, 105
 Astronomy 15, 16, 21, 28, 31, 34–36, 38, 39,
 42–45, 53, 216
 Atheism, -ist 70, 88, 101, 116, 132
 Athens 21, 23, 26, 27, 30–36, 72, 74
 Atmosphere 59, 153, 155
 Atom, -ic 7, 10, 22, 25, 26, 67, 88, 108, 123,
 152, 189, 194, 221, 230, 234
 Atomic theory 10, 123, 230
 Atomism 26, 30, 39, 42, 67, 101, 230
 Atrium 77, 81
 Attraction 99
 Augustinian 84, 148, 180
 Austria 10, 64
 Authority 1, 31, 33, 46, 47, 49, 52, 55, 62, 63,
 82, 83, 89, 123, 147, 153, 154, 172,
 180, 181
 Autoclaving 155
 Autosome 189
 Axiom 83
 Axis 138, 139
- B**
- Babylonia 21, 22, 30
 Baconian 20, 80, 83, 86, 98, 101, 103, 116,
 150, 163, 169, 170, 172
 Bacteriophage 203
 Bacterium, -a, -al 87, 152, 157, 202, 203,
 212, 213
- Bactria 34–36
 Baghdad 34, 36, 37, 51
 Barrier 157, 159, 210, 219
 Bat 135
 Bee 149
 Behaviour 6, 16, 90, 91, 105, 106, 111, 193,
 212, 213, 221, 223, 227, 230, 234
 Belief 4, 5, 8, 9, 13, 14, 17, 20, 23, 25, 26, 43,
 44, 52, 54, 58, 60, 67, 70, 76, 79, 82,
 85, 99, 102, 106, 110, 111, 115, 120,
 122, 126, 127, 147, 149, 150, 152, 154,
 156, 158, 161, 164, 166, 167, 173, 174,
 179, 180, 187, 214, 217, 225, 230
 Berlin Physical Society 123
 Bible, Biblical 17, 46, 53, 59, 68, 163
 Binary fission 152
 Biochemist, -ry 108, 123, 125, 127, 192, 199,
 201, 221, 222
 Biogeography 169, 171, 200
 Biometric, -ian 178, 179, 183–185, 187, 188,
 193, 194, 200
 Bird 90, 92, 93, 120, 136, 174
 Birth 4, 15, 25, 32, 35, 98, 101, 121, 129, 147,
 163, 168, 195, 216, 218
 Black Death 54, 55, 60, 62, 63, 69
 Bladder 76, 151
 Blastula 94, 135, 142, 144
 Blend, -ing 32, 85, 101, 122, 177, 181, 185, 193
 Blood 75–82, 84, 85, 87, 90–92, 94–97,
 106–108, 111, 125, 151, 177,
 209–211, 213
 Bologna 47
 Bond 99, 123
 Bone 89, 90, 119, 136
 Botanist, botany 95, 107, 119, 122, 169, 180,
 183, 184, 198, 229
Brahmasphutasiddhanta 35, 36
 Branching 164, 166, 168
 Breathe 89, 107, 108
 Breeding 170, 178, 185
 Brno 180, 181
 Brownian motion 229–231
 Buddhism 32, 33
 Bureaucracy, -atic 31, 38, 225
 Byzantine 34
- C**
- Cairo 36, 51
 Calculus 59, 60, 67, 68, 103
 Calendar 14, 16, 43, 53
 Caliph, -ate 36, 37, 42
 Calvinism, -ist 66, 130

- Cambridge 82, 168, 169
 Canning 154
Canon of Medicine 43, 44, 105
 Capillary 81, 85, 87, 153, 209, 210
 Capitalism
 early 61, 71, 73
 Capitalist 61, 62, 64, 73, 225
 Capsule 202, 203
 Carbon 19, 105, 109, 217
 Carbon dioxide 105, 108, 209–211
 Cardinal 64, 66
 Carnivore 90, 211, 212
 Cartesian 99, 100, 104, 111, 130
 Coordinates 58
 Catastrophism, -ist 156, 163, 164
 Catholic 46, 49, 52, 59, 61, 63, 64, 83, 152,
 153, 156, 166
 Cattle 151
 Cause, -al 3–5, 14, 15, 18, 20, 29, 44, 70, 71,
 91, 92, 100, 111, 113, 116, 117, 124,
 130, 158, 162, 164, 171, 192, 195, 201,
 202, 207–210, 222, 228
 Cause-effect relationship 3, 9, 13
 Celestial 15, 28, 29, 31, 43, 52, 58, 60, 65
 Cell
 biology 113, 121, 135, 138, 139, 143, 176,
 185, 188, 190, 199, 200, 205, 215, 216,
 233, 226
 theory 88, 115–127, 134, 138, 145, 154,
 155, 205, 220–223
 Central dogma 179, 222
 Centralised 31, 38, 46, 225
 Centrosome 140
 Change, social 46, 127
 Chaos, -tic 26, 105, 219, 228
 Character 3, 20, 25, 31, 36, 45, 66, 96, 106,
 115, 122, 167, 181, 184, 187–190, 192,
 194, 211, 222, 223
 Chemical 90, 99, 102, 104–109, 121, 123,
 144, 159, 192, 201, 203, 204, 217–222
 Chemist 8, 40–42, 109, 156, 159, 217,
 230, 234
 Chemistry 20, 38, 39, 42, 70, 73, 91, 99,
 100, 102, 104, 106–111, 121, 123,
 124, 127, 139, 150, 207, 215–217,
 219–222, 224
 organic 10, 108, 199
 Chick 93, 94
 China 11, 14, 21, 35, 41
 Choice 61, 100, 130, 209, 211, 222, 228
 Christian 26, 28, 30–33, 35, 37, 38, 44–46,
 48–50, 52, 55, 62, 71, 119, 150,
 175, 220
 Christianity 33, 35, 37, 46, 50
 Chromosome 138–141, 143, 144, 176–194,
 197, 198, 200, 201, 203
 Chronology, -ical 163, 168, 200, 207–209
 Church 44, 46–50, 52, 53, 55, 58, 61–63, 66,
 67, 73, 96, 102, 153, 166
 Circular 28, 29, 43, 58, 60, 65, 67, 82, 113,
 192, 228
 Circulation 40, 75, 76, 78, 80, 81, 84, 92, 96
 City, -ies 13, 15, 16, 21, 22, 26, 31, 32, 35,
 55, 61, 63, 73, 102, 225
 City state 21, 31, 32, 63, 226
 Civilisation 11, 14–16, 20, 21, 36, 74, 162
 Civil War 97
 Class 15, 23, 90, 110, 133, 169, 180
 Classical Greece 5, 11, 13, 42, 63, 68, 73,
 74, 92
 Classification 25, 90, 133, 137, 170, 171
 Cleavage 135, 138, 139
 Clergy 45, 55
 Climate 1, 49, 59, 155, 211, 223
 Cline 197
 Clock 41, 61, 86
 Clockwork 116
 Coalescence 122
 Coherent 9, 67, 90, 106, 205, 227, 231
 Colonial, -isation 11, 103, 115, 127, 133, 171
 Colour 1, 8, 59, 86, 88, 119, 120, 189,
 207–211, 231
 Combustion, -ible 54, 106–108
 Comet, -ary 15, 65
 Communication 11, 66, 110, 120, 162, 197,
 218, 219, 225, 226
 Comparative anatomy 90, 119, 121, 137,
 165, 171
 Compete, -ition, -itive 17, 21, 61, 142, 233
 Competence 63, 143–145, 156
 Complex 20, 23, 26, 32, 48, 73, 81, 88, 107,
 123, 127, 129, 144, 181, 187, 208, 211,
 222, 223
 Component 7, 100, 107, 110, 111, 122, 124,
 144, 181, 187, 208, 211, 222, 223
 Composition 104, 107, 108, 153, 209, 221
 Compound 17, 18, 86, 90, 108
 Comprehensiveness 7
 Computer 14, 43, 194, 218, 222, 234
 Concept 18, 33, 41, 43, 48, 50, 52, 54, 58, 60,
 71, 84, 95, 96, 98, 103, 106, 110, 113,
 117, 120, 124, 132–135, 144, 162, 163,
 165, 170, 174, 197, 198, 207, 216, 217,
 219–221, 230
 Conceptualism, -ist 48, 54
 Concrete 7, 11, 21, 73, 205, 215, 225

