

# *Judaism and Science*

with Norbert M. Samuelson, "Reflections on the Distinctness of Judaism and the Sciences"; Noah Efron, "Zionism and the Eros of Science and Technology"; and Bradley Shavit Artson, "Co-evolving: Judaism and Biology"

## CO-EVOLVING: JUDAISM AND BIOLOGY

by *Bradley Shavit Artson*

*Abstract.* Biology has been able to systematize and order its vast information through the theory of evolution, offering the possibility of a more engaged dialogue and possible integration with religious insights and emotions. Using Judaism as a focus, this essay examines ways that contemporary evolutionary theory offers room for balancing freedom and constraint, serendipity and intentionality in ways fruitful to Jewish thought and expression. This essay then looks at a productive integration of Judaism and biology in the examples of co-evolution, environmental ethics, the place of humans within nature, the relationship of mind and brains, and the ways that individual and group identity blur.

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There was a time when thinkers who desired to order their thoughts about physics and biology would attempt to distinguish between the two, as though knowledge of physics was somehow self-evident, and that it was self-evidently the knowledge of an abstract set of laws, which then allowed for the placing of physical reality in the context of those laws (Searle 2004, 4). Scholars like Newton were able to utilize mathematics, observation, and logic to deduce broad regularities, conceived Platonically as "laws" (Artson 2010a, 40) by which the universe appears to operate, and then in turn were able to use those logical tools to successfully anticipate and expand human understanding of the nature of physical reality. For quite some time, however, the knowledge of biology was a more complicated one to organize, with the laws governing it harder to discern, and a more pressing role for subjectivity in the identification of those laws. As far back

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as Aristotle, thinkers attempted to discern patterns within biology, but often one had a sense that those patterns were as much imposed by the thinker as they were extrapolated from the data. The data remained on the level of classification—categorization without integration.

Regardless of whether one attempts to integrate or to distinguish the grand patterns *and* the detailed categorization, it is clear that in the realm of biology there is a mix of both general narrative and specific details. Since at least the time of Charles Darwin, that narrative has gained coherence and force by recognizing the overarching narrative of biology to be provided by the theory of evolution, which entails randomness within a conserving system (mutation), relationship between the parts and the whole (natural selection), and intentionality on the part of at least some of the participants of the system. Darwin was able to provide an embracing narrative in which to place biological data, which in turn allowed him and his followers to perceive greater information than had their predecessors; the very ability to order the knowledge, to place the knowledge, to relate the knowledge as pieces to a larger puzzle—a coherent puzzle—gave them access to extrapolate even more information about the biosphere and the world around them. We live with the heritage of this synergy: biology as narrative, biology as manifest in specific details. But the details are not separate from the narrative; they are connected to it and a manifestation of it. In that regard, biology, like Judaism, is a complex dynamic system in which both narrative and detail (law and wisdom) form the principal means by which the living quality of the system operates; by which the dynamism inherent in its participants allows them to connect to each other and to contribute to something greater than any of the individuals who constitute a part of a broader community and of the components, which together constitute a system.

#### FRAMEWORKS

Some have attempted to frame a distinction between the different scientific disciplines as one of greater observer independence, say, for example, in the realms of physics or chemistry, as opposed to greater observer dependence in the humanities and the social sciences. It is clear, however questionable that distinction may be, that biology certainly partakes of both; the way people look at the information and attempt to gather it is very much shaped by the cultural and scientific expectations they bring to it, and the expectations in turn are dynamically shaped by what it is they are observing (Keller 2002). As we examine the ways that biology and Judaism shape an agenda of mutual study and elicit greater information from each other in a sort of dynamic interaction, we are going to be looking at that blend; that of observer dependence and independence. Rather than having to choose one over the other, our intersubjective and engaged observations will form a blend of elusive objectivity and involved subjectivity.

In that sense it is worth recalling Ian Barbour, the great scholar who brilliantly explicated the interface of religion and science, positing that science and religion logically can interact in one of four different ways (Barbour 1997, 77–105). There are those who see the interaction between the two as an interaction of *conflict*, so that the claims of biology, the claims of physics, the claims of chemistry on the one hand, and the claims of religions on the other, are inevitably in conflict with one another. Either one is true and the other false, or vice versa. For some forms of religion and for some forms of scientism, that may well be the case. If one believes that revelation and scripture contain the only vehicle for knowing truth, and that those vehicles are absolute and literal, then indeed religion and science are on a collision course, as is true for those for whom science is not merely a mode of inquiry into physical reality but is coextensive with all of reality, and all of reality is reducible to its most minute parts. For materialist reductionists, armed with a metaphysical assertion that the smallest components of matter comprise and describe all reality, and for fundamentalist literalists in the religious camp, it may well be that conflict is the only way to describe the relationship between the two disciplines.

