



# In Context

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The Newsletter of The Nature Institute

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#39



## The Nature Institute

Dear Friends,

Twenty years ago, in 1998, The Nature Institute was founded here in Ghent, New York, and a founding ceremony was held at the local school where both Craig and Henrike were teaching at the time. On that occasion Henrike spoke briefly, offering what you can find in the very first issue of *In Context* as “Words of Dedication at the Founding Celebration.” She concluded those remarks by relating the plea of a German colleague from the days when Craig taught in Germany. The woman advised Craig, “Do not go back to America, since your work there would be like a drop on a hot stone.” Henrike and Craig, of course, did come to America, and Henrike concluded her dedicatory words with a heart-felt wish: “May The Nature Institute’s work become a steady drop on the hot stone.”

Looking back over these twenty years, we would like to think that our work *has* become a steady drop. Certainly all of us feel that a great part of our lives has been invested in the Institute, and the task of responding to what seems like need and opportunity has been never-ending. Our educational programs, as you will see in the *News* section of this issue, are continuing to expand. And each of us feels that our personal research and outreach has been richly rewarding.

A steady drip-drip-drip, to be sure, can have monotonous and even torturous connotations. This is why we have always attempted to feature a variety of different kinds of articles in *In Context*. Some explicitly tackle major problems in our scientific culture, some lead through the consideration of natural phenomena to a deeper sense of the wisdom of nature, and others challenge us to become more awake to our own inner processes of thinking. And you will find such different perspectives addressed in this issue.

In her remarks Henrike also related a story that can remind us of the distorted understandings children can so easily pick up from our scientific culture. The story concerns a first grader who, as Henrike recalled, “came home from a play date one day with shocking news: the earth, the whole earth, was only as big as a marble. What can one say to that? Fortunately there was a four-year-old who laughed at these words and said, ‘That’s funny. How could our house fit on a marble?’”

You may be reminded of this story when you read the feature article by Steve in this issue, whose subtitle is “Do We Have a Home in the Vast Cosmos?” We often hear about the insignificance of our earth, our meanings and values, and ourselves, given the epic scale and massive “indifference” of the larger universe. But, as Steve tries to show in his article, this line of thought reflects a number of misunderstandings that have become associated with “hard-headed” science, but that find no justification at all in the world we actually live in.

Craig Holdrege

Steve Talbott

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EDITOR: Stephen L. Talbott

LAYOUT: Mary Giddens

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The Nature Institute  
20 May Hill Road  
Ghent, New York 12075  
Tel.: 518-672-0116  
Fax: 518-672-4270  
Email: [info@natureinstitute.org](mailto:info@natureinstitute.org)  
Web: <http://natureinstitute.org>

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## Form and Forming

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HENRIKE HOLDREGE

*This article is the preface to a book-in-progress, tentatively entitled “To the Infinite and Back Again: An Introduction to Projective Geometry through Self-Study.”*

PICTURE A TRIANGLE — to start with, an equilateral triangle (i.e. a triangle with all three sides of equal length). Next, picture one of the three sides getting longer. Observe which sides and angles change also and which do not. Next, let one angle get larger (or smaller). Again, observe the whole triangle in its changing and unchanging aspects. Continue to transform the imagined triangle willfully and wakefully. Let it take on all kinds of shapes. They can be acute, right, or obtuse triangles. Conclude by transforming the triangle back into an equilateral triangle.

Now, picture a circle. Let the circle gradually get larger without displacing its center. Let the circle become very large. Next, let the circle contract and get very small, but don't let it disappear into the center. Let it expand and contract again several times. End with the mental picture of a well-formed circle of a comfortable size.

Each of these two picturing exercises may take several minutes. While they seem to be simple they can serve as concentration exercises and assist us in gaining focus and becoming centered.

### Reflections on the Exercises

In the triangle transformation exercise, we cannot change a part without changing the whole.

Every concrete triangle has a certain shape and size. It and all its parts are specific. By mentally transforming an imagined triangle we overcome the specificity. The pictured triangle becomes fluid, but is always governed by the formative principle of triangle-ness.

When we draw a triangle, we must always draw a specific one. Placing two triangles next to each other, we can ask, “How can I transform the one into the other?” In mental picturing, we can perform a fluid, continuous

transformation from one shape into the other. On paper, we cannot do that. We have to draw separate “snapshots” in order to indicate a continuous transformation.

The idea, *triangle*, is inherent and expressed in every particular triangle. It in-forms it. While we can picture and draw particular triangles, and while we can picture a continuous triangle transformation, we cannot picture the idea itself. It remains invisible, so to speak, but is nevertheless at work in every imagined triangle and in every triangle we find in the world.

The idea of a triangle or circle can be articulated as a definition or a verbal description. That way the idea might remain abstract. When we perform the triangle transformation exercise, in contrast, the idea becomes palpable. We transform each triangle in accordance with the idea. In our inner activity we put to work and experience the idea as a formative principle.

When we do the circle-picturing exercise after the triangle transformation exercise, we can experience the contrast between these two different form principles.

With these mental exercises we have entered the (soul) space where all true mathematical activity takes place and where we are open to ideas. It is not through looking into the outer world—for instance, not through measuring angle openings or lengths of line segments—that we arrive at insights that hold true for all triangles, or all circles. Drawings can support us in our work; we might need them. However, the actual mathematical reasoning is a pure thought process.

Although mathematical truths about triangles cannot be found by empirical means, no triangle in the outside world will contradict these truths.

One virtue, therefore, of engaging in mental picturing exercises is that we learn to be present in that thought space and to dwell in it with full consciousness, intention, and clarity. We learn to work and observe in that space. Picturing is an inner activity. It takes effort to willfully form and transform mental images of geometric forms.

It is possible that I picture concentrically growing or contracting circles or changing triangles only as I have

seen them in animations. In that case, the inner activity of creating and transforming the form is missing. It happens without me. I am a mere onlooker. The inner involvement, however, is what matters. Without it, there is no exercise.

Such inner work can help us practice the kind of active thinking we need in order to explore the formative principles at work in nature, in plants, in animals, as well as in social life. In this book we will make ample use of mental transformation exercises. Projective geometry offers a wealth of opportunities to practice active thinking.

