

Chapter 2

Human Reality

Where indeterminacy of translation applies, there is no real question of right choice; there is no fact of the matter even to within the acknowledged under-determination of a theory of nature.

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2.1 Is There a World?

Realism is the view that objects and events in the world exist independently of human conception of them: the world is mind-independent. Looking at the book in front of me, I am prone to view the book as existing on its own even when I am the author of the book. That is, even when I know that the book could not have come to exist without my mental and physical effort, the existence of the book itself is not dependent on my mind. The book will continue to exist when I am no longer looking at it and thinking about it.

Needless to say, our sense of realism is more robust for unambiguously external objects such as rivers, trees and mountains. Much of human enterprise is geared to come to terms with this external world, including the social world, so that we are able to lead a meaningful—and hopefully happy—life in it. We engage with this world for every breath we take, every move we make, every step we take. The effort would have been far less demanding and interesting if the world happened to be just a manifestation of our minds. We live in the world even when we crave for the utopia. This much seems to be evident even if set aside the Cartesian logical problem that my own existence becomes problematic if the world isn't there.

On closer reflection though, the opposite anti-realist idea—that the world is fundamentally our own construction—seems to have considerable force. Classical philosophers, especially in the rationalist tradition, pointed out that humans are not just passive receivers of external stimuli. The human mind actively contributes from its own inner resources to organize and interpret sensory information. The rationalist philosopher Ralph Cudworth (1731) called these resources 'cognoscitive powers' which enable the mind to raise 'intelligible ideas and conceptions of things

from within itself'. The 'intelligible forms by which things are understood or known', Cudworth held, 'are not stamps or impressions passively printed upon the soul from without, but ideas vitally protended or actively exerted from within itself.' For another rationalist philosopher René Descartes, the human ability to form conceptions of things from chaotic and often-impoverished experience is akin to the formation of 'a statue of Mercury contained in a rough block of wood'. Thinking of human knowledge on the analogy of the statue of Mercury, it becomes very unclear if any significant notion of mind-independent reality can be attached to the statue. In an uncomfortably strong sense, then, the conception of reality can only be a conception of human reality.

To dispel possible misinterpretations, I distinguish between four senses of *human reality* to suggest that only the last one is under discussion here. First, by *human reality* people sometimes mean that reality has human-like properties much like humanoid faces in clouds. Various animistic conceptions of reality, such as panpsychism, often invoke anthropomorphic properties of reality itself. Second, in anthropological inquiry, the notion of a human reality sometimes indicates those aspects of the world—buildings, bridges, ships, computers, books and artworks—that are clearly products of human effort. Third, by *human reality* we could mean the conditions that humans face as socio-biological creatures: oppression, political history, and inevitability of death.

None of these three senses is at issue in this chapter. By *human reality*, I simply mean the reality that humans grasp by dint of their unique cognoscitive powers. Despite its metaphysical import, the notion of human reality is epistemologically linked to the human agent: the kind of reality humans know of. The notion is more fundamental than the other notions of human reality since the former subsumes the latter; for example, the reality humans grasp by dint of their epistemic powers could well have animistic features.

2.2 Truth and Knowledge

However, it is not often realized in intellectual circles outside analytic philosophy that two rather standard ideas in philosophy lead to the conclusion that the object of human knowledge is best viewed as mind-independent. Since, as noted, the notion of reality is intrinsically related to the idea of mind-independence, it follows that the concept of knowledge is also so related; in other words, the conception of human knowledge requires the realist position. Denial of reality—anti-realism—therefore, amounts to denial of knowledge: if there is no world, then there is no knowledge, for the world is the object of knowledge. Anti-realists, then, cannot uphold the idea of human knowledge. This consequence seriously dents the attractiveness of anti-realism. The two philosophical ideas that lead to this consequence are as follows.

The first of these ideas is commonly known as the justified true belief (JTB) conception of knowledge. The conception is traceable to Plato. In his allegory of the

cave, Plato invites us to imagine a dark cave with some light filtering in from the outside through an opening. The light throws shadows of objects that pass by the opening, on a blank wall across the cave. There are people sitting chained between the source of light and the wall such that they can only see the shadows of objects, including of themselves, on the wall. They do not have any independent grasp of these objects. According to Plato, these people have at best some beliefs about the world, not knowledge.

Plato's Condition: For an epistemic subject S and a proposition p ,

S knows that p just in case

- (1) S believes that p ,
- (2) p is true,
- (3) S is justified in believing that p

The first condition states that in order to attain knowledge that p , the subject S attains the state of belief that p ; this condition relates the content of the proposition p to the epistemic subject. The second condition requires that only true propositions count; this condition relates the content of the proposition to truth. The third condition requires that S must have some evidence for (the truth of) p ; this condition relates truth to the subject. Thus, the three conditions are said to be individually necessary and jointly sufficient for S 's knowledge that p . There is wide agreement that these three conditions are needed at least to characterize knowledge. For the purpose of this chapter, I will hold on to this general agreement.

In a later chapter (Chap. 8), I will examine the JTB conception of knowledge in some detail to reject the idea that this conception of knowledge is a mental or psychological account of human knowledge. Also, following an influential paper by Edmund Gettier (1963), the Platonic conditions are viewed as inadequate since many counter-examples have been found that satisfy the three conditions without satisfying the intuitive conception of knowledge; hence philosophers have proposed various additional conditions. I am setting all these modifications aside since they do not affect the realism issue raised here.

The second of the two standard ideas in philosophy is what is known as the semantic definition of truth due to Alfred Tarski (1956).

Tarski Condition: For a sentence p in a language,

p is true if and only if p .