Barbour argued for the existence of a second group who advocate *independence*. That is to say, those voices hold that religion has its own coherence and realm, its own insights, as does science, and that the two of them simply do not intersect. So, famously, there are those who argue that science talks about mechanics, “how things operate” whereas religion talks about meaning, or “why things operate.” Science is about facts, and religion is about significance. Bounded in that way, religion and science do not interact at all: a “how” question is a science question; a “why” question is a religion question. Sometimes religious people use “how” rhetorically when they really mean “why,” but the domain of the questions remain distinct. Science is sovereign in its area; religion is sovereign in its area. Religion has very little to contribute to a discussion about the makeup of subatomic reality or of galaxies, and science has very little to contribute to conversations about moral goodness or awe. And so the two of them are silent in each others’ territory, and restrict themselves within their own parameters.

The third mode of interaction, says Barbour, is *dialogue*, in which the two fields remain distinct, separate from each other, but nonetheless engage in a mutually fructifying conversation. Each benefits from being able to consider the narrative and the laws of the other, and while remaining distinct as two separate practices, nonetheless each discipline is refined and enhanced by engagement with the other. In that regard, science provides a corrective to religious superstition, or a tendency perhaps toward excessive mysticism, and religion forces science to engage in the living, subjective, integrated quality of the cosmos, which it attempts to study and explicate.

The fourth and final category that Barbour proposes is what he calls *integration*. Integration, I would imagine, is where most of us would hope

to wind up. Integration holds that we live in one world, which is somehow susceptible to explanation in a way that aspires, at some point, to a unified encompassing description. It may well be that we are going to have to take several partial steps to be able to arrive at this final grand description of everything; it may well be that for the foreseeable future, we will not be able to articulate a unified theory that integrates the sciences, the social sciences, the arts and the humanities. Perhaps it may be that we will have to live with partial explanations of the world as a whole for a very long time. But nonetheless, for most seeking people there remains a conviction that the cosmos must embody a unity (indeed, that is a universe) to be uncovered and described; that it is a oneness that somehow encapsulates the very small, the very large, and us in the middle, and that somehow the humanities, the natural and social sciences, and the arts are all contributing components of a vast but single canvas, and that therefore there ought to be an intellectual framework for bringing them into conversation with each other with the goal of an ultimate unification.

This essay is an attempt at the first flowerings of integration between Judaism and biology. I begin with a conviction that all reality is not reducible to its smallest components, but that it is out of its components that every level of reality emerges; that we live in one world, a *uni*-verse, and that our efforts ought to be expended toward using scientific methods to inquire scientifically, spiritual and humanistic methods to advance culture and civilization, and that all of those complementary modes ought to be seen as different oscillations (like electromagnetic waves) of an embracing unity.

In the exploration of integration, in the attempt to uncover an embracing oneness that makes room for the dance of science and religion, each responding to each other, and each to become, in a sense, part of each other's story, what we seek, I believe, is a role for serendipity, for chance, for randomness and for freedom. A universe in which our intellectual and descriptive understanding includes a place for events that do not have to happen (rather than a universe preordained by a mechanistic determinism, in which—like Simon de la Place's famous demon, if one knew the rules and enough information, you could plot out everything that has to have happened, from the beginning of time to its very end). We perceive ourselves to live in a universe of freedom; a universe in which the choices that we and other elements within the world make, are able to shape a future that is constrained but not dictated, and that is somehow profoundly open. How we do that requires thinking about the events whose regularities can be seen as "laws" of science, "laws" of biology, and the constraints of human existence. We also seek a role for providence, not necessarily in the sense of a future closed to freedom, but nonetheless one in which the divine is an active and constant partner in the choices that natural agents make, including human agents, and that the divine somehow permeates or is immediately available in every part of the cosmos, in every manifestation, at every level of emergence.

And then, finally, most acute of all, we seek the possibility of the nature of some form of revelation; a way in which, as our ancestors framed it, awareness of the divine is able to erupt into human consciousness, is able to be poured into words, and those words are able to then shape the communities and the practices of the peoples who seek to live in harmony with the divine made into word.