- Conquest 15, 36
 Consensus 48, 62, 80, 101, 138, 154, 159,
 162, 173, 177, 190, 192, 205, 215
 Consilience of inductions 118, 172
 Constant 29, 42, 60, 108, 143, 181, 194, 220, 233
 Constantinople 34, 36, 46, 47, 51, 63, 74
 Contagious 76
Continens Liber 43
 Continuity, -ous 36, 58, 85, 123, 127, 139,
 150, 152, 155, 158, 163, 179, 180,
 183–185, 177, 194, 205, 221, 222
 Continuum 43, 148
 Contraction, -ility 87, 97, 110, 111, 230
 Contradiction 8, 49, 82, 116, 148, 156, 227
 Continuity 123, 127, 139, 150, 152, 155, 183,
 205, 221, 222
 Control 5, 15, 20, 35, 46, 84, 85, 87, 97, 125,
 143–145, 196, 208, 210, 212, 213, 216,
 218, 221, 233
 Conversion 33, 46, 108, 217, 230
 Cooperation 170
 Copulation 153
 Córdoba 36, 47, 51
 Cork 87, 153
 Corpse 147
 Cosmology 10, 216, 226, 233
 Cosmos 22, 28, 29, 35, 43, 47, 50, 52, 58, 65,
 68, 89, 147, 228
 Cotton wool 155, 157
 Creation 20, 38, 47, 52, 62, 88, 96, 130,
 133, 152, 163, 166, 220
 Creationism 220
 Creator 38, 48, 52, 61, 98, 122, 137, 166, 175
 Crisis 79
 Critical realism 72
Critique of Pure Reason 117
 Crop 14, 16, 55, 184, 226
 Crossing 181
 Crossing-over 190–192, 199, 229
 Crusades 35, 55
 Cultivate 102, 180, 181
 Cultural relativism, -ist 72
 Culture 4–9, 13–22, 30, 32, 35, 36, 38, 52,
 60–63, 68, 71–74, 80, 89, 102, 115, 120,
 147, 155, 156, 158, 217, 224–227, 232
 Custom 115, 116
 Cycle 4, 14, 81, 82, 145, 150, 219
 Cytoplasm, -ic 144, 184, 192
- D**
 Damascus 32, 36, 51
 Data 9, 11, 17, 66, 79, 81, 82, 92, 121, 133,
 170, 172, 181, 185, 190, 192, 197, 215,
 220, 221, 231–233
- Daughter cell 138–141, 143, 185, 222
 Dead 82, 89, 91, 104, 147, 149, 150, 152,
 156, 181, 202, 232
 Death 4, 23, 26, 28, 30, 35, 52, 54, 55, 57, 60,
 61, 63, 66, 69, 79, 83, 85, 97, 106, 111,
 147, 158, 164, 175, 195, 216
 Decentralised 21, 63
 Deduction, -ive 83, 107, 115, 116, 158,
 172, 187
 Deferent 28, 81
 Deformity 177
 Democracy 62, 103
 Demographic 115
 Density 58, 87
De Anima 91, 95, 96
 Debate 22, 25–27, 31, 43, 47, 48, 52, 54, 75,
 82, 83, 88, 93, 95, 96, 99, 103, 118,
 120, 121, 127, 129, 133, 134, 152, 154,
 158, 163, 164, 166, 169, 171, 173, 174,
 176–178, 180, 182, 184, 186, 188, 190,
 192, 193, 203, 327
 Definition 13, 25, 45, 95, 106, 115, 222,
 231, 232
 Degeneration 134
De Generatione Animalium 93, 129
De Incessu Animalium 92
 Deism 122
De Motu Animalium 92
 Dentary 136
 Dentition 211
De Partibus Animalium 91, 93, 95
 Description 7, 33, 44, 47, 68, 71, 78, 84,
 87–90, 93, 106, 138, 142, 195, 196,
 203, 208, 216, 228, 232, 234
 Design
 argument from 162
 intelligent 220
 Determinant 189, 190, 192, 205
 Determine, -d 6, 47, 87, 95, 120, 135, 143,
 144, 180, 184, 192, 216, 222, 228
 Determinism, -istic 43, 119, 223
 Development, -al 14–16, 18, 21–23, 29, 32,
 33, 36–38, 41, 43, 46, 48, 51, 58, 63,
 87, 93–95, 102, 104, 110–112, 121,
 123–127, 129, 130, 132–139, 141–145,
 147, 161, 165, 166, 173, 180, 191,
 197–200, 204, 205, 208, 210, 218, 223,
 223, 225, 229
 - Mosaic 139, 143
 - Programme 144
 - Regulative 143
 Dialectic 23
 Dialogue 18, 23, 25, 26, 32, 34
 Differentiate, -ion 61, 144, 221
 Digestion 95, 91, 105, 107, 153, 212

- Digestive tract 211, 212
Diplococcus 202, 203
 Diploid 139, 141, 201
 Directed 85, 106, 127–143, 145, 181
 Direction 66, 72, 80, 103, 127, 135, 138, 196, 198
 Discontinuity, -ous 196, 198
 Disease 5, 16, 40, 54, 99, 105, 121, 123, 155, 201, 211
 Disuse 164, 177
 Divide, -sion 16, 28, 37, 42, 46, 48, 61, 76, 84, 85, 90, 119, 122, 123, 152, 185, 187, 191, 221
 Divine 8, 32, 33, 46, 52, 60, 71, 96, 123, 132, 133, 152, 185, 187, 191, 201, 221
 Diverge, -nce 23, 52, 135, 175, 178
 Diversity 89, 90, 91, 127, 197, 199, 200, 205
 DNA 109, 179, 184, 192, 200, 201, 203–205, 217
 Doctrine 29, 32, 47, 125, 154, 175, 218, 221, 234
 Dogma 179, 222
 Domestic 168, 170, 177, 212
 Dominance, -t 36, 117, 118, 150, 181–184, 187–189, 192, 193, 195, 196
 Dominican 49, 50
 Double helix 204, 234
Drosophila 189, 193, 197, 201
 Dualism 96, 97
 Dutch 17, 87
 Dye 135, 143
 Dynamic 169, 191, 225, 231
- E**
 Ear 136, 218
 Earth 1, 9, 15, 27–29, 31, 43, 50, 52, 59, 60, 65, 66, 68, 71, 73, 91, 104, 105, 147, 158, 159, 162, 163, 173, 175, 214, 223, 224, 228
 Echolocation 153
 Eclipse 15, 35
 Ecology, -ical, -ist 90, 170, 197, 198, 223
 Ecosystem 170, 213, 223
 Economic, -ist 6, 17, 45, 46, 54, 55, 58, 62, 64, 72, 73, 115, 133, 169, 189, 225, 233, 234
 Ectoderm 142
 Eden 52, 133
 Edinburgh 19, 102, 123, 166, 168, 169, 175
 Effect 3, 4, 9, 13, 20, 23, 26, 31, 32, 37, 44, 45, 47, 52, 55, 61, 62, 64, 66, 91, 93, 102, 104, 111, 113, 116, 124, 138, 139, 147, 154, 157, 162, 165, 170, 175, 177, 178, 188, 196, 175, 177, 178, 188, 196, 201, 207, 209–211, 223, 224, 229, 232
- Efficient cause 29, 91
 Egg 1, 87, 93, 95, 98, 135, 138, 139, 142, 144, 147, 150, 156
 Egypt 11, 14, 21, 22, 30–33, 40, 150, 164
 Electricity, -ical 19, 120, 156, 164, 217
 Electromagnetism, -ic 10, 18, 217, 231
 Electron 9, 19, 20
 Element 9, 10, 28–31, 34, 38, 49, 59, 65, 90, 91, 104–106, 108, 109, 111, 167, 177, 181, 217
 Elixir 33
 Ellipse, -tical 60, 65
 Embryo 29, 93, 94, 111, 124, 127, 129, 130, 133–135, 137–139, 142–145, 161, 198, 199, 204, 208, 210, 223
 Embryology 40, 94, 129, 134, 137, 139, 143, 145, 171, 188, 191, 198, 200, 204, 221, 223
 descriptive 133, 134, 136, 137
 experimental 138, 191, 198
 Embryonic 144, 147
 Emergent 127, 219
 Emigration 196, 223
 Empire 11, 21, 22, 30–38, 42, 45, 74
 Empirical 115, 167, 183, 184, 197, 210, 220
 Empiricism, -ist 48, 53, 83, 101–103, 107–116, 119, 148, 172, 173
 Employed 23, 31, 143
 Employer 61
 Enactive 234
 Endoderm 142
 Energy 43, 119, 192, 213, 217–219, 221
 flow 170, 223
 Engineer, -ing 15, 16, 19, 33, 62, 68, 216, 218, 219
 England 10, 82, 83, 102, 163, 166
 Enlightenment 19, 102, 103, 112, 115, 116, 122, 126, 152, 154, 161, 162, 172
 Entelechy 93, 95–98, 100, 103, 104, 107, 110, 111, 113, 120, 129–145, 167, 205, 208, 210
 Entropy 194
 Environment, -al 5, 13, 38, 43, 64, 95, 117, 134, 139, 162, 164, 165, 167, 177, 179, 180, 183, 194, 197, 211, 213, 221–223
 Enzyme 192, 196, 199–201, 203, 204, 212
 Epicurean 30, 67
 Epicycle, -ic 28, 44, 81
 Epidemic 16
 Epigenesis, -tic 93, 129, 130, 132–135
 Error 50, 72, 78, 83, 84, 89, 117, 133, 156, 187, 195, 201, 233
 Eternal 4, 22, 47, 49, 84, 116
 Ethics, -al 25, 28, 61, 173, 224, 227, 233
 Ethnography 38, 43