E.g., *Snow is white* is true if and only if snow is white.

According to Tarski, the truth-predicate *is true* exhibits the link between a sentence p of a language, and certain uses of the sentence that indicate the state of affairs mentioned in the sentence, the circumstance that p . In that sense, the truth-condition reflects the classical correspondence conception of truth: truth is a relation between language and the world. Thus, the sentence *snow is white* is true just in case snow, in fact, is white. This material effect is formally accomplished by naming, in the metalanguage, each sentence of an object language on the left-hand side of a material equivalence, and using a translation of the sentence in the metalanguage on

the right-hand side. The significance of the definition becomes more perspicuous when, instead of a homophonic language such as English in which the object language is contained in the metalanguage, we mention a sentence of another language on the left-hand side:

Baraf safed hai is true if and only if snow is white.

There are controversies over whether Tarski's theory captures the classical correspondence theory of truth or whether it is merely a 'deflationary' account of truth (Strawson 1949; Horwich 2004). One could also dispute whether the conception of the world/states of affairs in correspondence theory necessarily signals a mind-independent world or merely an 'extra-linguistic' world. Elsewhere (Mukherji 2010), I have argued in detail against Donald Davidson's idea (Davidson 1967) that Tarski's condition be viewed as a theory of understanding of a sentence. Finally, one could invoke other conceptions of truth, such as coherence and pragmatic conceptions, to give an account of human knowledge.

Nevertheless, I will adhere to the assumptions of correspondence and mind-independent reality in the account of Tarski's condition not only because these are the most natural assumptions, but they also help bring out a powerful intuition about human knowledge. For example, it is unclear if other conceptions of truth can even be articulated without assuming the realist version of the correspondence theory of truth (Davidson 1990).

With this preparation, we may now use the Tarski equivalence to replace the expression '*p* is true' with '*p*' in the second clause of JTB to obtain:

S knows that *p* just in case *p*, among other things.

Thus, S knows that snow is white when it is the case that snow is white. The formulation will be trivial if the whiteness of snow is a manifestation of S's mind; in effect, S will know that snow is white because S thinks so. That's exactly what Plato's condition was designed to rule out.

Such is the nature of human knowledge; human knowledge requires the conception of a mind-independent world. Our concept of knowledge begins to lose its regulative power if the object of knowledge fails to be a part of the *external* world; knowledge matters because the world does, every step of the way. A great deal of these powerful intuitions needs to be systematically rejected if we are to give up the proposed realist conception of knowledge. Suppose we hold on to the conception on that basis.

According to this conception of knowledge, which is based on strong philosophical foundations, alleged alternative conceptions of human knowledge as a mode of imagination, social construction, elaborate clan practice such as eurocentricity, expression of power in hegemonistic politics, a patriarchal trope since Plato, an instrument of control, an impediment to freedom, and the like, are simply beside the point. They do not affect the basic realist conception of human knowledge at all. On occasion, dimensions of human knowledge may be so used as to act, say, as an instrument of control. A glaring example is the knowledge of split atoms. Nuclear devices are instruments of control precisely because they exploit (realistic)

knowledge of atoms. If atomic structure was a fiction, there would be no nuclear weapons.

2.3 The Design Problem

Despite the rather compelling conceptual connection between human knowledge and objective truth, the realist conception of knowledge needs to be severely qualified. We saw that the JTB conception gives an account of knowledge of a subject *S*. By now, it is well understood that the epistemic subject is an active participant in the attainment of knowledge. As stressed by the classical philosophers mentioned earlier, humans form a knowledge of the world by virtue of ‘intelligible ideas and conceptions of things’ from within human cognitive resources. The crucial point is that humans come to know the world by forming *conceptions* of things; these conceptions are largely human-dependent. In that sense, it is seriously questionable if the object of knowledge may be viewed as mind-independent.

In a classic paper titled ‘What is it like to be a bat?’, the philosopher Thomas Nagel (1974) suggested that, given fundamental differences in the sensory apparatus between humans and bats, humans can never experience the world as the bat does. By parity of reason, the human conception of the world is a product of its own perceptual resources, not available to the bats. Humans would have formed a very different conception of the world if they were endowed with the bat’s equipment. Thus, our failure to adopt the bat’s perspective is not the basic issue, for the bat’s perspective is as species-specific as ours.

In any case, we know that humans perceive the world through a narrow band of, say, visual and auditory spectrums. For example, humans cannot directly perceive infra-red and ultra-sound effects, unless those effects are ‘translated’ within the range accessible to humans. Similarly, unlike many insects and other organisms, humans are unable to locate and identify objects with heat sensors, or find locations with geomagnetic tracking. What the world is like then is a product of the specific design of the epistemic subject.

In the next essay (Chap. 3) we will see that Immanuel Kant held that humans categorize their sensory experience of the world in terms of what he called ‘productive imagination’, a method of abstraction imposed by the mind. The task of productive imagination is to form schemata of objects given in experience by removing the ‘excesses’ of sensory information, and aligning the residual ‘image’ with categories already present in the mind. It is interesting that Kant also held that we possibly cannot have a ‘theory’ of the suggested alignment. We return to the issue repeatedly in this work, including later in this chapter.

In more recent work, the cognitive psychologist Elizabeth Spelke (2003) has shown that humans differ from other animals in their unique ability to combine information across broad categories such as colour and spatiality. Spelke (2010, p. 209) writes, ‘the capacity to combine core concepts freely and productively may give humans a range of choice far beyond what either our learning history or our

evolutionary history would seem to allow'. In recent studies, similar examples of human uniqueness from other domains of human knowledge abound (Penn et al. 2008). Many psychologists trace these abilities to the unique human endowment of language (Carey 2009).