So those three aspects form the framework of our inquiry: A role for chance and randomness, which is to say, for freedom; a role for providence, which is to say, for the structures that constrain and shape and make possible the building of systems and individual complexity; and then finally, the possibility of revelation, which is to say, to know the divine and to be able to live in harmony with it. How those three core virtues allow for an integration of fact and value, of life and faith, will form the base of our agenda. Since the key organizing narrative for biology is evolution, so it is to evolution that we must turn as we hunt for the braiding of these three principles into the staff of life.

#### THE STORY OF EVOLUTION IS THE STORY OF INTEGRATION

The key for organizing the story of biology is the saga of evolution. Articulated simultaneously by Alfred Wallace and most famously by Charles Darwin in *On the Origin of Species* (1859) and augmented by the genetic theory of Gregor Mendel and the DNA breakthrough of James Watson and Francis Crick in 1953, the current theory of evolution (sometimes referred to as “Neo-Darwinism”) posits and demonstrates three broad assertions: the gradual development of all species from a single origin, the interrelatedness of all living things on earth, and the mechanism of natural selection and random mutation as the driving forces generating speciation and diversity (Ayala 1998; Miller 2000). More recently, diverse voices have drawn attention to the role of deliberate selection (not by some external Designer, but by the agents of evolution themselves) and the role of cooperation, collaboration, and mutual support in addition to that of competition in conferring adaptive benefit (Cobb 2008).

The primary insight of contemporary evolutionary theories is that all life is related to all life. The evidence for this claim begins with genetics, and the realization that human beings share between 50% and 99% of our genes with other species. Even a relatively small degree of divergence can lead to quite significant distinctions (for example, humans and chimpanzees differ in only 5% of their genomes). The Tree of Life today is a genetic diagram, demonstrating the way that all life shares a common genetic code. All living things from single celled organisms through plants into animal life (including the human) utilize the same genetic system! That fact alone is astonishing and a powerful demonstration of the unity of all living creatures on Earth (Kitcher 2007, 43–72; Roughgarden 2006, 13–23). That we share more genetically with creatures closer to us on the

evolutionary tree of life is further evidence of the accuracy and sweep of the evolutionary explanation for life's diversity and commonality.

Genes are transmitted from generation to generation, generally with a high degree of stability and reliability. But with each generation's transmission, a small percentage undergoes random mutations—getting the message slightly differently. Generally, those mutations are either neutral (neither aiding nor interfering with successful reproduction) or negative (preventing successful reproduction). In very rare instances, those mutations are advantageous and permit the bearer to produce a greater number of progeny who in turn are able to produce more progeny (natural selection). Over the course of several generations, these accumulated, successive, small changes result in adaptations to the particular environment and the other species living and evolving with that particular species. In addition to the random selection just considered, it remains true that living things also demonstrate deliberate selection (where to live, what to eat, when to sleep, with which individual to mate, gene drift, etc.). That deliberate selection also drives the evolutionary process (Cobb 2008, 215–241). Through this mechanism of random mutation, deliberate selection, and genetic drift, and fortuitous circumstance, new traits gain traction, eventually leading to sufficient distinctiveness of the offspring that they can no longer reproduce with the original group, leading to the establishment of a new species. Through this mechanism, all new species are related to the earlier forms from which they emerged.

That sense of interrelationship is heightened by our renewed appreciation of ecosystems and co-evolution. When we speak of “natural” selection, the nature we mean is an ecosystem—the total system of living and nonliving things with which the individual and the species interact. Each population within an ecosystem occupies its own specific niche, which relates to all other niches in the same ecosystem (and the ecosystem relates to all surrounding ecosystems). This broader vision allows us to recognize that the evolutionary development of a species will be connected to the evolutionary development of every other species in the same ecosystem. This means, among other things, that an adaptation in one species will produce a corresponding adaptation in its prey and its predators. Evolution is a dynamic in which the constantly shifting characteristics of one species will produce ripples of adaptations in interdependent species, which in turn will stimulate further adaptations in the original species. Bees and specific types of plants have evolved in such a way that they draw each other's attention and their survival requires the other species. More than evolution, it is preferable to speak of co-evolution, in which every species evolves in sync with every other species in its ecosystem, with the physical as well as biological elements of the local environment. Indeed, this co-evolution manifests within a species as well, for example in the way that we have found correlated mutations of amino acids within a protein, or

mitochondria within eukaryotic cells. Flowers have evolved along with birds' bills so that particular birds can feed on particular flowers, thereby ensuring their successful pollination. There is no solitary evolving; each process is connected not only to the inherited genes of all preceding life, but to the choices, challenges, and opportunities of all other members of the same region (Swimme and Berry 1994).