- Ethology 90
 Euclidean 116
 Eugenics 195
 Europe 10, 11, 13, 23, 27, 28, 31–36, 38, 41–47, 49, 51, 52, 54, 57, 61–64, 68, 71–74, 76, 78, 103, 115, 117, 125, 133, 147, 150, 152, 161, 165, 225
 western 10, 13, 23, 34, 41, 51, 57, 63, 73, 74, 115, 133, 150, 152
 European 11, 26, 30, 32, 34, 37–40, 42–45, 47, 51–53, 57, 61, 62, 72, 73, 78, 101–103, 115, 122, 232
 Evo-devo 204, 222
 Evolution 14, 16, 17, 29, 43, 48, 119, 127, 132, 134, 136, 137, 148, 158, 161–176, 177, 179, 180, 184, 185, 187, 189, 190, 193, 194, 196–200, 202–205, 208, 210, 212, 214, 216, 220–225, 227, 228, 232
 -ary theory 10, 113, 127, 132, 137, 139, 145, 159, 162, 173–175, 193–205, 210, 211, 216, 220–222, 224, 226, 231
 Evolutionary psychology, -ist 227
 Excrete, -ion 89, 92
 Experience 1, 2, 4, 9, 13, 53, 54, 101, 116, 118, 121, 172, 179, 215, 232
 Experiment 2, 6, 8, 22, 42, 53, 54, 57–59, 67, 71, 72, 79, 80, 83, 85–87, 102, 104–106, 109, 110, 117, 118, 121, 124, 127, 138, 143, 148–150, 152, 154–159, 178–183, 201, 202, 204, 220, 222–224, 230, 233, 234
 -al 8, 39, 68, 76, 91, 92, 111, 134, 138, 139, 144, 148, 150, 152–156, 158, 159, 162, 174, 184, 185, 188–190, 192, 193, 198, 201, 207, 210, 212, 224–231, 234
 Experimental philosophy 68, 102, 115–127, 152, 162, 188, 199, 210
 Explain 4–7, 11, 14, 16–23, 33, 36, 54, 65–67, 70, 72, 84, 85, 91, 93, 96, 105–107, 118, 121–124, 129, 130, 132, 133, 139, 142, 144, 147, 158, 162, 166, 169, 171, 177, 178, 180, 183, 189, 190, 192, 193, 195, 198, 199, 204, 205, 208, 210, 216, 219, 221–223, 227, 230, 231
 Explanation 4–9, 20, 22, 29, 39, 55, 65–67, 70, 71, 76, 83, 89, 92, 97, 98, 113, 121, 127, 129, 132, 150, 152, 166, 170, 171, 174, 183, 184, 188, 196, 208, 211, 214, 220, 227, 228
 Explanatory 4, 73, 106
 Expression 118, 144, 145, 153, 179, 183, 208, 221, 222
 External 29, 58, 60, 72, 89, 91, 93, 116, 117, 139, 150, 153, 165, 174, 196, 208, 221, 227
 Extinct, -ion 132, 162, 163, 170, 175, 194, 211, 226
 Eyes 2, 78, 90, 91, 93, 94, 147, 171, 189, 218

F
 Factory 19, 20, 22, 61, 139, 154, 181, 185, 187, 188, 192, 197, 203, 221, 228
 Faith 4, 38, 44, 48, 49, 54, 74, 116, 117, 216, 220
 Fallacy 72, 225
 False 46, 89, 117, 142, 173, 225, 231, 233
 Falsification 117
 Fate 33, 143, 144, 173, 223
 Feedback 212
 Female 89, 93, 130, 177, 184, 186, 189, 194, 227
 Ferment, -ation 49, 155, 156
 Fertile 14, 16, 133, 170
 Fertilise, -ation 31, 87, 93, 95, 98, 130, 135, 138, 139, 142, 144, 153, 181, 188
 Feudal, -ism 45, 46, 48, 50, 52, 55, 61, 62, 73
 Filter, -ed 155
 Fin 120, 135
 Final cause 29, 52, 67, 70, 71, 91, 95, 117, 171, 208, 211
 Fire 1, 28, 29, 31, 53, 54, 65, 91, 97, 104, 105, 108, 223
 Fish 90, 92, 120, 136, 149
 Fitness 70, 161, 194, 195
 Fitness landscape 195
 Flask 149, 156, 157
 Flesh 80, 85, 149
 Flood 14, 16, 68, 163, 223
 Florence 62, 148
 Flower 129, 207
 Fluid 2, 3, 99, 105, 229
 Fly 88, 92, 149, 189
 Food 3, 14–16, 76, 77, 89, 91, 105, 130, 154, 169, 170, 207, 211, 217, 232
 chain 43, 223
 Foot, feet 92
 Force 29, 45, 58, 60, 80, 83, 99, 104, 108, 122, 123, 133, 152, 153, 162, 165, 175, 192, 199, 211, 220
 Vital 104–108, 110, 111, 113, 164, 174, 210
 Form 4, 13, 16, 18, 23, 25, 29, 30, 37, 48, 55, 71, 90–93, 95, 105, 111, 118, 120, 125, 129, 132, 135, 139, 142–144, 148–150, 152, 164, 165, 167, 173, 178, 180, 181, 198, 199, 201, 204, 217, 222, 227, 232
 Formal cause 29
 Formalist 164

- Forms, Theory of 25, 26
 Fossil 29, 132, 136, 137, 162, 163, 171, 198
 Fossil record 137, 163, 166, 171, 198–200
 Fraction 39, 53, 58, 59, 127
 Franciscan 50, 105
 Freezing 153
 Frequency 194–196, 226
 Frog 80, 138, 139, 148, 149, 153
 Function 3, 5, 42, 76, 83, 84, 91, 92, 96, 98,
 108, 117, 120, 130, 196, 203, 208–214,
 224, 228
 Fungus, -i 87, 201
 Fuse, -ion 32, 134, 139, 201, 232
- G**
 Galaxy 43, 216
 Galenic, -ism, -ist 42, 47, 75–81, 84, 96, 105
 Gamete 93, 130, 132, 139, 141, 143, 179,
 181, 183, 185, 187, 191, 201
 Gas 71, 105, 193, 194, 209, 210, 234
 Gastrula 135, 142, 144
 Gemmule 177, 178, 180, 184
 Gene 5, 144, 145, 188–196, 199–203, 205,
 208, 221–223, 234
 Gene pool 194
 General 2, 6, 7, 9, 10, 21, 39, 43, 46–49, 54,
 60, 68, 72, 79, 81, 83, 87, 90–92, 106,
 108, 116, 122, 124, 135, 137, 139, 154,
 172, 184, 185, 201, 205, 210, 215, 218,
 222–224, 230–232, 234
 Generalisation 13, 90, 93, 98, 116, 169, 210
 Generation 2, 21, 44, 52, 58, 62, 67, 79, 83,
 84, 88, 95, 98, 99, 102, 106, 121, 122,
 127, 130, 132, 134, 135, 137, 145,
 147–159, 161–164, 173, 179, 181, 182,
 199, 205, 211–213, 217, 225, 227
 Genetic, -ally 6, 72, 95, 125, 179, 194–197,
 199–201, 203–205, 210, 218, 221, 222,
 225, 226
 Genetic code 204, 205, 222
 Genetic drift 195, 196, 199
 Genetic fallacy 72, 225
 Genetics 143, 174, 179, 183, 188, 190–198,
 200–202, 205, 222
 Genome 204, 222
 Genotype 95, 187, 188, 190, 192, 200, 223
 Genus, genera 48, 90, 148
 Geocentric 31, 65
 Geography, -ical 4, 31, 38, 43, 44, 132,
 169, 197
 Geometrical optics 10, 17, 18
 Geometry 31, 32, 34, 43, 59, 83
 analytical 58
 Germ 120, 130, 132, 135, 142, 144, 155,
 179, 185
 Germany 10, 40, 64, 65, 122, 137, 139, 154,
 165, 172–174
 Germination 129
 Germ layer 135, 142
 Germ-plasm 179
 Gestation 93
 Glass 40, 87, 138, 153, 154, 157, 186
 Globalisation 225
 Glucose 125
 Goal 29, 48, 100, 106, 135, 145, 172, 208,
 209, 212–214, 225
 God 25, 33, 37, 38, 43, 44, 47, 48, 50, 52, 54,
 59, 67, 70, 82, 88, 100, 111, 116, 117,
 130, 132, 148, 161, 162
 Gondishapur 34–36, 38
 Government 34, 61, 63, 156, 225
 Graafian follicle 98
 Gradual, -ism 19, 28, 122, 142, 143, 174, 178,
 179, 184, 194, 197–200, 205, 233
 Grasshopper 185, 186
 Gravity, -ation 29, 58, 65, 68, 80, 110, 117,
 118, 139, 207, 220
 Great Chain of Being 23, 33, 43, 50, 148,
 161, 162
 Greek 5, 7, 11, 20–23, 25, 30–36, 38, 40, 43,
 47, 49, 55, 62, 63, 67, 75, 93, 105, 225
 Growth 11, 15, 61, 127, 129, 120, 134, 135,
 139, 142, 153, 155–157, 169, 200, 203
 Gut 134
- H**
 Habit 91, 115, 173, 232
 Habitat 90, 102, 226
 Hand 27, 54, 92, 119
 Handedness 109, 155, 156, 217
 Haploid 139, 141, 201
 Hardy-Weinberg equilibrium 185
 Harmony, -ious 38, 119, 143
 Harran 34–36
 Head 35, 90, 93, 94, 138
 Heart 49, 76–78, 80–82, 84–86, 93, 96, 98,
 130
 Heat 60, 84, 89, 91, 93, 108, 139, 153, 155,
 157, 164, 175, 202, 212, 217
 latent 18, 19
 Heliocentric 10, 31, 35, 43, 57, 64
 Herbivore 211, 212
 Hereditary 61, 138, 179, 192
 substance 134
 Heredity 93, 138, 176, 177–180, 182,
 184–190, 192, 196, 200, 203, 204

