meaning, purpose, and value to things outside human affairs (e.g., origins, places, natural phenomena, and life and death itself), and the presumption that there is something like intentionality or intelligence behind the way that things are and the unfolding of worldly events.

Both of these nearly universal tendencies reflect a complex interaction between the cognitive predispositions that have evolved to ease the acquisition of symbolic communication and the implicit power of symbols to alter conditions of life in the world. Since a prerequisite to symbolic reference is the "discovery" of the logic of the system of inter-symbolic relationships that supports any individual symbolic reference, there are reasons to believe that the changes in prefrontal proportions contributed not just an ability to sample these non-overt relational features, but also a predisposition to look for them. With symbols, what matters is not surface details, but a hidden logic derived from the complex topologies of semantic relationships that constrain symbol use.

So the neuropsychological propensity to incessantly, spontaneously, and rapidly interpret symbols should express itself quite generally as a predisposition to look beyond surface correlations among things to find some formal systematicity, and thus meaning, behind them, even things that derive from entirely nonhuman sources. Everything is thus a potential symbol—trees, mountains, star patterns, coincidental events—and if the systematicity and intentionality is not evident it may mean merely that one has not yet discovered it. Symbolic meaning is a function of consciousness and symbols are produced to communicate. So if the world is seen as full of potential symbols, it must implicitly be part of some grand effort of communication, and the product of mind. Whether this projected subjectivity is experienced as different personalities resident in hills, groves of trees, or rivers, or as some single grand infinite mind, this personification also taps into the intersubjective drive that is also fostered by symbolic projection.

In summary, the role of symbolic communication, and especially language, in moral cognition is ubiquitous. It has played a role in the evolution of a brain more capable of the cognitive operations required; it has provided critical tools for easing the implicit cognitive strain of performing these mental operations; and it has made it possible for societies to evolve means for developing these abilities (as well as opening the door for the horrors of their abuse). Moreover, the capacity for spiritual experience itself can be understood as an emergent consequence of the symbolic transfiguration of cognition and emotions. Human predispositions seem inevitably to project this ethical perspective onto the whole world, embedding human consciousness in vast webs of meaning, value, and intersubjective possibilities.

See also SEMIOTICS

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LAWS OF NATURE

It is generally held that the search for laws is part and parcel of natural science. Statements of the laws of nature provide the most systematic and unified account of phenomena; they are used to make predictions, and they figure centrally in explanation. But are the laws of nature real? Do they belong to the world or do they rather reflect the way people speak about it? Do they merely describe the facts and processes in nature or do they govern them? In other words, do laws possess a modal force, the force of nomological necessity, not attaching to merely contingent facts? And if they do, how does one get a handle on this important distinction between laws and nonlawful accidental generalizations? These questions continue to be widely debated and there is no generally accepted philosophical theory of the laws of nature. It is also unclear whether any single theory could do justice to the diverse kinds of laws used in different scientific disciplines (physics, chemistry, biology, psychology, etc.). Finally, it is a matter of controversy how the laws of various disciplines are related to each other.

Do laws describe or prescribe? Some historical background

The question of whether laws describe or prescribe the course of nature has always been given particular emphasis in the debates. Most historians agree that the concept of scientific law as it is used today did not become widely accepted until the scientific revolution marking the birth of modern science. The ancestors of this concept, however, are old and include the ideas of social, legal, and moral order, which themselves can be traced to the notion of divine legislation. This notion is clearly associated with the prescribing force various laws (*lex, regula*) possess due to their origin in God's will—be they the natural laws of moral conduct or the laws of mechanics. The mathematician and philosopher René Descartes (1596–1650), in particular, explicitly related his law of inertia to the sustaining power of God. Even as late as the Enlightenment age, philosophers such as Montesquieu (1689–1755) attributed the order of nature to the hand of God. But alongside this divine-necessitation understanding, natural scientists and philosophers as different as Roger Bacon (c. 1220–1292) and Johannes Kepler (1571–1630) advanced a quite different conception of law that was free of theological connotations and had to do with observable and measurable regularities in nature. The view of laws as regularities capable of being inductively inferred (or even "deduced," as Isaac Newton [1642–1727] thought) from phenomena and then used in prediction and explanation became firmly entrenched in the new science of mechanics and in many other disciplines in the decades following the scientific revolution. Such regularities were widely interpreted as being descriptive, not prescriptive. Rather than being imposed on phenomena, they simply reflected the way things are. This interpretation received a stamp of approval in the empiricist tradition and especially in the philosophy of David Hume (1711–1776). In was, however, challenged in twentieth-century philosophy, especially after the demise of logical positivism, the rise of scientific realism, and the revival of metaphysics.

