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# Introduction

If in the years since her death the genius of Ursula Le Guin needed quick and certain witness, it would be enough to read her 1974 short story "The Author of the Acacia Seeds. And Other Extracts from the Journal of the Association of Therolinguistics." The first of three imagined scholarly writings it presents interprets a manuscript in Ant, written by a female worker in secreted fluid on acacia seeds and preserved in a deep, isolated tunnel of the colony. Its author, the paper hints, may have been killed by a soldier ant because of her subversive, anti-queen sentiments. The second extract is a call to an Antarctic expedition aiming to expand understanding of literature in Penguin. Its organizer hopes to push beyond conventional readings of penguins' "kinetic sea writings," tackling the most intractable dialect of the language: Emperor, with its midwinter poetry of dark, shared, felt warmth. Finally, in the third extract the president of the association editorializes on language and art, urging members to look past the slow "communicative arts of the tortoise, the oyster, and the sloth" to a new subfield that might decipher the entirely passive, unmoving, and unknown plant arts. Even this new generation of "phytolinguists," he imagines, might not reach the far frontier of art:

> With them, or after them, may there not come that even bolder adventurer—the first geolinguist, who, ignoring the delicate, transient lyrics of the lichen, will read beneath it the still less communicative, still more passive, wholly atemporal, cold, volcanic poetry of the rocks: each one a word spoken,



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> how long ago, by the Earth itself, in the immense solitude, the immenser community, of space. (Le Guin 2016, p. 625)

From textual interpretation to a call to research action to a neodisciplinary vision, Le Guin frames her panlinguistic fable in deadpan academese hovering between the familiar and the breathtakingly alien. As a fantasy piece, "The Author of the Acacia Seeds" is irresistible.

Today, however, this fable is little resisted not only by sci-fi readers but also in certain scientific and popular scientific quarters. Fantasy seems at times to be confounded with evidence. Our linguistics faculties may not include plant scientists (yet), but we are enjoined to the notions that forests think and that plant cognition is a slow-motion version of its animal counterpart. Phytosemiotics, the study of plant signing, is a recognized subdiscipline in the broader field of biosemiotics. We are told not merely that slime mold growth processes might one day be put to use in computation, but also that the molds themselves solve problems and learn. We are instructed on the numeracy of bacteria. Research on animal communication has moved forward by leaps, with extraordinary new findings in many areas. In the process, however, it has led us to regard as truths about nonhuman experience what were once recognized as metaphors: whale and bird "songs," for example, and animal "speech" and "language." We have grown too comfortable with the transposition of Le Guin's fantasy into scientific assertion.

At what cost? My discomfort doesn't reflect any impulse to minimize the awesome, evolved complexity of even the simplest organisms; this will be clear in what follows. It doesn't stem from a lack of sympathy with animal rights movements and philosophies, which sometimes motivate assertions of humanlike capacities in other organisms. Neither do I wish to oppose efforts to sketch novel, posthuman anthropologies aiming to reenvision our place in the biosphere (for two different examples, see Kohn 2013 and Haraway 2016); I see my project instead as allied with those. And I certainly don't want simply to celebrate human exceptionalism — a fact in the world



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that we cannot help but acknowledge, but whose dire consequences we also see.

The discomfort, instead, is this: I worry that in assimilating to human terms the capacities and behaviors of other organisms we render invisible their own unhuman exceptionalisms. Understanding these depends on our reaching out from our experience toward something else — something related to us but also profoundly alien, like political tracts in Ant, warmth poetry in Emperor, or the lyrics of lichens. This reach, however, must not merely familiarize the alien but also gauge its distance; there is a balance to be struck between assimilation and sheer, never-to-be-assuaged alterity. The trends I shy away from hinder nuanced understanding of difference in order to emphasize undeniably real commonalities, as, for example, when the combinatorial designs shared by birdsong and human language are considered to make birdsong *like* language. Such convergences might more productively engage us as instances of evolutionary histories that have veered toward similar systemic means exploited by radically different organisms in different ways and for different ends. The revelatory significance of each convergence resides in its being at the same time a divergence. It needs to be teased out, its history reconstructed and contextualized in the operation of natural selection and other mechanisms connected to it.

One small branch of this evolutionary history, or perhaps a few small branches, resulted in a set of capacities, shared among a group of animals, that enables them to accommodate the world in a manner different from all other organisms. It allows them to create from their perceptions something we must call, for lack of a less loaded term that will do as well, *meaning*. This book is a study of the conditions under which this creation came into the world. It also involves an attempt to chart the terrain across which the conditions for making meaning pertain or operate, thus mapping the meaningful regions of the biosphere.