## Working with Clay and with Freehand Drawing

For some people, forming, holding, and transforming mental images of a geometric form is not easy, or may even be impossible. In that case, there are other ways to facilitate a deepening experience of form and forming.

Forming a sphere with clay can be one of them. We can form it from the inside out by putting small pieces of clay together and gradually forming a sphere. Or we can take a fist-sized clump of soft clay and form it into a sphere from the outside by gently pressing it into shape with outstretched palms of both hands.

Another very effective technique to assist in grasping geometric forms more fully and creatively is freehand drawing. Drawings of concentrically growing or contracting circles can be done after the freehand drawing of a circle has been practiced. A large piece of paper (“newsprint” quality is inexpensive and suits the purpose) is taped onto a table surface. You draw with crayons or fat, colored pencils while standing. First you take time to form an inner, mental image of a circle. Then you move your hand in a circling motion above the paper, shaping the form in the air before finally lightly tracing it on the paper.

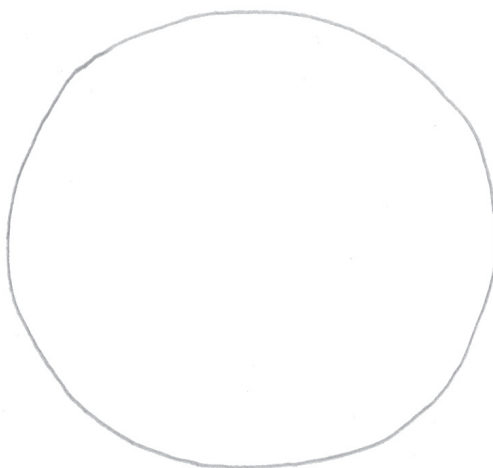
When I introduce the exercise in a workshop and draw a freehand-circle on the black board, I step back and take a look. What I have drawn is not a perfect circle. While we might not be able to do a better job, we all are able to perceive how the form on the board deviates from the ideal. We easily see where it is dented, bulging, lop-sided, or egg-shaped. This tells me that we all carry the ideal circle within us, and that the outward appearing form with its imperfections evokes for us the ideal form.

I once learned about a professional potter who was able to throw a perfect bowl or cup on her potter’s wheel at any time. It was a high skill and, for her, routine. If a cup, however, did turn out less than perfect, it was regarded as special and sold for more!

I sometimes begin a course with a group exercise. The room is set up for freehand drawing and the tables are placed in a loop. After preparing as described above, we each draw lightly a large freehand circle on the paper in front of us, to the best of our ability—just one single line. Then we put the crayon down and, on a signal that I give, we all move to the next station on our right. We pick up that station’s crayon, observe the form in front of us, acknowledge its imperfections, and draw a second form overlaying the first (always only a single line) by trying to improve it. When done, we put the crayon down and, together, move on to the next place. We continue until we return to the place where we started. Here, with more pressure on the crayon, we finalize the shape.

The outcome of this exercise is always reassuring. Each form has been worked on by every member of the group. (In case of a big group I form smaller groups of eight to twelve people.) We experience that collaboration is constructive and helpful. A critical eye that detects imperfections is asked for. We correct each other’s work. We sometimes experience that we can get caught in the existing form and are not able to change it forcefully enough. It takes confidence and trust to even out a bulge or lopsidedness. The forms in the end are pleasantly round and well-shaped, each a successful group effort.

Inviting collaboration and replacing our widespread competitive social habits as learners with helpful interactions and interest in each other’s work are keys to a positive learning experience.



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# Nature Playful

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CRAIG HOLDREGE

IN SPRING, when the brown and wrinkled leaf litter—remnants of life past—provides the dominant impression of the forest floor in northeastern North America, the flowers of Hepatica (*Hepatica Americana*) rise up through the dead leaves and offer little bursts of color to the forest. What’s intriguing about Hepatica’s flowers is how strongly they vary in a single plant, among different plants in one location, and among different locations.

In color, they range from white to purple, with many shades of pink and lavender in between. The showy part of Hepatica’s flower consists of a varied number of petal-like

sepals. (Why botanists say Hepatica has flowers consisting of showy sepals and no petals, and why they consider the three green leaves underneath the sepals, which form a kind of calyx, not to be a true calyx of sepals, but an “involucre” consisting of modified foliage leaves, is an interesting topic—but not one for this little article.)

During my years visiting Hepatica habitats, I’ve seen flowers with five petal-like sepals and ones with thirteen. Six is the most common number, but you often find seven or eight. The size of the flowers and the shape of the sepals also vary remarkably.



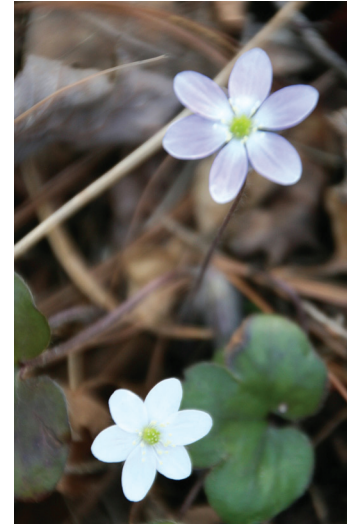
One plant with twelve flowers. Most have six petal-like sepals, but three have seven. The lobed leaves you see over-wintered from the previous year and will wilt and die away as the new leaves emerge at the end of the flowering period.

The photos below, which I took in mid-April, give you an impression of this versatile plant. All the plants grew in just one location—a small area of a mixed deciduous forest in the RamsHorn-Livingston Sanctuary near

Catskill, New York. Each photo below showing multiple flowers is of one plant reproduced at natural size, while the photos of individual flowers on the following page present them at twice their natural size.



This plant has three 7-sepaled flowers and one with 9 sepals!



A plant with two differently colored flowers — pale violet and white.



On this plant, the large flowers deviate somewhat from the radial symmetry that is typical of the species.



The small flower on this plant has eight sepals, while all larger ones have six sepals.