A taxonomy of scientific laws

The sciences display a wide variety of laws. Some laws are deterministic, the paradigm example being the laws of Newtonian mechanics, which prompted the astronomer Pierre Simon Laplace (1749–1827) to invoke his famous image of a demon capable of performing an arbitrary number of calculations in a finite amount of time. If the demon knew all the laws pertaining to the interaction of matter particles and the exact configuration of all the matter in the universe at a certain moment of time, he would be able to predict with absolute accuracy the state of the entire world at any future moment, as well as retrodict its past states. Given the deterministic laws and initial conditions, there is only one way for the phenomena and processes to occur. Probabilistic or statistical laws, in contrast, only attribute a certain probability to such occurrences. The laws of statistical mechanics, of Mendelian genetics, and of social and economic development are in this category. Since such laws are not the most fundamental laws of reality, however, their probabilistic character may not be irreducible. But if the currently dominant interpretation of quantum mechanics is correct, then indeterminism is a feature of even the most basic laws of nature.

Laws pertaining to natural processes (deterministic or not) and relating their earlier and later stages (e.g., a putative chemical law to the effect that putting together substances X and Y results in an explosive reaction) are often referred to as causal laws. The relationship between causal laws and causation (in particular, whether the former are constitutive of the latter) is a matter of dispute. Far from all laws are causal, however. Some laws assert a synchronic dependence among several quantities (e.g., the ideal gas law relating pressure, volume, and temperature). Still other laws state that an entity of a certain kind has a certain property (e.g., water's boiling point is 100° C).

Finally, there are conservation laws (of matter, momentum, energy, etc.), other basic principles such as relativistic and gauge invariance, and prohibitions such as Pauli's exclusion principle and the principle ruling out superluminal signals. How should they be classified? Are they on the same footing with other laws? Or are they rather second-order constraints on first-order laws? In any case, they are of paramount importance. Thus the invariance of some physical quantities with respect to coordinate and other kinds of transformation is bound up with the concept of symmetry and has been a powerful heuristic tool in the search for the fundamental forces of nature.

This classification of various types of laws can be extended in many directions. The diversity of laws calls into question any attempt to provide their universal form.

Philosophical theories of laws

Philosophical theories of laws are focused on the ontological status of the latter. In many ways, the ongoing debate about this status is a successor of the older dispute between the descriptive and prescriptive views of laws. It is hard to get rid of the feeling that when water boils at 100° C (under normal atmospheric conditions), it does so not simply as a matter of fact but out of necessity. Moreover, if no samples of water were ever heated to 100° C, it would still be true that, were an arbitrary water sample so heated, it would boil. Advocates of necessitarian theories attribute this necessity to nature and hold some facts about the world responsible for the modal power inherent in natural laws. Philosophers in the empiricist tradition, however, have always thought otherwise. Instead of attributing nomological necessity to nature, they have attempted to achieve the effect of this necessity by working in rather barren metaphysical landscapes. In spite of the sustained critique leveled against this attitude beginning in the early 1960s, it remains very influential, under the name of the *regularity theory*.

According to this theory, laws of nature are nothing but universal truths of spatio-temporally unlimited scope that can, in many cases, be expressed by quantified material conditionals involving only qualitative and local predicates: $(\forall x)(Px \supset Qx)$; for example, "All frogs are green," "All metals expand when heated," "All electrons have a unit electric charge." Laws, in other words, are cosmic regularities. On this view, being such a regularity is necessary and sufficient for being a law. What makes it a matter of law that water boils at 100° C is the cosmic fact about the instantiation of first-order properties—the fact that all actual samples of water at 100° C found in the history of the universe have boiled, are boiling, and will boil. The manifestly Humean character of this concept of lawhood made it one of the cornerstones of logical positivism.

The regularity theory confronts many problems. First of all, being a cosmic regularity is neither necessary nor sufficient for being a law. Some laws are probabilistic (e.g., those of quantum mechanics) and hence compatible with any actual degree of correlation between the relevant *P*'s and *Q*'s. There are also uninstantiated laws. For example, Newton's first law, which states that an object will remain at rest or in uniform motion in a straight line unless acted upon by a net external force, probably has no instances at all. It is (arguably) a genuine law of nature nonetheless. Thus being a (cosmic) regularity is not necessary for being a law.