Not all of this co-evolution involves conflict. There are many recorded cases of mutually beneficial adaptations, between plants and fungi, among different animals, even between organisms of the same species. Colonies of insects, somatic cells within an animal's body, kin assistance and support—each of these examples highlights ways that cooperation exerts an important co-evolutionary survival benefit. Evolution is not the external interaction of solitary individuals, nor even of species in isolation. Like the evidence from more recent physics, contemporary biology draws our attention to the dynamic embeddedness of each species with every other interacting species, of each individual with every other individual of the same group and of interacting groups. If what it means to be a zebra shifts, then simultaneously what it means to be a lion is no longer the same. Living, like all other phenomena, is dynamic, relational, and interactive. And, like simpler matter, it manifests agency. Plants grow toward this direction and not that, and there are consequences to their "choice." Amphibians enter this pond and not that one, birds mate with this partner and not that one, bison wander from this plain to that one. Their choices in turn impact upon the co-evolution of their own species, of the species that interact with their own, and on the ecosystems with which they interact.

So those three aspects form the warp and woof of our inquiry: A role for chance and randomness, which is to say, a role for freedom; a role for providence, which is to say, for the structures that constrain and shape and make possible the building of systems and individual complexity; and then finally, the possibility of revelation, which is to say, to know the divine and to be able to live in harmony with it. With that threefold frame as our loom, we can weave a response to the five principal issues where Judaism and biology most fruitfully can address each other and teach the world, given the agenda of each, given the strength of each, and given the thinking that has gone into both systems.

## EVOLUTION AND CREATION

The first of these principal issues is the issue of evolution and creation. Classically it has been construed as a battle between those who would say that every detail was foretold in advance, so that nothing happens in the world without God's prior intention, and the evolutionists who would say that everything is random, everything is chance, everything is the pure expression of a process that is ultimately reducible to the

chemical, and beneath the chemical to physics, so that there is complete happenstance without any intention whatsoever. And yet, of late, scholars have been drawing different lessons from the same information. The first, and I think, profound, reality of evolution, is that everything is related to everything else. From its very inception, all life emerged from prior life, and life itself emerged from the organic and the nonbiological, so that all of creation is part of a single web, a single interconnected, related, growing process, in which there seems to be a rise in complexity, a rise in experience, ultimately innocence, of consciousness. This is encapsulated in the study now called emergence, in which, with a single ontology, a single layer of being, organized however in newly complex fashions, it becomes something new (Clayton and Davies 2006; Morowitz 2002, 2003). The miracle of life is that in a universe of constant and regular law-like behavior, unprecedented novelty nonetheless develops. It takes several molecules of  $H_2O$  coming together to produce wet. Moisture is a characteristic emergent out of the  $H_2O$ . It does not exist in addition to the  $H_2O$ : it is not some added substance. It is rather a manifestation of the relationship of the molecules. And so it is with the complexity of life itself, that as matter transitions from the inorganic to the organic, from the organic to the biological and to life, there are repeatedly emergences of novelty, of mobility, of self-organization, of intention, and ultimately, of self-aware consciousness (Clayton 2006).

Some have argued—most notably Steven Gould and Richard Lewontin (1979)—that the very things we look to as making life rich and worthwhile—consciousness, emotions, joy, Eros—are epiphenomenal, what they call “spandrels.” Spandrels are the consequence in medieval architecture of the intention to create domes over cubed rooms. Above, the hemisphere is on top of the cube, there is a rounded area underneath each of the corners, and that rounded triangular area is known as a “spandrel,” which became the place that medieval artists could then make elaborate decorations. But to say that the church had been built for the sake of the spandrel would be incorrect. The spandrel was simply the fortuitous product of a certain type of architecture that created an additional and unnecessary space. Once the space was present, the artisans utilized it for other purposes—but the spandrels were not deliberately created to make space for more art. Gould and others have argued that many of those areas of life to which we point as looking like what evolution created are, in fact, the spandrels of evolution. They were not intended for the particular purpose for which they were drafted. They were not what was pushing the evolutionary change. They were simply an unanticipated epiphenomenon of the push to survive: “Evolutionary biology needs such an explicit term for features arising as byproducts, rather than adaptations, whatever their subsequent exaptive utility. . . . Causes of historical origin must always be



separated from current utilities; their conflation has seriously hampered the evolutionary analysis of form in the history of life” (Gould 1997, 10750).