Human knowledge is framed in the linguistic mode, as in JTB. As we saw, knowledge has the form (*that*) *snow is white*; that is how the objects and events of the world are organized for humans to have a knowledge of them. As Ludwig Wittgenstein (1922) would have said: <snow is white> is the thought, *snow is white* is what is uttered, and snow is white is what the world is like. It is not at all clear that nonlinguistic organisms categorize the world in familiar human terms at all. Analytically speaking, there is no doubt that all organisms organize their experiences with their own species-specific categories, but we may not have any idea what those categories are, as Nagel pointed out; worse, the 'organization' of their experience may not be categorial at all (Davidson 1975). So the troubling consequence is: what kind of world you know depends on what kind of species you are.

To summarize, on the one hand, we fondly entertain a conception of knowledge based on objective truth to achieve rationality in our living. Recall the justification clause in JTB: it is preferable to lead a life of knowledge than a (chained) life of beliefs. On the other, the very source of the coveted rationality, namely, the character of human design, threatens to turn human knowledge into a species-specific instinct, on par with the rest of the organisms. Given the rather severe boundaries of the problem, it is unclear how to retain the classical conception of knowledge.

The problem that human cognitive design poses for the conception of knowledge appears to be different from classical scepticism and some familiar versions of anti-realism. Scepticism denies the availability of knowledge as certain and truthful on the ground that human cognitive resources, such as the perceptual systems, are intrinsically unreliable and, hence, they may fail on occasion. Therefore, scepticism loses ground if perceptual and other systems function properly. For this reason, the general thrust against scepticism has been to argue that the idea that perceptual systems may fail globally is incoherent (Strawson 1985). In order to show that a perceptual system has failed in a certain case, we need to contrast it with a case where it didn't; global scepticism thus cannot be coherently articulated. In contrast, the design problem persists even if all cognitive resources function perfectly. In fact, the more perfectly they function, the more they impose human-specific 'conceptions of things' on human knowledge.

The basic thrust of anti-realism is to deny that there is a world for humans to have a knowledge of. For the anti-realist, human inquiry, especially abstract scientific inquiry, just provides some instrumental means of organizing sensory experience. It does not and cannot say what the world is like since the idea of a world beyond sensory experiences is a fiction. It is not clear that the design problem has the same effect. The problem no doubt stresses the central significance of human design in forming a conception of the world. But it does not strictly follow that the world so conceived is a fiction, because the conception of a fiction needs to be entertained within the resources of human design as well. It just follows that the

world so conceived is intrinsically tied to human design. That is the only kind of world humans may conceive of with their kind of mind; nonhumans, with different cognitive apparatus, may conceive of other kinds of worlds. No coherent meaning can be attached to the idea that human knowledge gives an account of an otherwise mind-independent world. In the sense outlined earlier, the world is a human world.

The reassuring idea that the design problem does not totally rule out the concept of knowledge also helps in dispelling some standard responses in philosophy. At this level of generality involving the entirety of human knowledge, philosophical problems often acquire a cloudy, even mystical, character. The uncertain nature of those problems might encourage some strategy for a dissolution of the problem, say, by ‘clarification’, as Ludwig Wittgenstein suggested. In the present case, it could be argued that the problem seems to assume something that it rejects. To question the objectivity of knowledge on the basis of species-specificity of human design is to grant objective knowledge of that design, and the problem apparently stands defeated. Further, what do we mean when we say that nonhuman organisms conceive of other kinds of world? If we cannot ourselves conceive of any other kind of world except what we are allowed by our design, how can we make a comment on what differently-designed animals conceive of? As Chomsky (2001) suggests, Nagel’s question, ‘What is it like to be a bat?’, does not seem to have an answer; hence, the question could be meaningless.

A short response to these suggestions is that it so happens that humans are simply endowed with the ability to reflect on their own design. Perhaps this endowment of self-reflection is a by-product of the linguistic endowment, but I’ll leave that aside for now. No doubt such reflections are severely restricted by the very nature of the enterprise. As Thomas Nagel (1997) observed: ‘There are inevitably going to be limits on the closure achievable by turning our procedures of understanding on themselves.’ Within those restrictions, however, once we form a preliminary idea of how we engage with the world, the basis for the design problem is already laid, and the (mind-independent) world is progressively lost.

Holding on to that thought, it is tempting to infer that the design problem is a consequence of the very conception of knowledge. This is because, as the JTB formulation highlights, knowledge is ascribed to an (epistemic) agent. The design of the agent is an essential component of knowledge, and once we entertain such a concept of knowledge, the idea of mind-independent world begins to collapse. Therefore, even if there is some methodological merit in the ‘clarificatory’ moves suggested in the previous paragraph, they do not enable us to reclaim the lost mind-independent world. From our limited knowledge of human design, we know that humans can only *raise* Nagel’s question, without answering it.

Some problems can only be contemplated in perplexity, if not in deafening silence. In fact, for the perplexity to arise, Nagel’s specific question is not really needed. As Nagel himself observes, Nagel’s question could be viewed as a rhetorical device—the method of difference, in this case between bats and humans—to highlight the design problem which persists even if humans are the only organisms around. In this chapter, I am setting aside the even more difficult issue that the design problem is not restricted to inter-species perspectives on the world, but generalizes to

intra-species perspectives as well—between you and me. Solipsism signals the end of philosophy.

2.4 Forms of Scientific Realism

Although the problem is all pervasive, the design problem may have little effect on common life. Common life is typically intimately engaged with the phenomenal world to sort out the fake from the genuine in that world. So the further issue of whether what is taken to be genuine is (also) *real* might not appear in the consciousness to generate the required perplexity. The design problem becomes menacing in more reflective enterprises like literature, philosophy, and the sciences.