It is also not sufficient for it. To use the renowned example of the philosopher Karl Popper (1902–1994), suppose every moa (an extinct species of bird in New Zealand) that ever lived died before age fifty as a result of some ubiquitous disease, thus giving an instance of cosmic regularity. There is, however, no law corresponding to this regularity. Every moa could have lived longer but, as a matter of fact, has not. The regularity in question is merely accidental, not genuinely lawful. But the theory is incapable of distinguishing these two cases.

This has prompted a modification in the regularity account based on the notion of counterfactual conditional. Genuine laws of nature, but not accidental uniformities, can be said to support (that is, imply) the relevant counterfactuals. Thus the regularity from Popper's example does not imply "If something were a moa, it would have died before age fifty." On the other hand, a genuine law that moa have a certain number *n* of chromosomes does imply the counterfactual "If something had been a moa, it would have had *n* chromosomes." To be able to use this criterion, however, one needs an independent account of truth conditions for the relevant sort of counterfactuals, namely, those that are not also counterlegals violating the laws of nature. But it is hard to see how one could know which counterfactuals are true and which of them are not counterlegals without already knowing what laws of nature there are.

It has been argued that laws, but not mere regularities, possess considerable explanatory power. While this is true, it can hardly serve as a criterion of lawhood. Something is not made into a law when its statement becomes explanatorily powerful. It is powerful because it is already a statement of law. A similar objection applies to the best version of the regularity theory, which was anticipated by John Stuart Mill (1806–1873) and Frank Ramsey (1903–1930) and elaborated in the 1970s and 1980s by David Lewis (1941–2001). According to Lewis, "a contingent generalization is a law of nature if and only if it appears as a theorem (or axiom) in each of the true deductive systems that achieves the best combination of simplicity and strength" (p. 73). This account makes lawhood relative to merely epistemic (hence subjective) standards of simplicity and strength pulling in opposite directions.

These and other problems have led to the emergence of necessitarian alternatives to the regularity theory. One such alternative, widely known as the Dretske-Tooley-Armstrong theory, takes laws to be grounded in relations between universals. A lawful regularity, such as the fact that all metals are electric conductors, obtains because *being a metal* nomologically necessitates *being an electric conductor*. Although such a relation between the two universals, *metallicity* and *conductivity,* is itself contingent (could have failed to take place), its actual presence confers on particular facts falling under it the right sort of necessity (i.e., the nomological of physical necessity), which sustains the relevant countarfactuals and accounts for the explanatory power of this law. On the contrary, no relation of necessitation obtains between *being moa* and *dying before age fifty*. The corresponding cosmic regularity is still there but only as a matter of historical accident, not as a matter of nomological necessity.

To uphold such a theory, however, one has to accept, not only real universals (entities such as *metallicity,* in addition to actual metals) but also contingent relations of nomic necessitation between them. Such relations must then translate into the relations among particulars. Some authors have argued that these commitments create serious difficulties (Bas van Fraassen's problems of identification and of inference).

The second major type of necessitarian theory states that laws derive from causal powers (dispositions and propensities) of objects. The possession of such powers by natural kinds of objects (e.g., elementary particles, chemical elements) disposes their bearers to behave in specific ways or to exemplify other characteristic properties. On this account, most properties—and especially those of the fundamental objects—are ultimately dispositional in nature. For example, the electric charge possessed by the electron disposes the latter to interact in a certain way with the electromagnetic field. Laws of nature, on this account, simply codify the natural behavior of things enforced by their intrinsic causal powers. Moreover, natural kinds possess their dispositional properties essentially: Nothing counts as an electron unless it has a unit electric charge, a specific mass, spin 1/2, and perhaps other essential dispositional properties. The major difference of this account from the relations-between-universals view is erasing the boundary between what things are and how they behave. On the former view, all electrons have a certain charge because of the relation between the two universals: *electronhood* and a determinate *chargehood*. On the latter view, part of what makes something an electron is having a certain charge. Instead of being imposed "from above," in the form of the necessitation relation between universals, lawhood emerges "from below," from the ascription of essential dispositional properties to particulars.

One difficulty with this view is that it raises the specter of *virtus dormitiva*: Causal powers of fundamental objects turn out to be their irreducible dispositional properties that must be possessed even when they are not manifested. But what exactly is involved in saying that a certain substance has an irreducible disposition that is not currently manifested? What keeps such a pure disposition in existence? Other questions arise: Do fundamental objects, such as electrons, have one disposition or many? If many, what accounts for their connection?

Thus all major philosophical accounts of laws have their difficulties. This has led some authors to skepticism about the possibility of a satisfactory analysis of lawhood or even to the view that the notion of law must be rejected altogether as being empty, obsolete, and having no important role to play in contemporary science. This, however, remains a minority view. Most philosophers (and probably all scientists) continue to think that laws are important, even if their ontological nature is elusive.