That characterization may well be explanatory from one perspective, but it is nonetheless also evident that, in addition to natural selection and heritable mutation, evolution is driven by the relentless and constant choosing that the participants in evolution make themselves. Natural selection, after all, is somebody making a choice that has survival consequences: the selection of this spouse, as opposed to that one, this mate as opposed to this one, these offspring as opposed to no offspring, this food as opposed to that food, that activity as opposed to this activity. Living entities seek to advance their own continuous teleology, but this teleology bubbles up from within rather than being imposed from above or from without. “The stone that the builders rejected has become the chief cornerstone (Psalm 118:22 NJPS)”: it may well be that it was the very spandrel that some creature found alluring (in a mate, in a meal, in a locale). That spandrel was given a significance in subsequent evolution that supplemented and transcended mere fortuity.

In all of those ways it looks to me like the lines between evolution and creation become more murky. It is clearly not an entirely thought-out process, in which from the very first moment, every single goal was known, and mapped, and slowly attained, as some religious people may have mistakenly presumed. But neither is it simply the mechanistic unfolding of happenstance. Rather, evolution and life becomes, with increasing effectiveness, a partner in the creation. One can speak of the creation itself as being a co-creative force and that divinity, in some ways, is the creative impulse to be found within the natural order; that biological entities are choosing, willing, designing entities, and with their own growing complexity, their “choosingness” increases, as well (Artson 2010b, 40–47).

#### ENVIRONMENTAL ETHICS

A second principal area of interface between Judaism and biology is in the realm of environmentalism. We have already considered with evolution and creation that we learn from both narratives, that all is connected to all; that we are related each individually to the totality of creation, and that all creation is related to all of its parts. What this creates in environmentalism is an ethics of belonging, and an interlocking set of consequences. Any behavior of any part of the system will have impact on every other part of the system, and that, for conscious creatures such as human beings, creates a responsibility. This conviction runs through ancient and medieval sources, and courses through the thought of the moderns: it erupts as Hermann Cohen’s ethical monotheism, Martin Buber’s I-Thou moment, Abraham Heschel’s prophetic pathos, and Emanuel Levinas’ obligation to the Other,

to cite a few. Awareness that what we do and the choices we make have an impact on the rest of the biosphere leads to a notion that moves us from the center of our own concerns, rather than using an outmoded rhetoric as though the world was designed to produce, eventually, *Homo sapiens*, and that we are the purpose and the capstone of all being. Emergence nonetheless makes it possible for us to affirm the unique qualities of human beings as the creatures in whom consciousness happens to have emerged. And that that urge toward consciousness, while perhaps coincidentally manifest in *Homo sapiens*, was an intrinsic part of the cosmos. It looked in many ways as though the universe was rigged for conscious awareness, for conscious life. We are the ones in whom it emerged most robustly, and therefore it is not we who are at the center, although our role is central. Paul Patton (2008/2009) points out that brains with sophisticated cognition actually evolved independently several times: in bony fish; in octopi, squid, and cuttlefish; in cartilaginous fish; in reptiles; and in birds, each independently of each other and of the evolution of the brain in mammals. At the moment, we humans are the ones who share responsibility for this cosmos, both to be of conscious voice, to sing its song, and to maintain the harmony of its constituent parts, so that it thrives maximally; so that it lives robustly; so that its diversity continues to be a symphony of creation and of self-creation. And that means that we then derive from the science of environmentalism an ethic of belonging and of mutual responsibility. The Jewish way to say that is that it is not human beings who are at the center, but rather, God. God as the ground of all-being; God as the wellspring of all existence. And, indeed, if one examines the role of many of the *mitzvot*, they do seem designed to reinforce the recognition that the earth is the Lord's and the fullness thereof (Artson 2001a, 161–171). Three examples will suffice:

- The law of *Shemittah*, of setting apart the land as somehow sacred so that every seventh year the land itself enjoys a Sabbath, and every cycle of seven times seven years.
- The *Yovel*, the jubilee year, that allows the earth an additional year of rest, and at this point, or restoration, so that Israelite property ownership is only within that finite frame, and then the land reverts back, according to God's plan as expressed in Torah.
- In *Kashrut*, we are often used to thinking of the good animals as being the ones that we are allowed to eat, as though they are somehow more elevated by our having access to them. But my teacher, Professor David Kramer points out, I think correctly, that in fact, it is the animals that are *tumah*, the ones that are supposedly impure, meaning not permissible for human use, that belong exclusively to God. We are given permission to use a very small segment of animal life, and only in strictly confined circumstances. Whereas the great majority

of living things are off limits to us, because they are manifestations of divine grandeur and majesty and playfulness, and therefore not fitting objects for human use, certainly not for human eating. *Kashrut* thereby understood, is an ongoing lesson of involvement, as the Kabbalists recognized, eating the animal turns it into human being. Of course with our death and our illness, we then become ourselves in our bodies the food for subsequent living forms, and thereby return into the cycle which we never actually leave. *Kashrut* reminds us that it is again God at the center; it is the totality of the biosphere at the center; it is living as an ongoing system of which we are a part that is the primary focus of divine energy, and of celebration.