For thinkers like Chomsky (2000) and others, the scientific enterprise is geared to establish referentiality of its explanatory terms. And the concept of reference gets its salience from the overriding scientific norm that scientific thinking aims to discover real *joints of nature*, notwithstanding the use of elaborate instrumental means such as mathematical models, approximations, artificial experimental set-ups, etc. Thus, the idea that human knowledge and, thus, the conception of reality thereof, can only be products of human design raises some interesting issues for the coveted scientific realism.

According to authors like Karl Popper (1979), scientific realism is fundamentally an extension of classical realism: the world consists of entities that correspond to the concepts humans employ to form a view of the world. Realism assumes the existence of a mind-independent world, some of whose properties are correctly described by humans to attain knowledge of those aspects of the world. Modern science may be viewed as the most salient example of such knowledge. In view of the design problem, what sense can now be attached to the Popperian idea of realism?

In the context of, say, theoretical physics, scientific realism is discussed from two different directions, general and specific; in my view it is prudent to keep them separate. The first general issue concerns the referential terms of a scientific theory as noted: whether the terms employed in science actually pick out aspects/entities in the world. The problem became philosophically significant, beyond the original Platonic concerns, ever since modern science employed terms for unobservable entities and processes, such as electrons and gravitational fields, to explain the nature of the world. Even if we assume that our observational terms—*dog*, *mountain*—have real counterparts, it wasn't clear that the assumption may be extended to photons that don't have rest mass, not to mention dark matter that apparently fills much of the universe.

The second, more specific, issue concerned the character of quantum theory. Quantum theory postulated the unobserved state (wave function) of a microscopic system in terms of the Schrödinger equation. Whether the wave function is real then depends on whether its postulated effects may be observed. Here the 'uncertainty principle' poses a fundamental problem since the principle embodies the idea that

some pairs of physical properties of a system, like the position and momentum of a particle, do not possess simultaneously precise values. According to one very prominent school of thought known as the Copenhagen interpretation, this implies that the ‘objectively real’ state of a physical system can never be precisely determined. This is because, in the very act of measurement of physical properties of the microscopic environment, the instruments of measurement, including the observer, interfere with the determination of these properties in an unavoidable way. It is important to emphasize that the fundamental problem is not just errors in measurement, it is the act of measurement itself.

It is a short step from this measurement problem to the anti-realist position that scientific description—in this case, the Schrödinger equation—is an instrument of representation of phenomenon rather than description of reality. Since the suggested anti-realism arises due to the unobservability of wave functions, quantum anti-realism also falls under the general problem of unobservability. But the crucial difference between quantum states of particles and such unobservable physical processes as gravitational and magnetic fields is that the unobservability in quantum theory arises due to the underlying uncertainty principle that endows physical systems with their non-deterministic statistical character.

Albert Einstein reacted to this peculiar consequence of quantum theory with his famous quip: ‘God does not play dice with the universe.’ According to Einstein, the problem is not that physical systems are uncertain; the problem is that quantum theory is an incomplete scientific theory. Thus, some physicists sought to recover the realist, deterministic picture of the physical universe by postulating ‘hidden variables’ allegedly missed in the quantum scheme. Other physicists since Einstein have attempted to ‘recover’ some notion of determinism with the many-worlds hypothesis, implicate order, and the like, the details of which need not concern us here. In this sense, quantum theory can be set aside without affecting the rest of physics. Therefore, the anti-realist picture posed by quantum theory does not extend to physics as such; physics might still satisfy the referential norm.

Nevertheless, once we fully engage with the design problem, it is not clear which notion of scientific realism survives given the obvious point that scientific theories cannot fail to be products of the human mind. To emphasize, both the realist view of quantum mechanics via hidden variables and the like, and the anti-realist, instrumentalist Copenhagen view are to be understood within the undeniable idea that quantum mechanics is a human product, just as relativity theory and string theory are. The specific realism issue concerning quantum theory has to do with the character of particular scientific theories, not with the identity of the species that constructs those theories; there is just one species. In that sense, even if physics is able to come up with a ‘new physics’ in which the measurement problem posed by quantum theory is solved (Penrose 2001; see Chap. 5), the new theory will continue to be affected by the design problem, on a par with otherwise realist theories such as Newtonian mechanics and relativity theory. So, the design problem forces the inquiry as to how some of the fundamental theories of the universe achieve the desired referential norm, even if we set the problematic quantum theory aside.

2.5 Nature and Order

In the next chapter (Chap. 3), following some suggestions due to Immanuel Kant and taking cues from the history of advanced sciences, we will see that some restricted notion of objective truth may still be available, within the bounds of human intelligibility, in some corners of human knowledge where we are able to invoke what is known as the Galilean style of inquiry. Here my goal is to briefly examine what effect the design problem has on the Galilean style.

It is of much interest that Galileo Galilei, the sixteenth-century Italian scientist often credited with laying the foundation of modern physics, actually held a rather grim view that humans will never completely understand even ‘a single effect in nature’. We will examine the basis of his pessimism in some detail in the next chapter. For now, if science cannot explain ‘a single effect in nature’, how do we explain the sense of deep understanding, of genuine scientific explanation, in some selective domains? How is it that some instances of science, say, theoretical physics, convey an abiding sense of truth, a view of ‘the real properties of the natural world’?