This implies that there are other regions of the biosphere, whole large groups of organisms, that are without the capacities necessary to



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make meaning — regions without meaning at all — *meaningless*. This word names the nonpresence of evolved capacities found in other parts of the biosphere and harbors no value judgment. We have no trouble accepting such nonpresence in countless instances. Most plants can use sunlight, carbon dioxide, and water to synthesize energy-rich carbohydrates; animals cannot. All animals share this lack, this nonpresence, just as they share exceptionalisms involving other, nonphotosynthetic capacities. My first wager in this book is that meaning-making is in a similar same way differentially distributed across living things — that only some animals can make meaning, and that most animals, along with plants and microbes, cannot. Rock poetry makes for alluring fantasy, but our understanding of the differences separating us from other forms of life must expect enlightenment more sporadic than the interpretation of volcanic words.

What it can expect in questions concerning mind, experience, and meaning was usefully circumscribed in another famous writing, philosopher Thomas Nagel's "What Is It Like to Be a Bat?" (Nagel 1974). The punch line of this essay — or the trick played on those for whom the title is a lure, who hope to find out — is that we cannot know. Nagel's article is an entry into debates over the mind-body problem that have been with philosophy since philosophy began, and he makes a principled dismissal of materialists who try to reduce mind to physical properties. He considers the method of reductivism inapplicable to the problem of mind, since it moves to objectivize something that is foundationally subjective. Conscious experience — what it is like to be something (a bat, a human, you, me) — is the first casualty of objective reduction, and its disappearance is fatal to the explanatory power of the method. There is no way to make fully articulate the "is" that links two subjective experiences: what it *is* like for you to be me, for a Martian to be either of us, or for either of us to be a bat.

Solipsism is not Nagel's interest, however. He posits *types* of what-it-is-like-ness, groups with members similar enough to enable them to have more sense of the conscious experience of each other than of members of other groups. The primary type or group in question



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for him, as for most philosophers, is humans. We can share among ourselves subjective experience more fully than we can do with other creatures, such as bats. But there is a necessary blurriness about Nagel's types, a slippage built into his sharing of experience. To what degree might I share the conscious experience of a chimpanzee, one of a type including humans but not whales? Or of a whale, in a type including humans but not monitor lizards? Or of my dog, member of a group — humans and dogs — in which a mutual domestication has been at work since the Paleolithic period? Surely, in each case, more fully than I can share a flatworm's or houseplant's experience, if any exists.

For me, the group of animals capable of creating meaning forms an extended type in this sense — more extended, probably, than Nagel would allow or find useful. This type came about in particular ways that are explained best by evolutionary theory and the histories it can posit and track. Kinship-in-meaningfulness is what determines the whole type and extends across it. It enables, in variously attenuated degrees, sharing of what-it-is-like-ness and, again in varying degrees, assuaging of alienness. This arises from the play of certain evolved capacities and the processes they sponsor; where they are not present, our sharing of what-it-is-like-ness narrows to the vanishing point. (After his 1974 article, Nagel's own approach to mind took an anti-evolutionary turn — a wrong turn, in my view, based on a simplified understanding of the complexities recent evolutionary theory envisions.)

The overlapping or sharing of conscious experience is precarious, even among humans. Its most robust manifestations are not about the content of experience but about a metaquality, the experience of experience. I can share with you, more than I can share with my dog or a chimpanzee, the experience of experiencing loneliness, but even with you I cannot share the nuance of your loneliness; this is your experience alone. My aim in this book is shaped by this precarity. Except in some very general sense, I don't attempt to understand the content of meanings created by nonhuman animals, but instead to describe the conditions under which they can have



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content at all, under which meaningfulness arose. Admitting the limit of human subjective consciousness in probing the specificities of other consciousnesses, I try to map a fundamental, evolved space that we share with many other animals, a community of meaning where some metaconscious commonality exists. In addition, and perhaps more intriguingly, I describe how we can look farther afield to understand — objectively, not subjectively, for that would be impossible — the performance of vast behavioral complexity by animals without any meaning at all.