Heresy, heretical 47, 60, 63
 Hermetic, -ism 32–34, 36, 38, 42, 53, 64, 153
 Heterogenesis, -tic 147, 148, 152, 156
 Heterozygote 183, 187, 188, 192, 195
 Hippocratic 43
Histoire Naturelle 100, 107, 134, 152, 153
 Histology 87, 100, 124, 125
Historia Animalium 90, 91, 93, 95
 Historical 14, 17, 25, 72, 88, 129, 132, 134,
 167, 171, 192, 211, 216, 222, 223
 Holistic materialism 126
 Holland 10, 101
 Homeostasis 125, 212
 Homology 92, 135, 137
 Homozygote 187, 188
 Homunculus 130–132
 Horse 132
 Host 125, 150, 170
 Human 3–6, 8–11, 13, 16, 20, 21, 26, 30,
 35, 38, 41, 52, 62, 71, 75–77, 79, 81,
 83, 87, 89, 91, 92, 96, 99, 100, 101,
 103–105, 115, 116, 118–121, 129, 147,
 151, 153, 166, 169, 171–174, 186, 196,
 211, 212, 222–228
 Hybrid 132, 162, 180–184, 187
 Hybridisation 133, 180–182, 184
 Hydra 135
 Hydraulic 97
 Hydrodynamic 99
 Hydrogen 109, 217
 Hyomandibular 136
 Hypoblast 94
 Hypothesis, -es 2, 3, 6, 8, 9, 22, 31, 54, 101,
 106, 107, 113, 117, 130, 132, 134, 137,
 139, 142–144, 147, 150, 154–156, 158,
 173, 174, 177, 178, 185, 187–190,
 199–201, 207, 212, 220, 229, 232–234

I

Iconic 234
 Idealism 32, 118, 174
 Ideology, -ical 216
 Idol 83, 101
Iliad 149
 Imagine, -ation 8, 68, 80, 89, 95, 117–120, 179
 Immigration 196, 223
 Immutable 134, 161, 162
 Impetus 58, 164
 Implication 15, 65, 67, 85, 115, 116,
 127–129, 134, 166, 167, 184, 203, 210
 Impression 89, 115–117, 170, 232
 Inanimate 4, 33, 50, 70, 75, 84, 89, 99, 100,
 102–104, 106–112, 148, 152, 207, 222

Incubation 93
 Incus 136
 India 11, 14, 21, 31, 34, 35, 42, 43
 Individual 2, 7, 8, 32, 46, 49, 54, 61, 63, 93,
 106, 118, 130, 132, 137, 138, 143, 144,
 172, 178, 183, 190, 193, 194, 207, 213,
 225, 226
 Individuation 61
 Induction, -ive 83, 90, 93, 107, 115–117, 169,
 172, 173, 210, 229
 Industrialisation 121, 127
 Industrial Revolution 19, 20, 112, 115, 118,
 126, 162
 Inertia 52, 58, 134
 Principle of 66, 67
 Inertial mass 52, 58
 Infection 6, 40, 43, 157, 211, 212
 Infinite 59, 116, 222, 230
 Infinitesimal 59, 60, 157
 Information 13, 18, 19, 87, 116, 138, 173,
 179, 204, 212, 217–219, 221, 222
 Infrared 2, 127
 Infusion 153, 155, 157, 158
 Infusoria 156, 164
 Ingest 232
 Inherit, -ance 43, 63, 134, 164, 165, 176–179,
 184, 185, 187–189, 191, 193
 Initiate, -ion 32, 45, 82, 121, 134, 138, 209
 Innovation 16, 19–21, 36, 38, 58, 61–63, 71,
 86, 127, 138, 144, 153, 176
 Inorganic 104, 106–110, 134, 157, 217
 Inquisition 66
 Insect 87, 148–150, 171, 207
 Insectivore 90
 Instinct 171
 Instrument 2, 17–19, 27, 36, 40, 44, 53, 66,
 86, 87, 95, 107, 116, 123, 134, 147,
 169, 175, 189, 197, 218
 Intention 5, 209, 212
 Intentional 222
 Interbreeding 133, 170, 175, 198
 Intermediate 44, 148, 150
 Internal 55, 89, 93, 117, 150, 162, 196, 208
 Interphase 140
 Intestine, -al 76, 94, 148, 150, 151, 154, 212
 Intracellular 123, 128
 Intrinsic 4, 59, 62, 70, 98, 102, 106, 107, 133,
 183, 208, 216
 Intuition 9, 231
 Invention, -or 19, 41, 65, 86, 103, 108, 121,
 153, 154, 157
 Invertebrate 90, 163
 Ionian 72
 Irradiate 201

Islam, -ic 11, 17, 26–28, 32, 333, 36–49,
51–53, 55, 57, 63, 67, 68, 72–74, 76,
78, 88, 92, 161
Italy 10, 34, 45, 62, 63, 82

J

Jaw 136
Jellyfish 135
Judaism, -istic 21, 32, 33, 37
Jupiter 28, 66
Juvenile 198

K

Kantian 117, 119, 121, 123, 127, 154, 172,
211, 229, 230
Kidney 76, 91
Kinetics 45
King 15, 45, 50, 82, 98
Knowledge 1–3, 5–9, 11, 13–23, 25, 26, 31,
32, 34–45, 47–49, 53, 54, 59, 60, 63,
71–74, 79, 80, 82, 83, 87–89, 92, 100–
102, 107, 110, 111, 115–119, 124, 125,
127, 129, 133, 145, 150, 163, 172, 173,
208, 214, 215, 219, 220, 224–227, 229,
231
Koran 44
Kuttaka 35, 39

L

Laboratory 107, 108, 155, 156, 158,
189, 222
Labourer 15, 55, 61
Ladder of Nature 23, 33, 119, 148, 150, 161
Lamarckian 158, 164–166, 177, 197,
198, 225
Land 14, 21, 32, 45, 46, 55, 61, 91, 163
owner, ownership 21, 61
Landform 102, 162
Landless 46, 61
Language 3, 17, 23, 28, 38, 42, 53, 71, 72, 96,
102, 104, 118, 210, 216, 218, 220,
231–233
Latin 33–35, 43, 44, 47–49, 95
Law 7, 9
Leaf 129, 211
Learning 1, 13, 30–38, 42, 45, 47–51, 53, 55,
57, 60, 72–75, 95, 172, 215, 225, 233
Lebenskraft 107
Leg 90–92
Leiden 58, 100, 102, 122, 181
Length 60, 212

Lens

achromatic 18, 121, 126
apochromatic 138
oil immersion 88, 138
Lens-grinder 17, 18, 66, 86
Lesion 125
Liberal Arts 34, 45, 47, 50, 58
Library 26, 27, 30, 31, 33, 196
Lice 149
Life-cycle 87, 150
Lifestyle 31, 61, 90
Ligate, ligature 80
Light 2, 3, 19, 43, 45, 53, 59, 66, 80, 82, 83,
88, 111, 117, 121, 124, 127, 139, 155,
157, 217, 220, 230
Limb 93
Lineage 143, 163, 198
Linear 28, 29, 33, 58, 143, 164, 166, 190, 192
Link, -age 3, 14, 15, 23, 148, 158, 189, 194
Linnaean 120, 162, 163
Society 167, 170
Liver 77, 78, 85, 9, 125, 212
Lockean 102, 103, 115, 152
Locomotion 92
Logic, -al 8, 22, 26, 54, 115, 132, 172, 213
Logical positivism 173
Lunar society 162
London 87, 97
Longitudinal 94, 139, 191
Lung 76, 77, 80, 81, 85–87, 91, 108, 195,
209–211, 213
Lutheran 66
Lyceum 26, 30, 95