In the following photos of individual flowers from different plants, note the many features of variation. Each flower is shown at twice the natural size, so they are all to scale, and you can see the marked variation in size between different flowers. There are fine gradations of coloration within the sepals of an individual plant, and large variations between different specimens. When a flower has six sepals—the typical number—they tend to be similar to

each other in size and shape (see image 6). When a flower forms more than six sepals, the additional ones tend to be narrower (images 2 and 5). Flower 5 has five wider sepals below five narrower ones, forming two somewhat irregular and offset pentagrams overlaying one another. The strongly irregular—and beautiful!—shape of flower 8 was most likely influenced by an insect that began feeding on the flower as it was still developing.

Observing such variation in individual plants and within the specimens of a species can bring us into a greater awareness of nature's playfulness. Why do I say playfulness? Because it is not as if the differences followed some variation scheme defined by an algorithm. I can hardly imagine that nature has any functional purpose "in mind" for now having seven gently rose-tinted sepals, now nine small and somewhat elongated violet sepals, and so on.

The more you look, the more different kinds of variations you find. And these variations are nature revealing herself in ways that force us to leave behind fixed categories and expectations ("Hepatica has six petal-like sepals"). When we turn to the concrete appearances and look closely, we see each as a new revelation of the plant's creative potential. Such flowers let us participate in the bursting forth of the playful life of the earth in early spring.



1



2



3



4



5



6



7



8

### Searching for “Origins”

In late October at The Nature Institute, Craig guided a day-long workshop for biology teachers and people interested in the topic of human evolution. To bring us into the subject, Craig used a “kit” he developed that consists of 30 hand-drawn images of skulls, in profile and drawn to scale (allowing for easy comparison). These skulls are a representative selection of the hominid fossils that scientists have discovered over the last century. They represent the concrete phenomena that scientists have studied and puzzled over in an attempt to answer the riddle “Where do we come from?”

Normally, students are simply taught the varying results of that investigation. They are given answers that scientists have offered. But they are not given space to *ask* the question themselves, to experience the phenomena directly, to observe it and form their own ideas. These skulls, even though only two-dimensional images, provide this opportunity. They begin to bring us into the act of discovery.

How do they do this? I can only share my own experience. To do so, I’ll have to take you through the process.

Craig split us up into groups of three or four people, and gave each group a packet of the skull images. He then asked us to order them.

Initially, my group clustered them according to their visible features: a stronger brow, a larger jaw, a rounder head, a ridge along the top of the head.... Then, once we had them in little clusters, we guessed their relative age and proceeded to order them in a linear sequence from oldest to youngest.

When we were finished, we went around and saw how the other groups had ordered them and heard their observations and thoughts. Then Craig gave us a handout with more details about the skulls. We learned where they were found, the exact size of the cranial capacity, and an important discovery—their likely geological age. With these new discoveries in hand, we again took up the skulls and came to a new understanding and order.

We realized that our initial activity of clustering the skulls made more sense than the linear sequence we later put them in. Of course these beings had not all lived one after the other in a straight line! — even though this is how it’s so often depicted in the ubiquitous image of the transformation from bent-over ape to upright man. Some of the hominids with quite different characteristics had lived at the same time. And some of them died off and had no direct hereditary connection to modern human beings.



Although many of us had a background in teaching science, nonetheless almost everyone assumed the skulls would line up in a nice linear sequence. We forget that that’s not how nature presents itself. Instead of a simple line of causality, we see a rich tapestry of being and becoming. This was an interesting insight. By entering more into the actual experience of scientific inquiry, discovering the skulls much like the scientists themselves had, we came to a far fuller picture of the life of our ancestors on earth.

In addition, I found the process also made it possible to catch a glimpse *behind* the question, “Where do we come from?” Usually when we try to answer this question, I think we’re just looking for some original forebear—a “missing link” of which we can say “we came from that.” Such an answer, if it’s to be found at all, doesn’t shed much light on what it means to be human today. But in the act of discovery, of really looking at these skulls and puzzling over their different features, I found there was a strong *aesthetic* experience that did shed light on this deeper question.

By “aesthetic,” I don’t mean that I became engaged artistically (though I could imagine it being very fruitful for



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## New Videos

This winter, we uploaded two of Craig's recent presentations onto our YouTube channel. The first—"Where Do We Come From? The Question of Origins and Ancestors"—was a talk that Craig gave in late October to a packed house at The Nature Institute. The second—"Giving Living Beings a Voice"—was a presentation he delivered in November at a conference on synthetic biology in Toronto, Canada. We hope you will find them thought-provoking. They can be found in the new "Other Media" section of our website (<http://natureinstitute.org/media>).

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students to draw the skulls!), but that the diverse skull forms became ever more *expressive* as we worked with them. In time, the manifold features became more recognizable and more pronounced. They began to speak.

If we hadn't lovingly given our attention to them, if we had ignored all the "offshoots" and sought instead only the one "truly human lineage," then the different skulls couldn't have created a contrast for each other. In the end, it was this movement *between* them that was the most interesting—a picture of "humanness" itself, in all its various aspects, that began to emerge. And, ultimately, *that* is the reality of our origin, where we've come from and where we continue to come from. *Seth Jordan*

## At Home and Abroad

This fall and winter have been a busy time at the Institute with numerous talks and workshops. But this hasn't stopped Institute staff from an equally busy schedule on the road.

- In November **Craig Holdrege** went to Toronto, Canada, and presented at a conference on synthetic biology. (That presentation is available on our YouTube channel, as mentioned in the *New Videos* announcement.) Then, in February, Craig gave four talks to science educators at the "Phenomena to Insight Conference" in Santa Rosa, California. In March, he taught at the Pfeiffer Center in Spring Valley, NY. Later that same month, Craig traveled to Long Island, NY, where he spoke on the sloth to the whole Garden City Waldorf High School and worked with the faculty there. Also on Long Island, he gave the keynote talk at a conference on "Caring for the Earth" organized by the Winkler Center for Adult Education.
- In November **Bruno Follador** spoke at the "Soil and Nutrition Conference" in Southbridge, MA. Then in December he traveled to Brazil and spoke at the University of São Paulo. Bruno spent early March in England: he gave a workshop at the Field Center-Ruskin Mill Land Trust, and spoke numerous times at Emerson College, where he worked with the post-graduate students of the Crossfields Institute.