### THE HUMAN ANIMAL

The third principal area of mutual concern is the nature of humanity itself. Humans have long quarreled as to whether we are apart of nature, or whether we are a part from nature. The uniqueness of human consciousness and self-awareness leads people to think of themselves as somehow outside of the natural order. Even those who are most aware of environmental consciousness speak of humanity as somehow outside of nature, so that the proliferation of human beings is considered unnatural, the building of human habitations is held to be unnatural, as though we could somehow step outside of nature, as if there is a realm outside of nature. And yet I think it is more productive to say that what human beings are, like many other species, is both a part of the web of living things, and at the same time, unique. Human beings have evolved over the same hundreds of millions of billions of years, as have the rest of existent things today, and we reflect the same uniqueness that other cascading life demonstrates, so that human beings are indeed both. We are a part of nature, we are unique, and Torah in many ways also recognizes both aspects of that; the ways in which human beings are biological creatures, the way that we are physical creatures, and also at the same time, the unique ways in which human beings reflect a unique level of consciousness and self-consciousness, a degree of volition and an awareness of consequences which set us apart. In the language of the Bible, we are uniquely reflections of *tzelem Elohim*, the image of God. But it is clear that we are not merely inhabiting our bodies, not souls inside bodies, but rather “spirited bodies” (Murphy 2006). Note that it is only after God breathes life into the body that the psychosomatic unity that is the Adam is called a *nefesh hayah*, a living being (Genesis 2:7). Note that a *nefesh* is not a soul planted in a body; it is the totality of the Earthling/*Adam’s* person—mind, emotions, and body all together. In that regard Judaism needs to attend specifically to our own biological aspects, and I can think here of several manifestations, the first being gender roles and differentiation.

We are told by biologists that human gender distinction is the product of our own evolutionary choices of standing upright, of bearing our young at a younger developmental age than many other creatures, which requires the greater size of our cranium, which requires women to be able to gestate for a long period of time and give birth to babies who are in need of greater care, which requires males who are able to protect, shelter, and provide for the babies and for the females. Such an awareness of an embodied “gendered-ness,” and the range of implications for contemporary and future human individuals who claim their identities with a range of different gender identities, a range of different family patterns and relationships, is something that Jews and Jewish religion have not contemplated in a self-conscious way, and there is a great crying need to be able to think about the many ways that gender plays out in our time, and the ways in which gender distinctiveness plays out among different individuals.

We need to think about people with special needs, and how we are able to fashion a cultural and biological awareness that honors the agency and diversity of a wide range of abilities. Instead, the old normative thinking posits that one kind of human ability is normal, and then at its best seeks a compassionate way of making room for those who do not quite fit the norm. Even at its best, this approach is inadequate, both to the richness of biological diversity within our species, but also to Judaism’s insistence that all people, without exception, reflect God’s image. The confluence of these insights invite us to see a range of different, normal humans, each with different abilities, and each with different challenges, and all of us together making up the great cacophonous mix that is humanity. How can we fashion an awareness to make ourselves see the holiness of a diverse humanity (Betcher 2007)? How we are able to harness our creativity and our energy so that people with diverse abilities are able to live productive, contributing lives, in which they are connected to and expressive of the community and of the tradition, that remains a vital task toward which we must address ourselves.

Along those lines, the *mitzvah* of *p’ru u-r’vu* remains a unique challenge—the commandment to be fertile and multiply (Genesis 1:28). This verse has been understood in rabbinic traditions as an imperative, not merely as an invitation. In its first millennia, that biblical story addressed a very, very small band of human beings on a very big planet. But today, humanity is replicating at an unprecedented rate, at a rate that seems to exceed our ability to sustain, and the number of human beings who are starving, who are undersupplied, and who are desperate in their poverty, outstrips all previous levels. Perhaps it is time for us to rethink *p’ru u-r’vu* as a biological activity, and to say that humanity has collectively fulfilled that *mitzvah* (Artson 2001b). We were collectively commanded to reproduce and fill the earth, and we have. Maybe now the challenge is not so much

the multiplication of children by each family, but rather encouraging those people who burn to be parents and who are eager to do it well, to parent the next generation assisted by the larger community and encouraging those people whose contributions to the next generation would be better expressed by assisting others in the raising of children to participate in education and youth groups, provide scholarships and resources, offer respite care and professional assistance. Perhaps we need to encourage those people to make those contributions to parenting without stigmatizing, or making them feel that they are somehow inadequate because they do not contribute in one particular way—the replication of their own DNA in a new generation. Perhaps the *mitzvah* pertinent to our time is no longer *p'ru u-r'vu*, but *giddel banim*—raising children well, regardless of whose offspring they are. It takes, after all, a village.