M
Macedonia 30
Machine, -ry 19, 61, 64, 96, 99, 101, 103,
110, 203, 207, 217, 218
Macroevolutionary 198
Maggot 149
Magic 33, 49, 64, 103–105
Magnetic 109, 156
Magnify, -ication 19, 87, 88, 186
Maladaptive 196
Male 50, 89, 93, 130, 153, 177, 180, 186, 189,
194, 227
Malfunction 123
Malleus 136
Malthusian 169, 170
Mammal, -ian 77, 81, 87, 89, 90, 92, 98, 120,
134–137, 142, 162, 164, 171, 202,
209–213
Mammoth 163

- Manufacture 61, 204
 Mapping 190, 192–194
 Mars, Martian 28, 65
 Mass 52, 53, 58, 71, 94, 156, 175, 193, 231
 Mastadon 163
 Material 5, 25, 26, 29, 32, 34, 44, 45, 52, 67, 91, 100, 122, 124, 134, 139, 153, 155, 161, 176, 177, 179, 185, 187, 190, 200, 203–205, 211, 212, 228, 232
 Material cause 29
 Materialism, -ist 101, 110, 117, 122–127, 172, 188–190, 193, 196, 214, 229
 Mathematics, -ical 7, 15, 16, 21, 25, 26, 31, 34–36, 38, 39, 43, 45, 53, 60, 63, 66, 67, 71, 73, 82, 101, 115, 116, 172, 179, 180, 185, 197
 Mating 185, 194, 213
 Matter
 living 17, 88, 104–111, 113, 123, 164, 215, 217, 221
 Mature, -ation 21, 25, 29, 89, 113, 119, 127, 129, 130, 132–134, 139, 143, 151, 156, 162, 165, 167, 190, 197, 198, 200, 208
 Meaning 22, 38, 46, 103, 104, 132, 173, 218, 222, 234
 Measure, -ment 2, 7, 45, 47, 62, 105, 178, 187, 217
 Meat 149, 212
 Mechanics
 Classical 10, 29, 68, 101, 117, 119, 233
 Newtonian 58, 67, 68, 79, 116, 123, 193, 230–232, 234
 Quantum 10, 19, 20, 79, 231
 Relativistic 68, 231
 Statistical 71, 193, 194, 233
 Mechanism 5, 644, 70, 72, 79, 84, 85, 99, 103, 106, 110, 111, 116, 119, 121, 122, 125, 138, 153, 158, 161, 165, 170, 174, 177, 179, 180, 187, 189, 190, 195, 196, 199, 200, 204, 210, 212, 213, 215–219
 Mechanist, -ic 5–7, 9, 22, 29, 53, 58, 59, 64, 67, 70, 71, 88, 96, 100, 101, 103, 105, 106, 109, 111, 117, 119, 122–127, 132–135, 139, 143, 145, 170–172, 174, 188–191, 193, 196, 205, 207–210, 212–215, 229
 Mechanistic materialism 117, 123–127, 172, 188–190, 193, 196, 214, 229
 Mediaeval 13, 28, 31–33, 36–54, 57, 59, 61, 62, 67, 68, 70–74, 78, 79, 105, 130, 147, 150, 153, 161
 Medical 16, 42, 43, 45, 76, 85, 100, 156, 168, 202
 Medicine 16, 20, 34–36, 38, 40, 42–44, 47, 73, 75, 78, 82–85, 89, 96, 98–101, 103, 105, 106, 111, 121, 132, 148
 Mediterranean 20, 21, 22, 30, 31
 Medium, -a 58, 59, 153, 155, 157, 201
 - minimal 201
 Meiosis 139, 141, 43, 185, 190, 191, 200
 Memory 1, 4, 9, 13, 25, 83, 95
 Mendelian 179, 185, 187–190, 193–195, 201
 Mental 3, 4, 30, 48, 54, 123, 125, 224, 231, 232
 Merchant 3, 4, 30, 48, 54, 123, 125, 224, 231, 232
 Mercury 28, 105, 157
 Mertonian 39, 60, 69, 71
 Mesoderm 94, 142
 Mesopotamia 11, 14, 21
 Metal 33, 53, 106, 153
 Metaphase 140, 186
 Metaphor, -ical 59, 72, 95, 133, 171, 173, 232
 Metaphysics, -al 28, 58, 64, 70, 80, 102, 116, 117, 171, 174, 175, 230
 Method 13, 42, 58, 79, 82, 83, 87, 88, 96–98, 110, 124, 125, 138, 154, 172, 178, 193, 194, 201, 216, 223, 26
 Microbe 156
 Microevolutionary 198
 Microorganism 148, 152–157, 162, 164
 Microscope
 compound 17, 18, 86
 electron 19, 20
 optical 18
 Microscopy 10, 19, 86–88, 112, 176, 221
 Microtubule 140
 Middle Ages 23, 30, 34, 53
 Middle East 21, 31
 Migrate, -ion 135, 144
 Military 15, 16, 21, 22, 38, 46, 63
 Milk 157
 Mind 4, 21, 25, 32, 38, 47–49, 54, 78, 83, 87, 93, 100, 101, 116–119, 148, 158, 166, 171, 172, 224, 228, 230–232
 Mining 162
 Mite 150
 Mitosis, -tic 138, 140, 141, 143, 184–186, 200
 Model 23, 35, 52, 64, 81, 85, 97, 98, 134, 144, 153, 167–169, 171, 172, 174, 175, 177, 179, 193, 194, 196–198, 200, 204, 222, 234
 Modification 120, 134, 165, 185, 205
 Modifier genes 195
 Molecular biology 145, 179, 199, 200, 204, 221, 222
 Molecular weight 203

Molecule 7, 108–110, 155, 156, 193, 194,
199, 203, 204, 207, 217, 219, 221, 234
Mollusc 143, 148
Momentum 58, 76
Monotheism, -istic 37, 38, 46, 74
Montpellier 47
Moon 15, 28, 29, 31, 59, 65, 66, 83
Moral 1, 6, 47, 172, 227, 228
Morality 33, 48, 102, 119, 171
Morphogen 144, 145
Morphology 120, 185, 192
Motion
 law of 45, 67
 ‘natural’ 28
 uniform 43, 45
 ‘violent’ 28, 29
Mouse, mice 148, 202
Muscle 85, 87, 97, 110, 125, 151
Muscular 80, 217
Museum 30, 120, 163
Muslim 33, 36–38, 40–46, 53, 55, 63, 74,
104, 148
Mutant 189, 195, 201
Mutation 184, 185, 189, 195, 199, 201,
202, 223
Mutationism, -ist 134, 181, 183–185
Mutilation 153
Mycologist 201
Myopia 60
Mystical, -ism 26, 32, 33, 36, 43, 64, 99, 111,
113, 124
Myth 4, 20, 22, 117

N

Natural history, -ian 137, 152, 166, 168, 169
Naturalistic, -ism 5, 9, 13, 20–23, 25, 29, 31,
33, 36–38, 52, 53, 55, 64, 70, 72–74,
89, 90, 170, 205
Natural philosophy 52, 53, 55, 58, 59, 67–71,
73, 80–83, 85, 86, 88, 101–103, 118,
120, 149, 169, 172
Natural selection 43, 64, 92, 161, 162, 165,
167–172, 174–176, 177–179, 184,
187, 193–200, 202, 205, 207, 210,
222, 227, 232
Natural theology 162, 166, 168, 169, 174, 175
Nature 3, 4, 14, 23, 25, 26, 30, 33, 35, 44, 45,
47, 50, 52, 53, 58, 65, 66, 71, 80, 84,
86–88, 90, 91, 93, 96, 98–100, 106–111,
117, 119, 120, 129, 130, 134, 135, 148,
150, 152–154, 161, 162, 171–173,
175–177, 183, 192, 194, 199, 203, 212,
217, 224–227, 229, 230, 233

Naturphilosophie 118, 119, 122, 123, 127,
150, 154, 162, 165, 167, 169, 172, 174
Neokantian 117
Neoplatonist, -ism, -ist 23, 26, 32, 34–36, 42,
45, 46, 48–50, 119, 148, 161
Neoteny, -ic 198, 199
Nerve 84, 85, 87, 96, 110, 121, 130, 217
Netherlands 17, 86
Network 170
Neural Darwinism 142
Neurite 142
Neurospora 201
Neutrophil 213
Newtonian 29, 58, 67, 68, 79, 99, 103, 104,
107, 116, 117, 123, 133, 193, 229–232,
234
Newton’s rings 86
Nitrogen 109, 217
Nominalism, -ist 48, 54
Non-organic 70
Normal science 79
Noumena 117
Nova 65
Nucleolus 140
Nucleotide 204, 234
Nucleus, -ar 119, 122, 135, 138, 140, 143,
144, 184, 192, 232
Numbers 2, 22, 35, 39, 43, 60, 64, 83, 185
Nutrient 76–78, 85, 89, 142, 201
Nutrition 91, 122, 127, 211