So this short book takes on a tall topic: the sources, nature, and locale of meaning in the earthly biosphere. I have come to this expansive topic gradually, hesitantly. In fact, *The Machines of Evolution and the Scope of Meaning* is the third in a trilogy of books on evolution, with a widening catchment across the three. This trilogy was not planned as such, but with the completion of each book the subject of the next fell into place, calling (as it felt to me) for a sustained effort to make sense of it. From the emergence of musical capacities in the evolution of the hominin clade (*A Million Years of Music: The Emergence of Human Modernity*, 2015) sprang a broader set of issues concerning the evolution of hominin cultures all told (*Culture and the Course of Human Evolution*, 2018). From the putative extension of culture beyond humans in the world today and beyond *Homo sapiens* in the history of hominins, then, came the question of the foundations of culture across many species, foundations located in the creation of meaning.

*The Machines of Evolution and the Scope of Meaning* is organized into Part I, a preliminary lexicon; Part II, a sustained analysis; Part III, two cases in point; and Part IV, a closing consideration of some questions raised by these. Part I, "Setting Terms," ushers the reader into the fundamental issues that will occupy later parts. After two introductory sections, it is devoted to a description of key concepts, ordered according to a rationale that seems to me logical because it is ontological. *Information*, *mediation*, *sign*, *interpretant*, and *signal* are keywords that distinguish different dynamics in life-forms, setting



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off the operation of meaning from the broader operation of information transmission. The point of these entries is to stake out positions on the concepts in question in interaction with other views on them, but for such general concepts I have made no attempt to be exhaustive; rather, my entries locate and define, in a fairly preliminarily manner, what I find to be the most useful approaches to the concepts in question.

Part II forms the analysis. This is the part that engages the extended evolutionary synthesis at a theoretical level. It describes and explores four patterns involved in the evolutionary emergence of meaning that we can think of as *abstract machines*, by which I mean something so simple as to be almost ineffable: conditions that, if met, set in motion processes. The first three such machines, natural selection, niche construction, and hypermediated systems regulating the interaction of organisms with their environments, occupy Sections 4–7. These are foundational for the evolution of all earthly life, and probably for life anywhere else it may have arisen. At first glance they seem straightforward, but on closer look they hide mysteries borne of several features they share: their immense scope and action, their circular or reciprocal causal pathways, the openness of the structures they bring about, and, perhaps most of all, their immanent, abstract operation, independent of palpable or material mechanism. No doubt we can discern within and around these fundamental designs many others that are essential to life-forms, right down to very fine granular levels, and many of these rely on quite material mechanisms. But they are all beholden to and outgrowths of these abstract machines.

These three machines (natural selection, niche construction, and mediation) are defining dynamics of all life-forms. From their machinations over several billion years the conditions arose under which a fourth abstract machine fell into place: a semiotic machine that creates meaning. One implication of this statement is crystal clear: Life on Earth existed for most of its history in forms that did not generate, process, or understand meaning. The biosphere then



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was a rich, changing, abundant locale of meaningless information transmission. To say this cuts against the grain of three current positions among philosophers and evolutionists who argue for a much larger sphere of meaning, and two of these, called *teleosemantics* and *teleodynamics*, form the topic of Sections 9 and 10. I examine these fascinating but unstable positions in the light of the first three evolutionary machines, arguing that their extension of meaning through the whole biosphere, and even beyond it, is unwarranted. The third position that similarly extends meaning, the *biosemiotic* position, is not directly addressed here because an alternative view of semiotics and its extent pervades the book. Indeed, to advance a semiotic view of meaning different from the semantic universalism of most biosemioticians is one of the primary purposes of this project.

The semiotic machine—the fourth abstract machine and the topic of Sections 11–14—is the linchpin of the book, for the signs it generates are the source of meaning in the world. The semiotic process here is described starting from humanistic theories of it, but these work not simply as heuristic constructions. Instead they characterize outcomes of the workings of the first three evolutionary machines that brought into the world, in a certain group of life-forms, new processes of information transmission. To mark this semiotic machine as a fundamental development in evolution is not customary among biologists, but it calls out to be ranked among the "major transitions" that now form an important part of their thinking—to be counted, that is, as one in a small series of major branchings in the tree of life, in each of which some life-forms abruptly came to manifest unprecedented features. The falling into place of semiosis, in the wake of the formation of certain capacities of certain living things, accords well with biologists' understanding of other such transitions.