- Besides working intensively with math teachers at The Nature Institute's annual "Mathematics Alive!" workshop, **Henrike Holdrege** also gave a talk on Cassini Curves in November at a conference in Ann Arbor, Michigan, and spoke about astronomy and about light at nearby Camphill Ghent.

## Still ahead

- Bruno will be giving an **Earth Day talk** at the Institute on April 19, entitled "If Only the Earth Could Speak: Reflections on the Language of Nature and the Human Word."
- In July, we will be joined by twenty-three people for the first session of our new, year-long foundation course in experience-based science, "**Encountering Nature and the Nature of Things.**" We were surprised and heartened by the amount of enthusiastic interest in this new program.
- We will also be doing a week-long course in June called "**Let the Phenomena Speak!**" More information can be found on the back cover.

## A Challenge Grant: *Helping the Work to Grow*

In our adult education programs and publications, we strive to foster a transformation of human consciousness that allows the wisdom of nature to speak more strongly in our perceptions, thoughts, feelings, and actions. We have learned much in our twenty years of activity and, with much still to be accomplished, we look forward to the next twenty!

To support this work, a Nature Institute friend has generously offered to donate up to \$5,000 as a matching gift. Every dollar you donate to The Nature Institute by June 30 will be matched, up to \$5,000. You can make a gift by check or credit card using the enclosed envelope, or by credit card through our website.

(<http://natureinstitute.org/friend>)

*Thank You!*



Math teachers working over a problem at the 2018 Mathematics Alive! workshop.



Observing fruit and vegetable morphology at the February 2018 Winter Course for farmers and gardeners.

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## Farewell to Bruno

Bruno Follador, the director of our Living Soils program, is moving back to his Brazilian homeland this June. During his nearly four years at The Nature Institute, Bruno has endeavored to foster not only a shift in agricultural practices, but also in human consciousness, exploring what is for him a central question: How does our way of seeing, speaking, and thinking contribute to the creation of our agricultural reality, for better or for worse?

During his time with us, this question has shaped his work. Bruno has traveled throughout Europe and the Americas giving workshops, courses, lectures, and farm consultations. He has written a number of articles for *In Context*, as well as for magazines and journals in the US, Canada, England, Australia, and Germany. In 2015, he was recognized by the organization Food Tank as one of the top twenty innovators protecting the planet. Clearly, his approach to agriculture has aroused enthusiasm wherever he has traveled.



Bruno returns to Brazil together with his wife Bruna and their young son Manuel, where he plans to continue teaching, consulting, writing, and doing qualitative soil and compost research. We're very sad to see him go, but we also look forward to future work together. He will be an affiliate researcher of The Nature Institute, and we imagine our paths will cross often as Craig and Henrike continue to teach in Brazil, and Bruno continues to teach and consult in the USA.

Thank you for your great work, Bruno!

# Thank You!

*We would like to express our deepest appreciation to all those who have contributed goods or services between October 1, 2017 and March 31, 2018. And we give special thanks to the Edwards Mother Earth Foundation for its challenge grant.*

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# A Physicist, a Philologist, and the Meaning of Life

## *Do We Have a Home in the Vast Cosmos?*

STEPHEN L. TALBOTT

*“A reality completely independent of the mind which conceives it, sees or feels it, is an impossibility.”*

— HENRI POINCARÉ

*“Man knows himself only to the extent that he knows the world; he becomes aware of himself only within the world, and aware of the world only within himself.”*

— JOHANN WOLFGANG VON GOETHE

**T**HE CELEBRATED PHYSICIST RICHARD FEYNMAN, skeptical of religious or mythic creation stories that focus upon humans and the meaning of their lives, once explained his doubt with arresting simplicity: “The stage is too big for the drama” (Gleick 1992, p. 372). It was a wonderfully succinct way to make his point, and suggests that Feynman had a bit of the poet in him.

The improbably large stage, which he found unsuited to our parochial origin myths, is, of course, the boundless frontier explored by cosmologists, whose probing, high-tech sensors have mapped inter-galactic dimensions of space and time so far beyond our immediate experience that we humans can scarcely hope to comprehend them.

We have all heard many times about our own non-descript place upon this vast stage. We are situated in an unremarkable galaxy among billions of others. Our solar system occupies a scarcely noticeable patch of real estate

well out into this galaxy’s hinterlands. And, following the Copernican revolution, we earthlings lost even the circling attention of our neighboring sun and planets.

Still, we reigned unchallenged on our own planet, where we imagined ourselves the possessors of a special destiny, above all other creatures. But then, as a final insult, Darwin re-told our local creation story as a wearily long series of accidents, after which we found ourselves to be “trousered apes.”

Oh, the ignominy of it! Or, at least, that seems the usual point of the story. And, to be sure, it stings. The entire account can feel like a soul-crushing blow, rendering coarse or absurd all our higher aspirations, our ideals, our loves.

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Photo: NASA, ESA, the Hubble Heritage Team (STSCI/AURA), A. Nota (ESA/STSCI), and the Westerlund 2 Science team

As a new creation myth, the story is compelling. Like any good myth, it pervades our culture. No one is surprised when a student of ancient Greek philosophy is given space in the *New York Times* to tell us why “The Universe Doesn’t Care About Your ‘Purpose.’” With no slightest flicker of troubling doubt, Joseph Carter shares with us his conviction that “the laws of physics are inherently mechanistic ... Eventually everything ends in heat death. The universe certainly started with a bang, but it likely ends with a fizzle. What’s the purpose in that, though? There isn’t one ... In the grand scheme of things, you and I are enormously insignificant” (Carter 2017).

This confession of meaninglessness may have been given its most quotable form by physicist Steven Weinberg: “The more the universe seems comprehensible, the more it also seems pointless” (Weinberg 1993, p. 154).