We need to reflect on our destiny as biological, mortal creatures, about what it means to be aging creature, moving always from a point of greater youth to a process of greater aging; to look at the challenges and the opportunities that come with meeting different life stages and anticipating subsequent stages, with the inevitability of aging and the challenges of illness, and of death (Jonas 1996, 87–98). How can we fashion a life enriched by a perspective of the divine that allows us to see aging as a process of harvesting a lifetime of wisdom? How we empower the elderly to be our sages, to invite them to teach, to guide, and to nurture us with the rich harvest they have reaped along the way, becomes an abiding challenge to our fears and preconceptions, and one that would fruitfully be viewed in the realm of biology. Particularly as we have chosen in the West to move toward a nuclear family, we have also spawned greater loneliness, a greater sense of redundancy among the elderly, where they go home to apartments in which they are solitary and isolated, in which they do not hear the vitality of life, in which people are not near at hand. And so we need to think about ways to be able to fashion opportunities for new kinds of community not simply for busy work, not simply for what looks like charity, but rather for engaging people in living at every moment they are actually alive.

Finally, it is time for Judaism to reconsider the place of ethics in a biologically grounded system. We are manifestations of our bodies, we are the totality of our bodies and our emotions, and our character, and our ethics, as the Torah wisely understands, has to reflect that embodiedness. When you see your enemies' donkey burdened and stumbling by the road, you pick it up. What is that? Is it not a physical, biologically driven ethic that we learn to love our enemy, that we learn to care for the stranger in our midst? Honoring parents is even understood biologically as not sitting in one's father's chair, and making sure that they have adequate food and shelter. In the West, the ethical tradition has somehow been divorced from the reality of life and turned into the application of abstract principle of

some disembodied duty (Lakoff and Johnson 1999). The time has come for Judaism, in conversation with biology, to be able to recognize the living, breathing pulsing nature of need, and therefore the embodied nature of response.

#### MINDING THE BRAIN: CONSCIOUSNESS AND INTENTIONALITY

And the last strand, the last issue we must address, is that of consciousness itself, rather than a Cartesian principle of dualism in which mind or soul are one kind of thing, and bodies are a totally separate kind of thing, raising an artificial and sterile debate about how is it that minds have an impact on bodies. Where is it that souls are while we are alive? And where do they go when we die? Or rather, where do *we* go when our bodies die? Rather than seeing ourselves as either body or soul, or as if those are two things, one shoved into the other uncomfortably and eager to leave, if we could see ourselves in a more biblical way, if we could understand that a *nefesh* is the totality of our body and our character, our intellect and our experiences. If we are a single somatic unity, then I think that changes the way we will look at intentionality and consciousness (Edelman 2004; Noë 2009). This awareness changes the way we will look at other living creatures, because at that point animals are also somatic unities, plants are somatic unities. It is possible that our planet and the galaxy as a whole is, in some way, also a unity. And it means that rather than worrying about such artificial questions as “how do I know that the thoughts of my mind reflect the world outside my cranium?” if I really recognize that I am a unity, and that I, biologically, am a part of the world rather than separate from it, then my consciousness becomes, in fact, my reliable tool for living in the world and for being a manifestation of the world. Embodied consciousness allows me to understand that the freedom of which I am conscious is a manifestation of the open-endedness and the freedom that the cosmos itself makes possible.