The analysis of semiosis here resonates with much recent thinking in its reliance on the ideas of Charles Sanders Peirce. But it differs from most neo-Peirceanism in the particular realm it discerns for sign-making: a realm that is much narrower than that imagined by



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biosemioticians, even as it is very much wider than the realm of signs proposed by the human-centered semiotics of many other recent thinkers. Peirce himself wavered across the career of his itinerant thought, veering usually toward anthropocentrism but occasionally toward its polar opposite, something closer to panpsychism. There are strong reasons, which I develop, to think that the sphere of signs is delimited within a middle ground between these extremes. Meaning is not exclusively human but instead is the outcome of a process inevitable under certain evolved conditions. These conditions extend far beyond humans, if not very far across the whole biosphere.

I resisted, at the outset of this introduction, posing the kind of question that often begins books on large topics: "Why do we need another book on *X*?" There are indeed many books on meaning from an evolutionary vantage point. Precursors in this area include Ruth Garrett Millikan, who approaches the question as an analytic philosopher of "naturalistic" bent; Daniel Dennett and Kim Sterelny, who emphasize two distinct interpretations of evolutionary theory, which we can respectively denote for now, in terms that will be clarified later, as "adaptationist" and "niche constructive"; and Terrence Deacon, an evolutionary philosopher and practicing scientist, who adds to the picture bracing doses of complexity and emergence theory. (Deacon is also a leading neo-Peircean, and his connection of Peirce's ideas to human evolution in work of the 1990s was a formative stimulus in my own thinking about Peirce.) My indebtedness to and differences with most of these writers will be dwelled on in what follows; it is the differences that justify my own effort.

Put in the most general terms, these concern the need to stake out and provisionally survey a territory of meaning that is neither so broad as to make meaning synonymous with information transmission nor so narrow as to make meaning a marker of human uniqueness. Human uniqueness in the world today is not predicated on the construction of meaning itself, but on more specific outgrowths of it—and even these outgrowths are not uniquely human, only hyperdeveloped by humans.



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What are the evolved capacities of animals that found sign- and meaning-making? How do they define the borderline between semiotic and nonsemiotic animals? To chart this border along its full length would expand this book to impossible length, taking me far beyond my expertise into the cases of countless species, but exemplification at least is possible. This comes in Part III and takes the form of studies in the recent science on songbirds and honeybees. I hope to convince the reader that this science, understood in the light of the semiotic machine, shows songbirds to be fully semiotic creatures and honeybees to be nonsemiotic.

I've chosen the case of bees exactly because it seems to pose a hard challenge to my position. The so-called waggle dances honeybees perform have been accepted as an exemplar of eloquent, meaning-laden animal communication ever since they won their interpreter, Karl von Frisch, a Nobel Prize in 1973, and still today they lead researchers to ascribe language, symbolism, and meaningful communication to bees. The science of honeybee sociality, however, has moved far since von Frisch's time, and a careful reading of it says something different about the waggle dances. They are a wonder of evolved social behavior and information transfer, forming part of the larger, wondrous complexity of insect superorganisms; but they involve no signs and they convey no meanings. They are richly efficacious informational mechanisms of beautiful intricacy — and exactly meaningless. Birdsong offers a contrasting case, also brightly illuminated by recent research, that sits on the other side of the semiotic divide. Here we witness a panoply of signs and meaningful behaviors, deployed across thousands of species in as many rich social circumstances. Two implications of the contrast of honeybees and songbirds are already clear in this summary: *neither complex sociality nor intricate communication need emerge from or generate meaning.* We must reserve room in each for both meaningful and meaningless varieties.

The difference between these two cases is sheer, even vertiginous, and it can be followed today down to very fine levels of biological mechanism — neuronal levels, at least, and sometimes even



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molecular ones. It marks, as I've suggested, opposed positions in relation to the threshold of an evolutionary major transition. This marking returns us to one of the keywords introduced in Part I: mediation. The distinction between information in general and the special case of it that is semiotic arises from differences in the kinds and degrees of mediation required for each. These differences begin to map out the small sphere of meaning constructed on and within the vast realm of information.

I end in Part IV with a series of "Outstanding Questions"—not so much a conclusion as a set of openings. Here broad issues are weighed and adjusted, and some tentative answers suggested, in the light of the fourth evolutionary machine. The topics taken up include several concerned generally with semiosis: the evolutionary history of major transitions, the reach of semiosis, and the nature of the borderline between semiotic and nonsemiotic information. The questions also concern two major outgrowths of semiosis: technology and culture. These latter questions once more underscore the difference brought about by signs in thousands of kinds of animals, even as they isolate this manifold of lifeways to one small corner of the biosphere.



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