Given this (in some ways admirable) spirit of self-abnegation, one might have expected the confession to include a humble lament about the severe and fundamental limits to current human understanding. Of course, this might have overshadowed the odd and unusually bright self-confidence evident in many of the abnegators, so its omission is understandable. But equally odd, as I will try to show, is their inattention to the remarkable significance of the understanding we do have. And most puzzling of all — this will be the main burden of my discussion — is their failure to reckon with the historical and evolutionary record bearing on their claim that the world is alien, or at least indifferent, to human meaning, value, and purpose.

## The sobering weight of our ignorance

As children of the scientific revolution, we have securely vested our sense of knowing in quantitative precision and unambiguous, machine-like causation (Talbot 2004). Science becomes technology, where the aim is to construct instruments that respond exactly and predictably to carefully specified conditions. The cockpit of every jet airliner, the technical apparatus of a typical research laboratory, and the cell phones in the hands of nearly all of us proclaim how wonderfully well we have succeeded.

And surely our technological prowess does reflect a practical knowledge of the world. But the pleasure and wonder of it easily blinds us to the fact that we remain infants in fundamental understanding. How often do we remind ourselves that the nature of matter is a mystery to us, or that, when we speak of “the physical,” it is difficult to indicate even roughly what we mean? When we get down to the sub-microscopic specifics, we find nothing there, no *thing* of any recognizable sort. We identify reliable mathematical rela-

tions suggesting particular structure, but we do not know, the structure of *what*.

Joseph Carter, in the article cited above, finds it natural to say, “As a materialist, I think ...” — as if “material” and “matter” were perfectly routine concepts. Yet I doubt whether any philosopher of science today would be so rash as to venture a confident definition of “matter.” Certainly our technological know-how does little to lend it content.

Much the same can be said of the terms often considered basic to science, such as *energy*, *space*, *force*, and *time*. Feynman himself once remarked, “we have no knowledge of what energy *is*” (Feynman, Leighton, and Sands 1963, p. 4-2.) Anyone who senses the disquieting shadow of the unknown enveloping our science will hardly pronounce upon the true nature of the “material” world. To do so might only suggest a tendency toward insecure bluster and a habit of uncritical thinking.

Things get no better when we turn to the problem of consciousness, which we might well think of as fundamental to all other perplexities we confront in thought and experience. The late Jerry Fodor, an eminent philosopher who spent much of a lifetime working in and around this problem, was convinced that “Nobody has the slightest idea how anything material could be conscious. Nobody even knows what it would be like to have the slightest idea about how anything material could be conscious” (Fodor 1992).

It’s almost as if cognitive scientists today have been competing to profess their bafflement in the most colorful terms, as when British philosopher Colin McGinn says, “The brain is just the wrong kind of thing to give birth to consciousness. You might as well assert that numbers emerge from biscuits or ethics from rhubarb” (McGinn 1993, p. 160). The entire field of consciousness studies remains in ferment, with no evident prospects for breakthrough discoveries.

While this degree of honesty is refreshing, we should keep in mind just how dramatic are the implications of our ignorance. The confessions we have just heard amount to saying that our science altogether lacks support at the deepest level. I mean the level at which we try to understand what, if anything, our scientific thoughts tell us about reality — or even how we can distinguish between “the world,” on one hand, and the conscious processes through which alone the world exists for us, on the other.

## The only science we have is a science of experience

But perhaps more remarkable than the sobering darkness of the unknown is the refreshing light of our apparent understanding. Albert Einstein once claimed that “The eternal

mystery of the world is its comprehensibility,” adding: “the fact that it is comprehensible is a miracle” (Einstein 1936). This comprehensibility, which presents us with a puzzle logically prior to the particular nature of matter, energy, space, and all the rest, may be far the most fundamental fact of our own, and the world’s, existence.

Einstein meant, of course, comprehensible *for us*. It is obvious enough that we have no science and no knowledge of the world except by means of our own experience. If we could not reliably start with our experience, we could not *know* anything. The only world we can investigate is the one that takes form within our understanding minds.

In slightly different words, the content of our science is always mediated by human consciousness. We can conceive the world only by *conceiving* it. Reality, whatever else we may say about it, must share in the character of thought; otherwise we would not be able to embrace it with our thinking. We can have no idea of things that, in their own nature, are entirely non-ideational.

I don’t suppose there could be a more startling disconnect than when a knowledge seeker aims to *articulate a conceptual understanding of a world he considers inherently meaningless*. A conceptual articulation, after all, is nothing other than the working out of a pattern of interwoven meanings. A truly meaningless world would offer no purchase for this effort. We cannot understand what, in and of itself, doesn’t make sense.

If we believe that an empirical (experience-based) science — a science grounded in the conceptual ordering of sensible appearances — really does give us a genuine knowledge of the world, then the reasonable conclusion is that this world is, *by nature*, a realm of conceptually ordered appearances possessing the qualities of sense. It asserts its existence and character in the terms of conscious, thought- and sense-derived experience.

In our own day, such a view is bound to seem strange. We are shielded from it by the historically eccentric conviction of the past few hundred years that our thought and experience, so thoroughly bound up with qualities, are merely subjective. The qualities are “in our heads,” not “out there in the world.” We have done our best to rid science of these supposed phantoms of subjectivity by turning to the rewards of quantitative analysis.

But, as anyone can verify with a moment’s reflection: subtracting all the qualities from our picture of the material world erases the entire picture. There is no content — nothing but a blank — without the qualities of experience. Mathematics alone, without the qualities of actual things, is not *about* anything material. And we should not forget that mathematics itself is a content of *thought*. This thought is not merely “in our heads”; it is also in the world, which

is why we so readily discover our mathematical ideas in physical phenomena. Our inner experience and the material world are not mutually alienated.

Having done their best to deprive themselves of the qualities that alone can give them a sensible world, and therefore being left with a mathematics disciplined only by the demands of technological workability, many physicists have long considered it disreputable even to discuss the reality their science refers to. By the middle of the last century — so say two accomplished physicists — “any nontenured faculty member in a physics department would endanger his or her career by showing interest in the implications of quantum theory” (Rosenblum and Kuttner 2006, p. 13).

And so the question, “What sort of world do we live in?” came to be more or less excluded from our science of knowing precisely at the point where this science was thought to be most fundamental! The result is that we have a physics of light and color framed as far as possible in language suitable for those who cannot see, and a science of acoustics gauged for those who cannot hear.