O

Objective 8, 23, 47, 62, 72, 90, 118, 214
Observable 5, 13, 21–23, 26, 29, 48, 54, 60,
68, 71, 96, 98, 111, 162, 194, 220, 224
Observation 3, 8, 14, 17–19, 37, 47, 53, 60, 65,
76, 79, 80, 82, 83, 85, 87, 88, 90–93, 97,
100–102, 107, 110, 115–117, 121, 124,
132, 135, 138, 142, 147, 153, 163, 169,
172, 177, 180, 181, 184, 185, 189, 210,
211, 231, 233, 234
Ockham’s Razor 54, 59
Offspring 93, 132, 165, 176–178, 180, 181,
189, 194, 210
Ontogeny 137
Optic nerve 121
Optics 10, 17, 18, 31, 32, 53, 59, 60, 64, 68,
87, 120
Orbit 5, 9, 59, 60, 65, 66, 68, 173, 231
Order 4, 22, 23, 25, 26, 35, 38, 44, 48, 49, 54,
62, 65, 76, 90, 96, 100, 106, 110, 116,
117, 121, 144, 148, 161–174, 171, 182,
186, 188, 190, 194, 200, 215

- Organ 91, 105, 121
 Organelle 88, 207
 Organic 8, 10, 29, 35, 43, 53, 70, 104, 106,
 107, 110, 134, 137, 147, 149, 153,
 155–157, 164, 194, 199, 217, 234
 Organicism 126
 Organisation
 biological 95, 123
 social 15, 16, 55
 Organiser 144, 145
 Origin
 of Creation/cosmos 47
 of life 158, 159, 167, 175, 222, 224
Origin of Species 92, 137, 158, 166–171
 Orthodoxy 46
 Orthogenesis 167, 174
 Osmosis 124
 Ovary, -ies 130
 Oviparous 133
 Ovum, -a 98, 135, 137–139, 144, 181
 Oxford 39, 52, 53, 60, 157, 158
 Oxygen 107–109, 209–211, 217
 Oxygenated 81
- P**
- Padua 42, 47, 82
 Pair 92, 139, 181, 185–187, 191, 194, 210
 Palaeontology, -ical 39, 120, 171, 174, 198
 Pancreas 125
 Panda 211, 212
 Pangen 184, 185, 188, 189
 Pangenesis 93, 177–179, 188
 Panspermia 159
 Paper 135, 138, 149, 166, 180–182, 184, 185,
 193, 203, 215, 218, 229–231
 Paradigm 79, 224
 Paradise 71, 73, 103
 Parasite 147, 148, 150, 170, 211
 Parent 23, 93, 130, 132, 138, 139, 141, 176,
 180, 184, 185
 Paris 44, 47, 49, 50, 52, 53, 57, 102, 118, 120,
 131, 152, 163
 Parsimony, -ious 8, 22, 90
 Part 5, 7, 10, 11, 22, 23, 26, 28, 29, 32, 33,
 35, 38, 43, 45, 46, 52, 58, 63–65, 71,
 76, 80, 87, 90–93, 96, 99–101, 103,
 110, 111, 118, 120–122, 124, 127, 130,
 132, 134, 136, 139, 142–144, 147, 152,
 156, 161, 162, 165, 173, 175, 180, 188,
 196, 200, 201, 203, 207–213, 219, 226,
 231, 232
 Particle 19, 30, 85, 99, 106, 124, 134, 174,
 190, 191, 193, 229
- Particular 2, 6, 7, 9, 11, 13, 14, 44, 47, 52,
 63, 67, 72, 83, 85, 101, 104, 107, 110,
 123, 135, 137, 138, 142–144, 163, 172,
 189, 197, 211, 220–222, 225, 227–229,
 231
 Particulate 88, 189, 192
 Pasteurisation 157
 Path analysis 195
 Pathology 40, 110, 123
 Pathway 199, 221
 Pattern 1, 2, 7, 14–16, 41, 79, 81, 82, 115,
 129, 135, 137, 144, 166, 178, 187, 189,
 198, 223, 224, 234
 Pea 180–182
 Peasant 50, 180
 Perception 2, 95, 231
 Perfect 25, 26, 48, 52, 60, 65, 68, 83, 148, 181
 Pergamum 31
 Persia 21, 30, 35, 36, 41
 Phenomenalism 173, 230
 Phenomenon, -a 7–9, 11, 21–23, 35, 49, 65,
 67, 70, 72, 79, 113, 117, 118, 120, 121,
 124, 137, 147, 152, 163, 172, 183, 190,
 193, 198, 208, 222, 224, 229–231
 Phenotype 187–190, 192, 195, 200, 202, 223
 Phial 153
 Philosopher 5, 7, 21–23, 25–27, 30, 38, 44,
 54, 57–59, 68, 70–74, 80, 82, 83, 88,
 92, 97, 102, 103, 117, 122, 143, 154,
 161, 172, 173, 229, 231, 234
 Philosophy 22, 30, 32, 33, 35, 36, 38, 44, 45,
 47, 49, 52–55, 59, 60, 66, 68–73, 80–83,
 85, 85, 86, 88, 101–104, 115, 117, 118,
 120, 133, 149, 152, 162, 172, 173, 216,
 224, 229–234
 Phlogiston 106, 107
 Phoenician 22
 Phyllotaxis 65
 Phylogeny 137
 Physician 40, 75, 98, 107, 111, 119,
 130, 148
 Physicist 58, 79, 111, 118, 173, 175, 193,
 215, 217, 218, 221
 Physics 6, 18, 20, 28, 29, 35, 42–44, 46, 53,
 57–60, 67, 68, 71, 73, 78, 79, 82, 84, 86,
 88, 89, 96, 98, 99, 110, 111, 121–124,
 175, 180, 193, 194, 207, 210, 214
 Physiology, -ical 38, 73, 75, 76, 79–81, 84,
 85, 91, 100, 110, 111, 115–127, 188,
 191, 192, 196, 199, 210, 212, 223
 experimental 115–127, 188, 199, 210
 Pigment 143
 Pineal gland 84, 97
 Plague 54, 55, 60

- Plane 117, 138, 139
Planet 5, 7, 14, 15, 28, 39, 60, 65, 66, 68, 82, 159, 175, 214, 223, 231
Planisphere 43
Plant 40, 50, 87, 89, 93, 95, 117, 120–122, 124, 129, 135, 138, 139, 147, 150, 170
Platonism, -ist, -ic 26, 32, 49, 50, 54, 84, 148–150, 170, 177, 180–184, 198, 201, 211, 212
Plug 155, 157
Pneuma 76, 91, 95, 104, 107
Pneumonia 202
Pole 140, 144
Politics, -ical, -ician 6, 15, 20, 28, 31, 36, 38, 46, 49, 53, 55, 62, 72, 82, 98, 102, 103, 115, 116, 118, 123, 137, 154, 156, 158, 166, 169, 170, 172, 195, 225, 227
Pollen 181, 229
Pollinate 180
Polyp 152
Polypeptide 201
Polytheism, -istic 16, 21, 37
Pope 27, 52, 66
Population 14–16, 54, 55, 61, 147, 168–170, 178, 179, 183–185, 189, 193–200, 205, 212, 213, 222, 223
Pore 76–78, 85, 97, 147, 157, 158, 201
Positivism, -ist 125, 154, 169, 172, 173, 178, 179, 193, 196, 214, 216, 229
Post-mediaeval 74
Postulate 68, 88, 101, 204, 220–222, 231, 232
Potential 15, 19, 62, 93, 95, 98, 104, 106, 129, 143, 147, 212
Pragmatic 216
Prague 65
Precursor 73, 132, 135, 159
Predator 170, 211
Prediction, -ive 3, 5, 7, 9, 15, 16, 22, 31, 72, 85, 87, 187, 189, 212, 223, 224, 226, 227, 230, 233
Preformation, -ism, -ist 93, 129–135, 139–145, 161, 191
Premise 4, 6, 17
Pre-existing 17, 19, 122, 130
Preparation 135
Pre-Socratic 21–23
Pressure 20, 64, 71, 125, 153, 155, 171, 178, 179
Priest 15, 16, 21, 33, 107, 152, 153
Prime mover 28, 52
Primitive groove 94
Primitive streak 94
Principia 57, 67, 68
Principles of Geology 163, 168, 169
Printing press 41, 60, 61, 69, 70, 73
Probability 57, 194, 195, 227
Problem 3, 4, 42, 47, 65, 68, 87, 88, 91, 103, 111, 113, 117, 119–123, 125, 127, 130, 132, 135, 167, 173, 174, 190, 191, 207–214, 224, 226–228, 231
Progeny 142, 149, 180–183
Programme, -d 95, 125, 137, 144, 204, 162, 163, 208
Progression 147, 162, 163, 208
Progressive, -ness 9, 22, 26, 62, 70, 71, 85, 92, 164–167, 171, 174, 184, 194, 205, 215, 225
Prokaryote 203, 204
Proliferation 156
Proof 21, 83, 149, 154, 155, 175, 181, 190, 192, 227
Prophase 140, 191
Proposition 48, 52, 63, 116, 173, 210, 212
Protein 109, 179, 201–204, 219, 221, 222
Protestant 17, 61, 63, 64, 69, 83, 112
 work ethic 61
Protozoa 87
Prussia 101
Psyche 95
Psychology, -ical 46, 115, 227
Ptolemaic 44, 81
Publication 57, 102, 115, 137, 138, 159, 167, 168, 171, 174, 189, 198
Pulmonary 40, 43, 76–78, 209
Pulsatile 77
Pulse 84
Pump 20, 78, 80, 84
Punctuated equilibrium 134
Purpose 5, 20, 22, 23, 29, 47, 52, 68, 91, 103, 110, 111, 117, 122, 123, 125, 127, 129, 143, 152, 167, 174, 207–214, 219, 233, 234
Purposeless 70
Purposive, -ness 70, 84, 103, 104, 106, 111, 113, 119, 122, 125, 129, 135, 145, 205, 145, 205, 208, 210
Pythagorean, -ism 32
- Q**
Quadrante 136
Quadratic 35
Quadrivium 34, 58
Qualitative 7, 26, 67, 70, 184, 215
Quantify, -ication 60
Quantitative 71, 107, 181, 194, 218, 227
Quantity 80, 105, 108, 194
Quantum theory 220, 221, 226