It is commonly held in science that the answer is located in the idea of mathematical physics. The mathematical formulae of physics are not only empirical in character, they also signal vast generalizations: Newtonian mechanics, relativity theory, quantum theory, and now string theory are often viewed as theories of everything. So, the really puzzling feature of the fundamental laws of physics is that they are at once mathematical in character and representations of large aspects of the universe. Thus, mathematical physics in the Galilean style stays within the limits of human intelligibility justifying Galileo’s pessimism, but it raises the *standard* of intelligibility to a very high order to be able to pronounce discovery of the secrets of nature (see Chap. 3).

This primacy of mathematical physics as the ultimate form of human knowledge was recognized since the beginning of modern physics. Kepler (1609/1858) held that ‘nature is always able to accomplish things through rather simple means, it doesn’t act through difficult winding paths’. Galilei (1632) thought that ‘nature generally employs only the least elaborate, the simplest and easiest of means... nature is perfect and simple, and creates nothing in vain’. Newton (1687) suggested that ‘we are to admit no more causes to natural things than such as are both true and sufficient to explain their appearances... for nature is pleased with simplicity, and affects not the pomp of superfluous causes’. Einstein (1954) said that ‘nature is the realization of the simplest conceivable mathematical ideas’.

Contemporary authors such as Weinberg (1976, 1993), in fact, trace the *realistic significance* of physics to its mathematical formulations: ‘we have all been making abstract mathematical models of the universe to which at least the physicists give a higher degree of reality than they accord the ordinary world of sensations’ (Weinberg 1976). Weinberg and others have called this form of explanation in physics the *Galilean Style* (Chomsky 1980). The style, according to these authors, works as a foundational methodological principle in science, especially physics.

The brief discussion of intelligibility and Galilean style brings out three salient aspects of the mathematized conception of reality.

- (A) It abstracts away from the ordinary world of sensation; ‘most of what we find around us in the world of ordinary experiences is unhelpful for determining the real properties of the natural world’ (Chomsky 2000).
- (B) It assumes the universe to have a ‘simple’, ‘perfect’ design because nothing else can be studied at the desired depth.
- (C) It prioritizes mathematical models which are a priori and, hence, an exclusive product of the human mind.

Still, despite its impressive record, the Galilean style is available only rarely in human inquiry. Vast domains of ordinary human knowledge, thus, cannot ensure objective truth on this count. In any case, the Galilean style itself is a supreme example of human design, especially via (C): in a very significant sense, the Galilean style essentially constructs an imaginary world. Its late emergence in human history simply adds to the problem of design. So, by itself, the Galilean style does not seem to provide any definite analytical handle to meet the design problem.

Yet the amazing thing is that the Galilean style actually works! The world does seem to obey simple mathematical principles justifying the intellectual confidence of centuries of outstanding reflection, as we saw. Theoretical physics has unearthed deep secrets of nature in terms of strikingly simple laws; these can be understood only after elaborate mathematical argumentation. But there are other, more direct, examples. I will discuss two of the popular ones.

The Fibonacci sequence, allegedly discovered by the twelfth-century Italian mathematician Leonardo Fibonacci, is the series of numbers: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34,... Starting with 0 and 1, the next number is found by adding the two numbers before it: 1 is (0 + 1); 2 is (1 + 1); 3 is (1 + 2); 5 is (2 + 3); and so on! The sequence is generated by a very simple *recursive* function that imposes the same order repeatedly at progressively higher levels: $x_n = x_{n-1} + x_{n-2}$. The series was also described by Indian mathematicians working on syllabic and metrical structure of speech perhaps much before Fibonacci did. Indologists suggest that ‘the sequence F_n had already been discussed by Indian scholars, who had long been interested in rhythmic patterns... both Gopala (before 1135 AD) and Hemachandra (c. 1150) mentioned the numbers 1, 2, 3, 5, 8, 13, 21 explicitly’ (Singh 1985).

The interesting aspect is that this progress of numbers maintains a constant ratio, the ‘golden’ ratio:

A	B	B/A (Golden ratio)
2	3	1.5
3	5	1.6666...
5	8	1.6, and so on.

When the numbers are plotted figuratively, the golden ratio generates a systematic spiral. The amazing thing is that the Fibonacci spiral is observed in many forms in nature, most notably in the organization of seeds, leaves and petals in flowers and

other flora; they are also seen on snail-shells, starfish, bone structure of sharks, distribution of digits on human hands, etc. (see http://jwilson.coe.uga.edu/emmat6680/parveen/fib_nature.htm).

The second, slightly more difficult example comes from the study of fractals, self-replicating geometrical shapes. A simple and small geometrical shape such as a triangle, or an open section of a curve, may be repeated at different levels and scales to generate some of the most complex phenomena in nature. The self-replication or self-similarity can come in a variety of forms: exact self-similarity as in some snowflakes; quasi self-similarity noted usually in artificial mathematical figures such as Mandelbrot sets; statistical self-similarity as in shape of coast-lines, and so on (see <http://www.mnn.com/earth-matters/wilderness-resources/blogs/14-amazing-fractals-found-in-nature>).

As with the Fibonacci sequence, fractals can be mathematically generated from simple recursive functions such as $z = z^2 + C$. From organization of leaves, snowflakes, patterns on snails, meandering rivers and coastlines, to solar systems, fractals exemplify Galileo's statement that 'nature generally employs only the least elaborate, the simplest and easiest of means... nature is perfect and simple, and creates nothing in vain'. The evidence is overwhelming.