The loss of qualities — which is to say, the loss of the world of experience — has meant that physicists, so far as they venture at all beyond their equations and well-designed instruments, find themselves participating in a Wild West of speculation, illustrated by the “many worlds” theories so prominently heralded today. This is high-flying conjecture that puts to shame those medieval doctors whose soaring intellectual acrobatics were precisely what the pioneers of the Scientific Revolution so badly wanted to bring down to earth, where ideas could be tested within human experience.

The instincts of those pioneers were sound. A science of human experience is the only science of reality we can have. And what seemed to startle Einstein into an invocation of the “miraculous” was the fact that we *can* have it.

## The world’s speech resounds in us

According to the evolutionary story that most of us have forcibly absorbed from a young age, humankind somehow raised itself above the beastly, mindless, material substrate of its origin so as to achieve, step by step, the mystifying wonders of language and poetry, music and art, politics and science, and all the other sublimations of high culture. The sea of meaning within which we now swim — without which we would have nothing we could recognize as human life — *somehow* bubbled up from *somewhere*, if only as an illusion, and overflowed the bedrock meaninglessness of brute matter.

“Somehow,” I say, since the meaning at issue, and the question how it could have emerged from an eternal silence

of Unmeaning, is so great an enigma for conventional thinking that it has received no fundamental elucidation. Biologists, despite proclaiming the centrality of evolution for our understanding of life, have not often looked at the historical record to see how meaning, language, and consciousness have *in fact* evolved over the period available for inspection.

Doubtless, however, many have been willing to make easy assumptions, as when they fantasize that our ancestors *somehow* — starting with crude grunts and gestures, and eventually employing such devices as metaphor and intellectual speculation about causes — laboriously invented the linguistic, cultural, and proto-scientific meanings that would lend profound structure and significance to human life. But (although the fact is almost universally overlooked) this tells us nothing about the *origin* of meaning and language in an inherently meaningless world. Our apprehension of the meaning of a grunt or gesture (say, the pointing of a finger) depends on our ability to recognize the pointing *as* a pointing, which means we are already caught up in the play of meaning. The imagined leap from unmeaning to meaning never occurs except via circular reasoning, whereby elements of meaning are brought in through the back door.

But we can leave the question of origins aside, for the usual assumptions are belied by everything we know from history. As we look further and further back in the direction of our “material” roots, we find something like the opposite of the conventional picture. It is a commonplace among students of language that, as the nineteenth-century English poet Percy Bysshe Shelley wrote, “In the infancy of society every author is necessarily a poet, because language itself is poetry.” And it was the whole business of this poetry to apprehend the “true,” the “beautiful,” and the “good” (Shelley 1840).

We do not, that is, discover the more ancient productions of language to be impoverished relative to the multi-layered richness of meaning we expect in a later literature reflecting millennia of literate cultural accretion. It is more like the reverse of this: we still debate today whether, for example, the Homeric epics — composed orally before the development of writing in ancient Greece — have ever been surpassed for psychological depth, dramatic power, and human interest.

Likewise, the earliest “history” was not a record of cave-men going on adventures with clubs. It was more like a spiritual and a *cosmic* history. Humans — their gaze riveted by fascinating goings-on in what we today would probably consider supernatural realms, but which they experienced simply as *nature* — did not narrate their own histories. Rather, as is still echoed in Hesiod’s *Theogony* long after the primary age of myth, they told the story of the genesis of

gods and nature spirits. Only with time did history become more human-centered and prosaic.

And, again: “The farther back language as a whole is traced, the more poetical and animated do its sources appear, until it seems at last to dissolve into a kind of mist of myth. The beneficence or malignance — what may be called the soul-qualities — of natural phenomena, such as clouds or plants or animals, make a more vivid impression at this time than their outer shapes and appearances. Words themselves are felt to be alive and to exert a magical influence” (Barfield 1967, pp. 87-8).

**A Primordial Unity of Inner and Outer Meaning.** That last remark was from the British philologist and semantic historian, Owen Barfield. His death in 1997 deprived us of a rare authority on language and meaning who actually *looked* at the evolution of consciousness. The meanings of words, he showed us with wonderful subtlety in a series of works spanning much of the twentieth century, “are flashing, iridescent shapes like flames — ever-flickering vestiges of the slowly evolving consciousness beneath them” (Barfield 1973, p. 75).

If Barfield made one thing inescapably clear, it was that the “enchanted” landscape of mythic consciousness could not have been one of conscious invention, unrestrained metaphor, or causal speculation. The earliest ancestors of which we can form any picture at all could only observe nature as it was given to them. Their meanings did not arise from anything like modern reflection or theorizing.

This truth has been disguised from us by what Barfield referred to as “logomorphism” — the projection of modern thought processes upon “that luckless dustbin” of the primitive mind. “The remoter ancestors of Homer, we are given to understand, observing that it was darker in winter than in summer, immediately decided that there must be some ‘cause’ for this ‘phenomenon,’ and had no difficulty in tossing off the ‘theory’ of, say, Demeter and Persephone, to account for it” (Barfield 1973, pp. 74, 90).

But we see no evidence that the mythic mind had any concern with such explanation, if only because the conditions for it did not yet exist. For one thing, explanation requires distinct ideas — something to be explained, on one hand, and an explanation for it, on the other. But the inner and outer aspects of the unity that our ancestors experienced — which theorists today want to dualize into material fact and fanciful, immaterial explanation — were not separable in that sort of way. The mythically enchanted landscape was an unanalyzable interfusion of outer and inner, of sense perceptions and soul content.

For example, “Helios” could hardly have originated as an animistic effort to account for a material sun, given that

neither the history of language nor what we know of mythic consciousness affords any evidence that a purely material sun (from which one could infer — against all logic — the idea of a divine being) had yet been conceived. The sun's glory, its light and warmth, were simply experienced as ensouled realities.