R

Rabies 76, 155
 Race, -ial 132, 195
 Radiation 2, 201, 217, 233
 Radical 53, 71, 80, 102, 109, 110, 118, 121, 158, 166, 170
 Radioactivity 275
 Radioisotope 203
 Rainbow 53, 68, 88
 Random 88, 161, 183, 185, 193–195, 222, 229
 Rationalisation 61
 Rationalism, -ist 83
 Reacting tissue 144
 Realism, -ist 48, 54, 60, 72
 Reason
 Age of 102, 115, 153
 Recapitulate, -ion 136, 137
 Recessive 181–185, 187–189, 192, 195
 Reduction, -ism, -ist 7, 9, 22, 32, 205, 215, 216
 Reflect, -ion 25, 44, 46, 48, 50, 55, 62, 66, 72, 83, 167, 228, 229
 Reformation 61, 63, 69, 70, 73, 112
 Refute, -ation 3, 47, 76, 93, 107, 109, 150, 154, 159, 174, 175, 198, 225
 Regenerate, -ion 132, 188
 Reject, -ion 2, 26, 44, 46, 54, 75, 84, 88, 95, 97, 98, 104, 105, 108, 119, 132, 137, 152, 154, 156, 158, 173, 178, 188, 196, 230
 Relativity 10, 220, 229–231
 Reliable 11, 14, 26, 47, 73, 83, 88, 102, 115, 116, 234
 Religion, -ious 4, 16, 17, 21, 23, 31–33, 35, 37, 38, 43, 44, 46, 49, 70, 82, 88, 96, 101, 102, 116, 122, 152, 156, 173, 220, 224
 Renaissance 62–64, 67–70, 73, 75, 78, 225, 232
 Replicate, -ion 107, 127, 153, 204, 208, 221, 222
 Reproduce, -tion 89, 90, 93, 94, 97, 98, 130, 141, 150, 152, 157, 169, 186, 201, 210, 211
 Reproductively isolated 194, 198
 Reptile 136, 137, 174
 Republican, -ism 154, 156, 158, 166
 Respire, -ation 85, 86, 91, 95, 107, 108, 124
 Retina 121
 Revolutionary 17, 19, 65, 79
 Rhetoric, -al 8, 34, 44, 83, 102, 158, 170
 Rock 50, 102, 120, 162, 163, 207
 Rodent 90
 Romantic, -ism 118, 119, 162

Rome, -an 11, 30–36, 38, 43, 46, 47, 62, 64, 75, 82, 83, 118, 119, 147
 Rotation 59, 64
 Royal Society 71, 83, 86, 87, 102, 118, 123, 148, 152

S

Saltation, -ism, -ist 174, 181, 183, 184, 187, 189, 191, 193, 197–200
 Sceptical, -ism 26, 44, 45, 87, 105, 106, 115, 116, 154, 156, 166, 172, 175, 179, 187, 190, 192, 203, 226, 229, 230
 Schism, conceptual 99
 Scholastic, -ism 38, 44, 47–49, 51–57, 59, 60, 62, 70, 72, 78, 83, 130, 132, 147
 Scientific Revolution 30, 33, 42, 57–74, 75–88, 89, 91, 92, 95, 96, 100, 104, 106, 112, 129, 133, 145, 147, 161, 208
 Scriptures 17, 46, 47, 52, 66, 156
 Seal, -ed 40, 67, 149, 152–154, 232
 Sea urchin 138, 143, 185
 Secularisation 44, 61–64, 69, 73, 103
 Seed 29, 46, 93, 129, 134, 153, 155, 159, 165, 169
 Semantic 216, 219, 221, 222
 Semen 93, 98, 138, 153
 Sensation 1, 115, 118, 121, 172
 Sense 2, 4, 5, 7, 14, 19, 22, 26, 29, 53, 91, 92, 95, 96, 100, 103, 106, 107, 116, 119, 121, 129, 133, 134, 139, 144, 147, 148, 166, 196, 207–209, 212, 214, 216, 219, 220, 230–234
 Sense-organ 121, 232
 Sensibility 54, 110
 Sensory 2, 9, 13, 116, 117, 153, 212, 218, 222
 Septum 76–78
 Sequence 3, 14, 93, 101, 164, 201, 202, 204, 207
 Servo-mechanism 212
 Sex, -ual 89, 95, 98, 135, 143, 171, 177, 185, 186, 189, 195
 Sexual selection 171, 195
 Silicon 108, 109, 217
 Skill 1–3, 9, 13, 17, 31, 32, 54, 55, 70, 125, 150, 188, 233, 234
 Slave 23, 31, 61
 Snake 149
 Socio-economic 17, 45, 62, 72, 73, 225
 Soil 43, 117, 130, 139, 223
 Solar system 10, 14, 17, 43, 65, 68, 123, 166, 233
 Solid 80, 99, 121, 175
 Somatoplasm 179
 Somatopleure 94