Laws and explanation

Even if explanatory potential does not by itself make something into a law, the ubiquitous role of laws in scientific explanations is beyond doubt. This observation has formed the basis of the covering-law model of explanation introduced in 1948 by the philosophers Carl Hempel (1905–1997) and Paul Oppenheim (1885–1977) and further elaborated by Hempel in the 1950s and 1960s. To explain a particular phenomenon is to answer a why-question, and this requires an account of how the phenomenon was brought about. Hempel has construed deterministic explanation as a deductive argument of the form:

$$\frac{\begin{array}{l} C_1, C_2, \ldots, C_n \\ L_1, L_2, \ldots, L_m \end{array}}{E}$$

Here $C_1, C_2, \ldots, C_n$ are statements describing the initial conditions and $L_1, L_2, \ldots, L_m$ are statements of laws (together constituting the *explanans*), while E is a statement describing the event to be explained (the *explanandum*). Thus to explain why a particular sample of metal expanded when heated, one invokes a law to the effect that all metals do so when heated and the initial condition stating that the sample in question was heated. The above deductive-nomological schema has a probabilistic (statistical) counterpart to account for explanations involving indeterministic laws.

Since its inception the covering-law model has been the target of many objections. But it is still the starting point of any informed discussion of explanation. It is plausible that most deficiencies of Hempel's model are ultimately due to its implicit reliance on a broadly Humean (i.e., regularity) conception of laws.

Laws and reductionism

Whether higher-level laws of nature (chemical, biological, psychological, etc.) are reducible to the fundamental physical laws—and if so, in what exact sense—is part of the problem of reductionism. However natural it may seem to think that chemistry is eventually just a chapter of physics, many authors have resisted this line of thought. Even physicists have always doubted that the irreversibility inherent in the second law of thermodynamics can be explained on the basis of time-reversal invariant laws of mechanics. Developments in chaos theory have all but deepened such doubts.

See also CAUSATION; DETERMINISM; SYMMETRY

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LEVEL THEORY

Level theories are used to explain the relationship between different academic disciplines and the realities that they describe. Drawing on concepts of emergence and supervenience, level theories seek to counter the claim that all of reality can be explained as nothing but a collection of atoms. Various scholars in science and religion have argued that reality should be understood in terms of increasing levels of complexity, each level emergent from, but not reducible to, the levels below.

See also COMPLEXITY; EMERGENCE; HIERARCHY

GREGORY R. PETERSON

LIBERATION

Liberation is a central religious notion both in South Asian religious traditions and in contemporary Christian theology, but in what way are South Asian meanings of liberation (*mokṣa, mukti, nirvāṇa*) comparable to liberation as understood by contemporary Christian theologians? This entry will highlight significant differences regarding the meanings of liberation across traditions, then draw conclusions about the meaning of those differences for how each tradition engages the sciences. The discussion will focus on those traditions that seem most philosophically unlike Western religious traditions, namely the nondualism of Advaita Vedānta (constituted as a school by the eighth-century theologian, Śaṇkara) and Buddhism, particularly the Madhyamaka tradition (inaugurated by first-century C.E. Buddhist philosopher Nāgārjuna).

Success in cross-cultural comparison requires examining what South Asian religious traditions seek to be liberated from. There is greater agreement about the nature of the predicament that makes liberation necessary than about how to escape. The reason for this wide divergence is plain: Each South Asian tradition (indeed each subtradition) has a unique understanding about the nature of the ultimate reality to which liberation leads. Nevertheless, nearly all concur in their assessment that all beings are beginninglessly bound to *saṃsāra,* the wheel of rebirth or transmigration, by the force of karma. The question about just what causes karmic bondage quickly reintroduces serious debate both within and across South Asian religious traditions.

South Asian traditions, although they have typically maintained that all sentient beings are in bondage, have traditionally been anthropocentric in focus. Even if all beings are in bondage, it is primarily human beings who can be liberated. Moreover, only individual human beings, not communities, are liberated from the cycle of transmigration. Human bondage is rarely construed in sociopolitical terms. Liberation is understood largely as a matter of freedom from afflictions of the heart and ignorance of the mind, the root causes of bondage to the process of rebirth. Liberation from craving, ignorance, and delusion (the three poisons in Buddhism and also in Śaṇkara's Advaita) does lead to more compassionate living, but the essential locus of transformation is the person.

Until contemporary attention to ecological matters transformed Western religious thinking, Western traditions have also been anthropocentric in character. And, like South Asian traditions, the religious goal has most often been understood as salvation for individual human beings. Salvation was