We still find remnants of such indivisible meaning in the *New Testament*, where we read:

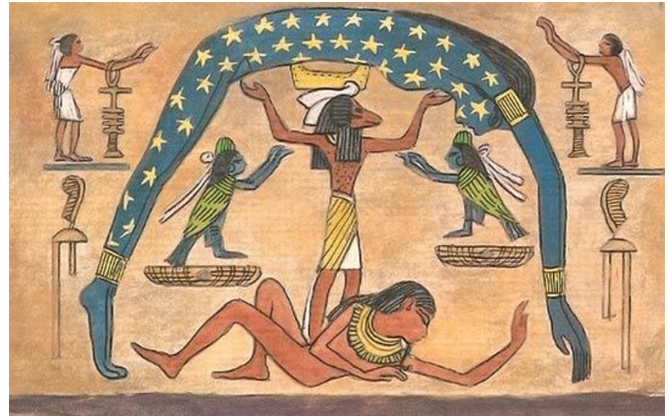
Truly, truly I say to you, unless one is born of water and the spirit, he cannot enter into the kingdom of God ... The wind blows where it wishes and you hear the sound of it, but do not know where it comes from and where it is going; so is every one who is born of the spirit. (John 3:5-8)

The translator has been forced by modern English to use two different words, “spirit” and “wind” (in other texts “breath” is required) where the original Greek has a single word, “pneuma”. “We must, therefore, imagine a time,” Barfield noted, “when [Latin] ‘spiritus’ or [Greek] ‘pneuma’, or older words from which these had descended, meant neither *breath*, nor *wind*, nor *spirit*, nor yet all three of these things, but when they simply had *their own old peculiar meaning*, which has since, in the course of the evolution of consciousness, crystallized into the three meanings specified” (Barfield 1973, pp. 79-81).

“Nor yet all three of these things” — not the addition of one distinct meaning to another, but a single unity of wind, breath, and spirit. Today's disconnected meanings simply weren't there yet in human experience. Grasping this truth is a great difficulty for us today, whose language forces a dichotomous choice between the terms of outward, sensible reference and those drawn from our interior life. To take one further example:

As far back as we can trace them, the Sanskrit word “*dyaus*”, the Greek “*zeus*” (accusative “*dia*”), and the Teutonic “*tiu*” were all used in contexts where we should use the word *sky*; but the same words were also used to mean *God*, the Supreme Being, the Father of all the other gods ... If we are to judge from language, we must assume that when our earliest ancestors looked up to the blue vault they felt that they saw not merely a place, whether heavenly or earthly, but the bodily vesture, as it were, of a living Being. (Barfield 1967, pp. 88-9)

Summing up the historical picture, the nineteenth-century American transcendentalist, Ralph Waldo Emerson, wrote in 1849: “As we go back in history, language becomes more picturesque, until its infancy, when it is all poetry; or all spiritual facts are represented



by natural symbols.” And again: “It is not words only that are emblematic; it is things which are emblematic” (Emerson 1849, chapter 4).

So the entire direction of the evolution of language and meaning is, so far as we can discern from the historical record, the very opposite of the widely assumed “ascent from brute materiality.” Before humans could speak in their own individuated voices, or could even conceive of devising theories or telling their own stories in a modern biographical sense, the natural world spoke to and through them. It was a time (as the rhythm and meter of early language testifies) “when men were conscious, not merely in their heads, but in the beating of their hearts and the pulsing of their blood — when thinking was not merely *of* Nature, but was Nature herself” (Barfield 1973, pp. 146-7).

**Nature's ‘Speech’ Gave Us Our Meanings.** Historically, then, nature presented us with exteriors whose inner significances were, so to speak, written on their faces. Phenomena constituted a living language, rather as, still for us today, the sense-perceptible human face can scarcely be distinguished from its expressive eloquence — that is, can scarcely be distinguished from the meaning it communicates. Similarly, it was from the evocative countenances of nature that our forbears discovered, in a living unity, the profound potentials of meaning that eventually yielded our current, analytically refined language.

As it happens, virtually *all* language traces back one way or another to the kind of inner/outer unity evidenced in the Greek “pneuma”. We see this in two broad classes of words:

- Some words — those now bearing immaterial meaning in the form of high abstraction, or else referring to our interior life — were once inseparable from sensible experience. “Right” meant *straight*; “wrong” meant *twisted*. To “conceive” something was to *grasp* it, as with the hand. Only with time did words such as “right”, “wrong”, and “conceive” become detached from sense perception. More-



over, as Barfield reminds us, the general rule that abstract and immaterial terms originated in connection with sense-perceptible phenomena is one from which “high-sounding ‘scientific’ terms” such as *cause*, *reference*, and *stimulus*, are not miraculously exempt (Barfield 1973, p. 134).

- The other group of words, now referring to material, sense-perceptible phenomena, once also connoted sentience or inwardness. We have already seen how words for “sky” originated in conjunction with *divine being*. “Matter” itself traces back to Latin *mater*, “mother”. And “physical” derives from the Greek *phyein*, “grow”. So the Greek *ta physika* — “natural things” or “things of external nature” — was rooted in living activity.

In this way virtually all our language testifies to the primeval experience of nature as a material/immaterial, inner/outer unity. But none of this is to say we should look to etymology for current meanings. Who will claim today that when we say someone is “wrong,” we mean he is bent like a stick, or that to “grasp something with a hand” means to “conceive” it? Nevertheless, the history of meaning raises its own questions.

How did the meanings of our ancestors gain their immaterial aspects if the sense-based images (a bent stick, the hand’s grasp) did not, out of their own nature, lend themselves to the expression of those aspects? If the relation between sensible image and immaterial meaning were arbitrarily invented by early speakers and were not inherent in the phenomena themselves — if things were not, as we heard from Emerson, *emblematic* — how would anyone have understood the speakers’ invented, immaterial meanings? (For a treatment of this and related questions, see Barfield’s remarkable essay, “The Meaning of ‘Literal’” in *The Rediscovery of Meaning and Other Essays*. Perhaps equally valuable is his essay on “The Nature of Meaning.”)

In today’s terms: *we* may not mean “wrong” when we say “bent like a stick,” but who can deny that the physical image of a bent object carries within it a potential for such inner meaning? (Actually, one aspect of that potential is fully realized in the English “bent”, which can mean “strongly inclined, resolved, or determined.”)