- Soul
 nutritive 95, 105, 147
 perceptual 96, 148
 rational 84, 96, 147
- Space 26, 42, 47, 68, 85, 103, 116, 117, 125,
 170, 210, 219, 230
- Spain 17, 40, 42, 44, 47
- Species
 Origin of 92, 133, 137, 158, 166–171,
 174, 183, 197, 198
- Specimen 87, 88, 121, 135
- Spectrum 59, 86
- Speculation 25, 42, 85, 105, 115, 127, 147,
 152, 171, 188, 190, 211, 224
- Speed 58, 60, 85, 230
- Spermatozoon, -a 87, 98, 130, 135, 138, 139,
 185, 187
- Sphere 28, 29, 44, 52, 65, 66, 95, 135, 142
- Spindle 140
- Spinal cord 97
- Spine 94, 135
- Spirit 53, 59, 95, 95, 97, 99, 100, 102, 104,
 106, 107, 117, 118, 122, 124, 125, 129,
 132, 147, 149, 152, 170
- Splanchnopleure 94
- Spontaneous generation 88, 95, 98, 127, 132,
 145, 147–159, 161, 162, 164, 205
- Spore 147, 157, 158, 201
- Squamosal 136
- Stage 18, 70, 72, 93, 94, 110, 135–138,
 140–142, 144, 186, 191, 194, 198, 210
- Stain, -ing 135
- Stapes 136
- State 29, 32, 33, 35, 44, 46, 53, 46, 53, 62,
 111, 135, 208, 212, 219, 220, 224
- Statement 2, 54, 68, 71, 89, 107, 116, 117,
 130, 150, 165, 196, 207–212, 214, 231
- Static 22, 26, 48, 52, 62, 63, 71, 148, 173, 191
- Statistic, -al 71, 173, 178, 181, 184,
 193–196, 233
- Steam engine 18–20, 217, 218
- Stimulus 111, 208, 219, 221, 222
- Sterile, -ise 120, 155, 157
- Stomach 105
- Strain 183, 194, 202
- Strata 163
- Stratigraphy, -ical 163
- Structure 8, 14, 17, 47, 49, 50, 52, 55, 62, 65,
 87, 89–92, 94, 98, 100, 116, 117, 120,
 123, 125, 130, 133–135, 137, 138, 143,
 144, 164, 170–172, 181, 185, 200, 203,
 204, 210, 230–232, 234
- Student 30, 42, 47, 101, 108, 121
- Subatomic 68, 174
- Sufi 32
- Supernaturalistic 4, 5, 11, 21, 32, 73
- Surgery, -ical 31, 35, 38, 40, 76, 78
- Swim 92
- Symbolic 222, 234
- Syntaxis, see *Almagest*
- Synthetic 109
- Synthetic theory of evolution 197–201,
 203–205, 208
- System 2–5, 9, 10, 14–17, 20–23, 43–46, 65,
 68, 81, 83–85, 89, 97–100, 120, 123,
 124, 133, 143, 162, 164, 166, 167, 172,
 187, 194, 212, 213, 215, 218, 219, 222,
 223, 233
- Systema Naturae* 133
- T**
- Tadpole 138
- Taenia saginata* 151
- Tapeworm 148, 151
- Target 75, 102, 142, 144, 203, 212–214
- Taxonomy, -ic 10, 90, 120, 132, 133, 135,
 137, 162–164, 171, 197, 198
- Technology 13–23, 31, 41, 45, 62, 63, 70, 71,
 73, 74, 90, 115, 138, 154, 217, 222,
 226, 228
- Teleology, -ical 5, 22, 29, 52, 53, 67, 70, 91,
 92, 117, 119, 129, 132, 145, 162, 167,
 171, 174, 175, 207–210, 212–214
- Telescope 17, 18, 28, 65, 66, 86, 102
- Telophase 140
- Temperature 71, 105, 125, 156, 158, 175, 212,
 213
- Terrestrial 14, 15, 28, 29, 58, 65, 68, 136,
 159, 215, 224
- Testable 3, 187, 207, 212, 224, 233
- Testis, -es 130, 138, 185
- Textbook 9, 89, 130, 155, 187
- Theism, -ist, -istic 5, 70, 125, 152, 166, 174
- Theologian 43, 47, 52, 58, 150
- Theology, -ical 32, 35, 36, 44, 47–50, 52, 53,
 83, 84, 130, 166, 168, 169, 174, 175
- Theorem 21, 39, 60, 83, 194
- Theoretical 20, 23, 178, 184, 193, 197, 200,
 224, 232
- Theory 2–8, 10, 17–19, 25, 26, 31, 57–59, 67,
 68, 71, 75, 79, 80, 84, 85, 87, 88, 104,
 111, 113, 115–127, 130, 132–134,
 136–139, 145, 154, 155, 158, 159, 161,
 162, 164, 166, 167, 169–179, 185,
 188–190, 193–205, 207, 208, 210–212,
 214, 216–226, 228–234
 change 79, 232

- Thermodynamics 10, 71, 175, 194, 217, 218,
 225, 226, 231, 233, 234
 Theurgy 33
 Things-in-themselves 115, 117, 172, 229, 234
 Throwback 177, 178
 Tide 45, 53
 Time 6, 9–11, 14, 17, 18, 20–23, 26, 31, 42,
 44, 45, 47–49, 52, 57, 60, 68, 69, 71–
 73, 75, 76, 79, 82, 84–86, 93, 98, 103,
 112, 117, 121, 123, 125, 126, 132, 134,
 144, 148, 150, 152–155, 158, 161–164,
 168, 169, 173, 175, 176, 181, 183, 187,
 192, 194, 197, 201, 204, 205, 207,
 209, 210, 212, 219, 221–223, 225,
 230, 233
 Tissue 76, 77, 81, 85, 87, 94, 110, 121–123,
 125, 127, 135, 142, 144, 211
 Tooth, teeth 89, 90
 Trade, -ing 11, 21, 31, 35, 38, 41, 61–63,
 87, 225
 Trait 180–185, 187–190, 192, 193, 195,
 211, 230
 Transcribe, -iption 179, 216, 221, 222
 Transformation 132, 161, 162, 164–167, 203,
 224
 Transformism
 Translate, -ion 26, 29, 31, 33–36, 38, 42–44,
 47, 48, 53, 54, 58, 93, 95, 96, 117, 137,
 158, 179–181, 204, 222
 Transmission 134, 151, 176, 178, 196, 208,
 213, 219, 222, 227
 Transplant 143, 180
 Transport 76, 162, 163
 Tree 68, 105, 171, 207
 Trivium 34
 Trunk 94
 Truth 44, 62, 63, 71, 80, 83, 91, 116, 122,
 124, 130, 172, 214, 234
 Type 15, 18, 41, 87, 90, 91, 105, 111, 162,
 174, 180, 189, 192, 195, 213, 217, 223,
 234

U
 Ujjain 35, 36
 Ultraviolet 2, 217
 Umanisti 62, 71, 73
 Understanding 3, 7, 13, 22, 25, 26, 33, 37,
 44–47, 52, 63, 66, 71, 73, 82, 85, 86,
 89, 90, 93, 95, 96, 101, 102, 110, 115,
 116, 119, 123, 127, 138, 143, 145, 162,
 188, 196, 213, 218, 220, 223, 224, 232,
 233
 Unification 120, 122, 137
 Uniformitarian, -ism 156, 163, 169
 Unit 22, 30, 121, 123, 184, 187, 194, 221
 Unity 119, 120, 127, 204, 221
 Universal, -ity 38, 45, 48, 68, 86, 98, 100,
 101, 118, 150, 155, 169, 201, 204, 215,
 220, 222, 226
 Universe 4, 31, 32, 35, 49, 57, 60, 64–66, 68,
 75, 82, 96, 100, 101, 116, 117, 159,
 166, 173, 174, 214, 224, 233
 University 44, 49, 96, 100, 125, 130, 136,
 137, 157, 178, 180, 197, 198, 218, 224
 Untestable 4
 Urea 108, 109
 Urine 76

V
 Vaccination 155
 Vacuum 67, 71, 85, 92
 Value 2, 6, 9, 59, 62, 73, 184, 194, 205, 209,
 214, 224, 225, 231, 233
 Valve 42, 76, 78, 80, 84
 Vapour 43, 76, 77
 Variant 99, 111, 130, 132, 165, 167, 170, 180,
 192, 202, 205, 233
 Variation 132, 162, 165, 170, 174–179, 183,
 185, 188, 195, 196, 198, 223
 Vatican 27, 64, 66
 Vegetable 82, 149, 153
 Velocity 29, 43, 66, 193, 220, 221, 230, 231
 Vein, venous 42, 53, 76–81, 85
 Vena cava 77, 78, 80
 Ventricle 76–78, 80, 81, 84, 97
 Vertebrate 90, 120, 135, 136, 147
 Vessel 20, 76, 81, 84, 85, 87, 94, 110, 111,
 152, 157, 193
Vestiges 166, 168, 169, 171, 215
 Victorian 169, 170, 172
 Vienna 57, 180
 Virulent 202
 Virus 203, 221
Vis essentialis 133
 Vitalism, -ist 99, 104, 106, 109–111, 121,
 123, 124, 133, 143, 210
 Vital properties 110, 111, 113
 Vital spirits 76, 77, 95
 Viviparous 133
 Void 67

W
 Walk 15, 92
 Warfare 46, 61
 Waste 89

- Water 1, 28, 43, 87, 91, 92, 104, 105, 125,
 143, 156, 229
 Wealth 21, 38, 46, 55, 61, 73, 90, 91, 225, 226
 Weapon 13, 15, 16, 45, 225
 Weight 58, 59, 105, 117, 153, 173, 203, 211
 Wild 3, 178, 183–185, 197–200, 211
 Wild type 180, 189, 195
 Wing 88, 92, 120, 135, 156
 Work 1, 3, 7, 9, 13, 15, 19, 20, 22, 23, 25, 26,
 30–32, 34, 40, 42, 44, 47, 50, 52, 57–60,
 63, 64, 66–68, 71, 75, 76, 79, 80, 83,
 85, 89, 92, 93, 95, 97, 99–102, 104–109,
 115, 119, 121, 122, 124, 125, 130, 132,
 136, 138, 148, 153, 154, 156, 163, 164,
 166, 169, 178–180, 184, 185, 187–189,
 191, 194, 197–199, 201, 217, 218, 221,
 229, 230, 234
 Worm 150, 154, 166
 Writing 8, 16, 21, 22, 36, 38, 42, 44–46, 52,
 60, 62, 64, 66, 75, 96, 101–103, 117,
 119, 123, 132, 157, 161, 163, 169, 171,
 173, 195, 229, 233, 234
- X**
- X-rays 201, 217
- Z**
- Zeitgeist 72
 Zoology 119, 137, 178, 180, 198
 Zoroastrian 35
 Zygote 139, 142, 144, 183, 185, 187, 188,
 192, 195