In my view, such phenomena suggest a different angle on the design problem. The mathematical forms just cited—Fibonacci numbers and fractals—are no doubt contributions of the mind. But to observe their instances all over nature in astonishing variety does not seem to be occasional idealistic fantasy. It seems there are intimate connections between forms that arise in the human mind and the real forms of nature, and the connections are not satisfactorily explained by saying, 'oh, that's how our grasp of the world is designed by the mind'. The fit is so extensively varied and regular that it almost looks as if the mind-design is such that it simulates—perhaps, reciprocates—world-design; in these cases, Descartes' statue seems to just leap to the mind as a finished product. In other words, there is a strong intuition that the mind comes up with such a design because the world is so designed.

Several related caveats are immediately in order. First, it cannot be the case that each mind-design has a corresponding world-design. This is not only because sometimes even strong beliefs about the world are false, most mathematical forms conceived by the human mind are not realized in the world. Second, even if there is strong intuition about 'fit' in these cases, the intuition may well be aesthetic—based on simplicity, beauty, symmetry, harmony—rather than on truth. Third, given the severe restrictions on inquiry on these questions imposed by the design problem, it is hard to see how to make analytical and empirical progress on the question of 'fit'; there is no 'third party'.

Even with these caveats, it is simply counter-intuitive to ascribe the strong sense of fit to 'idealistic fantasy'. A disclaimer of the form 'it is nothing but mind-design' just does not explain the strength of the 'externalist' intuition when the curvature of the coastline or the arrangement of sunflower seeds unfold, as we zoom in; this intuition could be the primary source of mathematical realism, but I will set it aside. In general, as the tortuous discussion back and forth between realism and anti-realism in this chapter suggests, the idea that the world is something of a fiction

is deeply problematic. The philosopher Paul Edwards once suggested that, no matter how many sunsets, rushing rivers and naked women you show, the idealist will keep on saying, ‘further manifestations of my mind’. The remark is hilarious precisely because idealism is counter-intuitive.

Yet, as the caveats suggest, there does not seem to be any ‘objective’ route available to inquire into and establish the fit, and the mind-independent world continues to be elusive. It looks like the end of philosophy. I am aware that, following the work of Hilary Putnam and others, the literature in analytical metaphysics offers some other complicated alternatives, such as ‘internal realism’, at this point. My general feeling is that they ultimately fail to meet Nagel’s stricture about limits on the closure achievable when human inquiry turns on itself.

Be that as it may, could it be that a very different style of inquiry might alleviate some of the discomfort with the preceding picture? Could it be that, in looking for a mind-independent world ‘out there’, we are adopting the wrong perspective on the problem? Maybe we are unable to locate the world because, in our analytical mode, we are *looking* for it. Perhaps there is nothing to look *for*, but everything to live *in*. I am reminded of the Zen master’s quip when the disciple asked in frustration if the fly will ever be released from the bottle. The master replied that there was nothing to worry if the food was good and well-eaten, and the utensils were clean: the fly was out. Are we missing the world in our anxiety to grasp it?

To pursue the thought, let me collect some of the points mentioned mostly in passing earlier: (a) the problem of realism is not likely to occupy consciousness in common life because that life is immersed in the phenomenal world, the world of experience; (b) the realism issue *significantly* arises only with unobservable entities and processes; dogs and mountains certify our robust sense of reality when other things are equal; (c) the sense of reality could be an aesthetic consequence of certain stretches of experience, rather than an analytical move to account for those experiences.

2.6 The Table and the Poet

During his conversation with the physicist Albert Einstein, the poet-composer Rabindranath Tagore stated that ‘truth, which is one with the universal being, must be essentially human; otherwise, whatever we individuals realize as true, never can be called truth’. ‘The truth which is described as scientific’, he continued, ‘can (only) be reached through the process of logic’ which itself is ‘an organ of thought which is human’ (in Marianoff 1930).

The point of interest in these remarks is that Tagore is concerned with truths of physics, scientific truth. For him, scientific truth is one with universal being; in other words, truth is universal. While claiming that truth is ‘human’, there is no emphasis on social norms, cultural forms, historicity, artistic variation, etc. In particular, he is not proposing that truth is subjective, whatever that problematic notion amounts to. In that sense, truth is objective. He seems to be upholding the

concept of objective truth *while* asserting its essential humanness; in fact, he suggests that humanness is a *necessary* condition for objective truth. In our terms, it means that objective truth is not only consistent with human design, truth and design complement each other.

Tagore was a great poet and a humanist. As a humanist thinker, he also lectured and wrote on a variety of topics of general human interest such as the character of human existence, the play of nature on human creativity, and the role of values and religion in human societies. In one broad common sense of the term *philosophy*, the writings just mentioned may well be characterized as philosophical insofar as they are general reflections on the human condition. However, these reflective works are not philosophical in the narrower, more academic sense. Broadly viewed as systematic reflections on the nature of language, thought and reality and the relations between them, academic philosophy can be safely identified, as with other academic disciplines, with its textual lineage (Mukherji 2002, 2005).

Tagore's views on physics and science, therefore, need to be viewed not as technical comments, but in terms of general humanist reflections of a literary mind. Even then Tagore's 'outsider' view carries much intellectual interest. A work of art, including the writing of poetry, is not merely a play of form. Somehow the artist has to relate the emerging forms in his aesthetic imagination to stable aspects of human experience for the forms to have an irresistible interpretation. In that sense, an artist constantly struggles with the elusive reality of artistic depictions, giving rise to the other formidable issue of realism in the arts. An artist and poet of Tagore's genius was likely to have reached a satisfactory reflective understanding of his own artistic expressions that might have interesting philosophical implications. Elsewhere (Mukherji 2012), I have discussed how Tagore's poetic contemplation of bird-songs illuminates an empirically-viable conception of human musical ability. I wish to adopt a similar strategy for Tagore's 'poetic' views on science and truth.