The original emblematic, or symbolic, meanings of things were not inventions. In the mythic consciousness, Barfield showed us, thinking was “at the same time perceiving — a picture-thinking, a figurative, or imaginative consciousness, which we can only grasp today by true analogy with the imagery of our poets, and, to some extent, with our own dreams” (Barfield 1973, pp. 206-7).

This picture-thinking was *given* by nature. The thinking element — the expressive content — was already experienced in perception, and was not added to it by a reflective

or theorizing perceiver. Things meant something *on their face*. Our ancestors were, in a sense, spectators entranced by an ensouled drama staged by the phenomena themselves.

What the historical record shows is that those progenitors recognized, in whatever was expressed through natural phenomena, a speaking agency akin to themselves. “Whether it is called ‘mana’ [wrote Barfield], or by the names of many gods and demons, or God the Father, or the spirit world, it is of the same nature as the perceiving self, inasmuch as it is not mechanical and accidental, but psychic and voluntary” (1965, p. 42).

We can make of all this what we will today, when our evolutionary trajectory, as Barfield traces it (and as I cannot here), has brought us to a vastly different place. But whatever case we choose to argue, we will necessarily invoke sublime, hard-won meanings that are available to us only because the world first put those meanings on display, enabling them to light up in nascent human minds.

At the same time, we will need to acknowledge that, so far as the historical record testifies, our evolutionary trajectory has not accorded with the usual assumptions. There is no evidence that we slowly ascended from a crude life of material Unmeaning to a humanly invented realm of meaning, value, culture, and spirituality. Our life today, with its materialistic convictions about the meaninglessness of nature, has required a long descent from the living, ensouled landscape upon which our ancestors were nurtured.

Our Cartesian heritage has taught us well to insist upon a radical separation of the inner and outer dimensions of our experience, which once formed so compelling a unity. And then, under the further influence of materialist thought, we have learned to regard the inner dimension as “merely subjective” or somehow less than fully real. This suggests that, instead of projecting our current mental processes upon the “ignorant” ancients, we might want to consider how a Cartesian and materialist heritage has concreted in our own deepest, most unyielding, and largely unconscious habits of thought and experience.

Through such reflection, perhaps we would gain the freedom within ourselves at least to inquire in all seriousness whether we today are the ones who lack ready access to much of the world’s reality.

## Why make our lives a drama too small for the stage?

We have seen that a great unknown presses in upon us from all sides. In particular, the origin of things is hidden from us and, despite all our technological successes,

the fundamental terms of our science remain seemingly impenetrable mysteries. What one physicist wrote in 1985 is no less true today: “As yet no physicist can tell you what sort of world we happen to live in” (Herbert 1985, p. 146). Humbling as it may seem in an era so arrogantly dismissive of the past, our current physical science gives us no basis for belittling the ancient human experience of living in something rather more like a universe of beings than a universe of things.

But we have also seen that an intelligible world is more intimately near to us than we have dared to imagine. If we understand the world at all — and we are all convinced we do — it can only be because it consists, by nature, of qualitative *appearances* (“phenomena”) available to experience. It readily manifests itself on the stage of our own inner being.

And, finally, by looking at the history of language we have seen that the expressive face of the world presented itself to our ancestors as a kind of speech, and it was from this presentation that our own powers of speech derived. Like language, every natural phenomenon was an exterior through which there shone interior significances. The essential elements of nature were not mute, expressionless things, but images symbolizing meanings.

We return, then, to Feynman’s statement. When he said the stage is too big for the drama, he must already have concluded that the drama is sadly insignificant. Otherwise, what told him the stage is too big? Further, he was assuming a vast cosmic expanse indifferently related to the human story. But this assumption is the whole point at issue.

It is not at all clear how a universe of *appearing things* — things declaring themselves *to us* and bearing the sources of our language and thought within them — could possibly be alien to our own story. Not only have we drawn our interior life from the world’s meanings, both sublime and awful, but we live in a world whose very nature is to be encompassed within our consciousness — to live within us. Far from finding ourselves strangers in an alien universe, we embrace with our imagination and understanding the most distant galaxies, bearing witness to the significances of their light.

The universe’s appeal to our inner being runs deeper than intellect alone. For one thing — and what mystery could be more profound? — it yields itself gracefully to the choreography of our purposeful action. And, for another, it is the source of endless inspiration and encouragement. J. R. R. Tolkien reminds us of this when, in *The Lord of the Rings*, Frodo catches a momentary glimpse of a single star on high, penetrating the gloom of Mordor:

The beauty of it smote his heart, as he looked up out of the forsaken land, and hope returned to him. For like a shaft,

clear and cold, the thought pierced him that in the end the Shadow was only a small and passing thing. There was light and high beauty forever beyond its reach.

Perhaps the truth is nearly the reverse of Feynman’s saying. What is to prevent us from thinking that our receptive, respectful, and attentive consciousness is the stage, or one stage, upon which the material universe is itself realized — upon which it comes to its essential appearance? The question then is whether we have made *this* stage too small to accommodate nature’s eloquence — the qualitative and full-throated eloquence that, for all we know, desperately needs our own consciousness, conscience, and voice for its own most profound expression.

We are, of course, free to shrink the stage of our consciousness until it can present us only with a pitiful, mechanistic reduction of the natural world’s performance. But we can reasonably hope that the cosmos that so patiently brought us forth — a cosmos whose expressive material is woven through our own being — will tolerate a few hundred years’ momentary foolishness during which, like adolescents leaving home to establish their own independent life, we struggle against the “tyranny” of our upbringing. It is, in its way, a noble as well as a necessary struggle. And if it has yielded, among other things, Richard Feynman’s devotion to disciplined truth within the sphere of his own inquiry, this is something always to be cherished.

Yet, as we know so well, merely efficient truth is quite capable of blowing up the planet. A lot may depend on our gaining trust in the meaning and dignity of our own story. And this will prove impossible, I suspect, except so far as we also renew our trust in nature’s meaningful *appearances* — in the beautiful, compelling, sobering, terrifying, and inspiring phenomena it has so freely entrusted to us as the basis, not only for any genuine science, but also for the plenitude of our inner lives.

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