#### INDIVIDUAL AND GROUPS

And finally, we need to rethink what it means to be an individual. In her book Joan Roughgarden (2006, 74–78), a professor of evolutionary science at Stanford University, raises the question that science itself now has enough information to be confused about: the subject of where the borders of an individual and that of a community, begin. Let me offer two examples:

Any who have hiked the high Sierras, particularly in western Colorado, have witnessed beautiful forests of aspen trees. Aspens reproduce by one of two means. They reproduce by way of seeds, like other trees do, but they also produce through rhizomes, which are shoots that emerge from their root system underground, buried several feet parallel to the ground, which

then send up shoots as new-looking trees. These trees are connected to the first tree, they are genetically identical to it, and there is no boundary between the two of them. Scientists look at groves with hundreds of aspen trees and tell us there is a single individual there; that all of those trees are one large, interconnected individual. Similarly, in the oceans, coral formations are very complex systems in which the human awareness of autonomy and individualism simply does not apply well. But it turns out that it does not apply so well to human beings either. When we think of ourselves as autonomous, separate individuals, we are stuck to an outmoded Newtonian physics and a pre-Darwinian mentality that does not really account for the fact that mind is the processing of brain, and that brain in the processing of cells of which we have trillions, and that those cells are constantly taking in from the larger world and giving out to the larger world, as are the organizations of bacterium within our bodies and cells without which we could not survive. We far underestimate the range of human interaction with the larger world. Our awareness of each other means that our consciousness is shaped by those whose lives we share; that our identity is shaped by our history, our memory, our character, our experiences of others; that no two brains are alike because each of them evolves in reaction to the totality of their own experiences, their own nutrition, their own history. And perhaps that means then that it is time we rethink what it means to be an individual who is also a part of a group. Maybe it means that being *B'nei Yisrael*, a child of Israel, is far more engaged, relational, dynamic, and interconnected than thus far Western thought has allowed us to explore, and that armed with a more biological consciousness we are now prepared to return to the Bible, return to rabbinics with the insistence that we are children of Israel, and to understand that embeddedness in a more robust way.

#### CONCLUSION: LIVE THEOLOGICAL OPTIONS

Of course these five principal issues evoke great theological possibility as well. They beckon that our exploration of Judaism, informed by biology, opens up to us the possibility of a theological worldview that is evolutionary, relational, biologically mediated, and intersubjective. Far richer than the dichotomous notion we had entertained in the past, of substantively separate individuals who would periodically come together for common interest, or to duke it out with each other in a world that was largely unchanging, in which we would attempt to ignore the world in which we were embedded for an eternal, timeless, changeless world, which was held to be somehow our soul's true home, and the home also of an unchanging, impassable divinity. Rather, vitalized with this biological view, we are able to embrace a much more dynamic, interactive, relational, and biologically connected vision, one that sounds a lot like Torah, in which the hills and

mountains sing for joy, in which the land can spew out sinning inhabitants, in which trees clap and exult and sing along with us. We can recognize that we live, once again, in a garden; a *pardes*, a paradise, a wilderness, through which the voice can be heard and the divine perceived. It means placing greater weight on those parts of the tradition which speak of God as *hei olamim*—the life of the universe. It means taking seriously when the rabbis refer to the Torah as a Tree of Life, understanding our tree of life to be in need of nurture, and care, but incapable of being immobile or immutable.

Such a biologically embodied vision invites recognizing that both God and wilderness are the two entities that the Torah refers to a *gadol venora*—great and awesome—so that in a sense, just as the wilderness is the ground which birthed our people as a nation in which we were able to focus to receive Torah, so, too, God becomes the grounds for our birthing as a species, launching into the future with an embodied Torah of relationship. No surprise to understand that *mitzvot* are themselves profoundly embodied. The *midrash* notes that God so loved the Jews that we are never without commandments for our bodies: When we are born there is a *mitzvah* to observe; when we get up out of bed there is a *mitzvah* to practice. We clothe ourselves physically in *mitzvot*: the *tzitzit*, the *tefillin*. At each meal there are *mitzvahs* to accompany every bite of every meal, and when we go to bed at night and at the end of our life, we are accompanied by embodied action, by *mitzvot*. The Jewish body is the locus and agent of *mitzvot*, offering a constant opportunity for living God's commandments and for walking in God's ways physically. For that very reason the Covenant is best understood as theology lived; as biology theologized.

Today's rich harvest of biology offers us a vision that is profoundly interactive and relational. The cosmos and its denizens are co-evolving and interdynamic—in that the character of objects, creatures, and groups are in processes of change and coherence generated by taking in the data of the changing cosmos and responding to those changes according to each unit's previous choices, nature, and possibilities. Chance and intention, constraints and choice, established character/istics and novel responses—these dipolarities offer an ever-shifting integration of continuity and change, of coherence and innovation. "Creation" is our term for this ever-shifting, unending process of growth, diversification, coordination, and co-evolution. Every day, constantly, the cosmos and its creations, the world and its creatures are renewed and are self-renewing. Centers of agency, the creatures participate in (and contribute to) the processes that are creation. Self-evolving, creation continues to renew itself.

#### NOTE

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