Albert Einstein also was not an academic philosopher in the sense outlined above. However, his philosophical location with respect to the issue of scientific realism was far more intimate than Tagore's, as we saw. Thus, both for his outstanding role as a practicing scientist and a reflective thinker on the nature of science—especially, on the new physics—Einstein's remarks on the nature of reality carry intrinsic significance.

The Tagore–Einstein conversation does not really have the form of a debate. Rather, it has the form of repeated assertions by two minds reflecting in parallel. And it is not very clear what these assertions were about. For example, from some parts of the conversation it appears that the conversation was about whether there is a mind-independent reality. Dmitri Marianoff, who reported these conversations in the *New York Times*, titled the first dialogue, 'Thoughts on the possibility of [truth's] Existence without relation to Humanity'. It is suggested that Einstein says 'yes', Tagore says 'no'. It is unclear that there was in fact such a direct opposition.

Consider the issue of the table. While Einstein clearly holds that the table continues to be there even if no one sees it, Tagore does not quite say that the table won't be there. He says instead that it will be there but under the gaze of a universal mind. So Tagore does not deny the existence of the table when no individual human

is present to perceive it; he ascribes the existence in that case to the presence of a universal mind. Similarly, in his *Three Dialogues between Hylas and Philonous*, George Berkeley held that since sensible things may exist independently of human beings, ‘there must be some other mind wherein they exist’ (Berkeley 1731). For Berkeley, this ‘other’ mind is God; Tagore called it variously ‘supreme man,’ ‘universal being,’ and the like.

The standard criticisms against Berkeley thus apply to Tagore as well. The postulation of a constantly and universally aware supreme mind does not seem to have more explanatory power than the simpler postulation of the (existing) table itself. The universal mind will need the table for a veridical perception of it in any case; if that perception is non-veridical, the table won’t be there which is a consequence both Berkeley and Tagore deny. So, Tagore needs to postulate all of: (a) a universal mind in the form of all-pervasive consciousness; (b) the ability of the human mind to grasp the universal mind; *and* (c) veridical perception of the table by the universal mind, just to say that the table continues to be there. Even though Einstein does not offer any further realist argument in favour of his view that the table continues to be there (‘I cannot prove my conception is right, but that is my religion’), his robust and simple common sense seems to outweigh Tagore’s complicated idealist thrust.

Philosophical difficulties aside, for the case under study, humans do seem to have a preference for the simpler option of settling for the reality of the table because that sense of reality is in fact withdrawn in some special cases. For one, even if, other things being equal, we robustly believe that the table continues to exist when I leave the room, we do not believe that my shadow—which also I can see among other ‘thing’-like stuff—will continue to exist in the room if I leave the room. This is because other things are not equal; unlike the table, the continued existence of my shadow is tied to my presence in the room. So, there is a clear distinction between things to which we do or do not ascribe (independent) reality even if they are perceptible in a non-illusory way. Note that, at this stage, I am not proposing that the design problem thus stands refuted by common consensus; that cannot be the case, as we saw. All that I am doing now is to inquire into the character of human commonsense to see why the design problem fails to have a near-fatal grip there.

To reject Tagore’s idealistic argument is not to deny the appeal of Tagore’s basic assertion that ‘the truth which is described as scientific and which only can be reached through the process of logic—in other words, by an organ of thought which is human’. However, Tagore’s own explanation of what he means is not very helpful, as we saw. For Tagore, scientific truth obtains when the human mind forms a ‘universal harmony’ with the ‘supreme being, *Brahman*’. Such an explanation seems unnecessary because the basic claim is obvious as scientific theories are unfailingly human products. Furthermore, the postulation of a universal being takes the explanation away from the *individual* human being whose perception of the table and the conception of scientific truth *are* the relevant phenomena. In that sense, Tagore in fact loses his grip on the ‘humanness’ of the issue.

Earlier, I mentioned the reflective value of Tagore's poetic conception of how things are such as bird-songs. Naturally, then, Tagore's deeply reflective views on the nature of reality is likely to be represented more effectively in his literary work, rather than in occasional philosophical pronouncements of uncertain value as we saw. Consider the first two lines of his very popular lyric *mahāvishwe mahākāshe* (my translation from Bengali throughout):

In the cosmos, the endless sky, the boundless time
I, the human, travel alone in wonder, in wonder.

The first line depicts what philosophers call the 'manifold' consisting of all that is there in the universe located in the universal space-time framework. The second line 'humanizes' this manifold. I have access to the *entire* manifold for further reflection because I can be *there* at every possible point of this manifold as a part of my travel itinerary. Tagore emphasizes the idea of traveling *in wonder*; he mentions it twice in succession. Perhaps he means that, if the manifold were to be my (subjective) *construction*, an effect of my conscious imagination, then there is no travel, no wonder. I travel in wonder because the manifold is there independently of my reflection such that I *experience* the manifold just as I experience the table out there.

Now, it cannot be literally correct that the entire manifold is open to my experience; I can possibly cover only a tiny fragment of the manifold. Yet the point of wonder will be missed if I think of the unexperienced parts of the manifold either as a manifestation of my imagination or as a world unknowable. For the poet, this *impasse* does not arise because the manifold is not contemplated in isolation of my travels. In a sense, my travels reveal the manifold already there; the unrevealed manifold must already also be there to facilitate the conditions for my continued travel. As noted earlier, the form of discourse, loaded heavily with metaphors, is not analytic in character. It is rather an expression of convictions, perhaps even a dynamic report, as the subject's experiences uncover further aspects of the universe.

At many places in his creative work, Tagore elaborates on the notion of a cosmos which unfolds due to human intervention. Consider another very popular lyric *ākāshbharā suryatārā*.

The sky is full of the sun and stars, the world is full of life
I have found my abode there,
Thus my song comes alive in wonder.
The waves of eternal time that cause the ebb and tide
Also guide the rush of blood through my veins,
Thus my song comes alive in wonder.
When I walk on the grass on the forest-path,
The scent of the flowers startle my spirit
The gift of joy is scattered all around
Thus my song comes alive in wonder...

In line 1, Tagore begins to describe the cosmos as a skyful of sun and stars, but it also includes the life in the universe. In line 2, just as in the earlier poem, he locates the I, the poet himself, amongst the elements of the cosmos. Line 3 says, this wonder of self-realized cosmos gives rise to the poet's song. In lines 4 and 5, Tagore highlights the unity of the cosmic order by noting that the reason why my blood flows is the same as ebb following tide for eternity. In lines 7 and 8, the idea of the cosmos is expanded to include blades of grass on the forest path (7) and the smell of flowers (8), both giving rise to the joy and wonder (lines 6 and 9). Similar sentiments can be found in dozens of other poems and songs.

How do we interpret this image of a human universe? In some literary and philosophical circles, Tagore's colourful 'animated' conception of the cosmos is often overinterpreted to suggest parallels with the *Upanishadik* tradition, or the primacy of artistic (fictional) imagination. In both cases, the emphasis is placed on the subject, the I, as *constructing* the cosmos. In other words, the cosmos is viewed as *dependent* on the solitary self, the cosmos *disappears* if the self does. Tagore is thus viewed as a classical idealist. As noted, some of his inadequate philosophical arguments do suggest such a picture, wrongly in my view.

Tagore, as noted, did not develop his complex worldview with professional philosophical rigour. There is no doubt that his conception of the universe is a fallout of his artistic endeavours; it is not a systematic product of cold analytical reflection. Also, Tagore's conception of universe is scattered in a large body of artistic work whose meaning changed sharply throughout his life; in some cases, he did leave the impression of an idealist's universe. For example in one of his much-cited poems, he seems to assert that the emerald gets its colour due to my consciousness, the sky is lit up when I open my eyes, etc. Authors cite these lines with glee to emphasize Tagore's 'subjectivism' and affinity with quantum theory (Ghose 2010, pp. cxli–cl).

But it is routinely missed in the literature that, in this poem, Tagore carefully keeps to what philosophers call 'secondary qualities' after the seventeenth-century British philosopher John Locke—qualities of matter that seem to manifest only under human observation and are not intrinsic to matter. Tagore also mentions aesthetic properties such as 'beautiful' which, of course, have intrinsic reference to the beholder. Yet there is no evidence that Tagore thought that the so-called 'primary qualities' such as size and density of objects—proper subject matters of physics—are also products of the beholder.

Be that as it may, let us assume that Tagore might not have been fully consistent in his worldview through his varied artistic expression. Yet, as explained in some detail above, a central part of his artistic work seems to project the conception of a human reality which is metaphysically independent of the human mind, but gets its entire epistemic significance via human experience. This is the sense in which the universe is at once familiar and unfamiliar (*ciradivaser vishwa ankhisammukhei*):

The perennial universe in front of my eyes,
I have seen a thousand times
At my door.

This timeless familiarity of the unfamiliar
 Has filled the deep recesses of my heart
 At ease.

So, the human universe is an *experienced* universe; only in human experience does the universe carry its full metaphysical significance. The universe appears to us in all its variegated complexity because humans—only humans—are endowed with ‘organs of thought’ that transform the experience into a symbolic conception. And an experienced universe has the self as the interpreter of experience at its cognitive center. As Tagore puts it (*mānuSher ahankār patei*): the grand-designer works on the canvas of human ego.

To emphasize, fractals and Fibonacci sequences, among many other similar recursive forms, are products of the ingenuous human (mathematical) mind and, as noted, mathematical ideas, by themselves, are entirely *a priori*, that is, they are independent of the sensibilia. Yet, these beautiful ‘fictions’ seem to fill all parts of nature. It is in this specific sense of the mathematization of reality that we may understand Tagore’s poetic idea that ‘the human mind forms a universal harmony with the supreme being’, except that nature itself is that supreme being.

Strictly speaking, the artistic conception of harmony with the universe does not really address the design problem in its original formulation; nothing can, as we saw. As in the philosophy of Immanuel Kant and later in the work of continental authors, Tagore placed the emphasis, not so much on the immanent world, as on the primacy of human experience. As we will see in the next chapter, Kant held that any rational account of human experience demands some conception of a mind-independent reality because, otherwise, we are left with no conception of what these experiences are experiences *of* (see Mukherjee 2007 for Tagore’s familiarity with Kant). A poet’s perspective goes beyond a mere postulation of the world to a direct ‘travel’ in it in wonder since the world *is* what human consciousness experiences. Following the analytic route, we end up with posing human design as a *problem* and lose the world as a consequence. In the poet’s aesthetic route, the design is the source of wonder as human artistic imagination enables the world to unfold in front of human consciousness.

Deep scientific inquiry into the order of nature, as in hundreds of years of mathematical physics, requires even more ingenuity, not only to experience nature, say, in terms of Fibonacci numbers, but to explain the inner structure of matter that gives rise to its surface systematic forms. That deeper inquiry, resulting in the postulation and discovery of fundamental laws governing basic elements and forces can only be ‘reached through the process of logic which itself is an organ of thought which is human,’ as Tagore emphasized in his poetic gesture. There is no fundamental divide between scientific and artistic forms of inquiry. Humans, after exercise of ingenuity in either form of inquiry, come to grasp reality because reality, in that explicit sense, is human.

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