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A More Child-Like Science

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Why do leaves turn red? Where does the sun go at night? What made Whiskers die? Will Mommy die sometime, too?

Children are notorious for posing naïve and perplexing questions. When one of our sons was four years old, he asked, "Why did God make poisonous snakes?" I do not recall our answer, but very much doubt that it was helpful. And who among us can do justice to the most perplexing question of all—the one *incarnated* in every newborn child: "Who are you, and for what purpose have you entered our lives?"

The child's large and difficult questions arise not from complex theoretical constructions but from simplicity—"childish simplicity" we are tempted to say, with a slightly patronizing smile. We need, after all, to defend serious discourse against fruitless inquiries about God and the moral significance of poisonous snakes. This is why our more child-like questions have, over the past few hundred years, disappeared from science. They are anachronisms, echoing hollowly off the instrument panels and surgically precise tools of the laboratory. Their implications would be only an embarrassing distraction, oddly disjoined from the prevailing paths of technical investigation. "Child, for what purpose have you come?" Imagine a genetic engineer or an evolutionary theorist asking such a question!

Yet a strange thing is happening. Questions rather like the child's impossible ones are now being forced upon us from the side of science. The biotechnologist, faced not with poisonous snakes but with "defective" children, is led to ask: "Where do these defects come from? Can we unmake them?" And further, regarding the child's destiny: "Why do we age and die? Must we submit passively to human limitation?"

I say "rather like" the child's questions. For the child is always inquiring about meaning and purpose. *His* question about why we age and die is morally, teleologically, and aesthetically tinged. The scientist, by contrast, is asking about the mechanisms that "implement" aging and death, and wondering to what effect we might manipulate them.

Such, at least, is the usual distinction, not only between child and scientist, but also between the scientific dialogue and the larger human conversation. But the distinction is muddied when scientists tell us that they are gaining the knowledge to engineer *better* children. How can you recognize a better child, after all, if you must shun the language of value? And how can we, as scientists or parents, propose to manipulate an individual child's destiny if we cannot ask serious questions about the child's identity and purpose?

If the scientist is to join in this larger conversation, then nothing less than a second scientific revolution will have occurred. Science will have been reopened to the categories of meaning and value. The genetic engineer and the evolutionary theorist will learn to ask: "Child, for what purpose have you come—and how can we make things better for you?"

Without such a revolution there will be no true societal conversation. Rather, we will hear two different and dissonant styles of speaking and they will spawn endless confusions between them. Using one style we will converse *with* the child, and therefore at least partly in the child's terms. With the other we will converse *about* the child, concerning ourselves with the manipulation of genetic, hormonal, neural, and other mechanisms as if we were engaged in little more than an engineering project.

The President's Council on Bioethics, with its discussion of "better children," has stepped boldly into the no-man's land between these two ways of speaking. Perhaps wisely, *Beyond Therapy* has not asked for a revolution in science. Instead it has tried only to delimit the engineering project and to establish the propriety of discussing the ends and purposes of human life.

The Council begins with the most fundamental question of all: "What, exactly, is a good or a better child?"

> Is it a child who is more able and talented? If so, able in what and talented how? Is it a child with better character? If so, having which traits or virtues? More obedient or more independent? More sensitive or more enduring? More daring or more measured? Better behaved or more assertive? Is it a child with the right attitude and disposition toward the world? If so, should he or she tend more toward reverence or skepticism, high-mindedness or toleration, the love of justice or the love of mercy? As these questions make clear, human goods and good humans come in many forms, and the various goods and virtues are often in tension with one another. Should we therefore aim at balanced and "well-rounded" children, or should we aim also or instead at genuine excellence in some one or a few dimensions?

Against the backdrop of these unanswered (and perhaps unanswerable) questions, the Council considers various genetic and pharmacological technologies that promise to give us "better" children. The first set of technologies aims at shaping, choosing, or improving a child's native endowments. Prenatal diagnosis permits us to "weed out" fetuses with undesirable genetic traits. Preimplantation genetic screening allows us to select in vitro embryos with desired genetic traits. Genetic engineering would allow us to produce certain genetic traits by deliberate design.

For now, prenatal diagnosis and preimplantation screening present only restricted possibilities for "improved" children. These methods are limited by the genetic resources of the parents, neither of whom may have the desired trait.

Further, most traits require the interplay of many genes, so even if the parents had the right genes, it would be nearly impossible—short of producing and screening thousands of embryos—to find one with the right genetic combination. And even if our scientific understanding enabled us to identify trait-specific gene combinations, our powers of control would still be limited. As the Council points out, "since most traits of interest to parents seeking better children are heavily influenced by the environment, even successful genetic screening and embryo selection might not, in many cases, produce the desired result."

As for genetic engineering—the direct insertion of desired genes into an embryo—the difficulties are even more imposing. Not only is there the challenge of working with genes that interact in still largely unknown ways, but there is also the problem of inserting these genes into the embryo without damaging it or causing unintended "side effects." The history of genetic engineering in non-human species has been one long crescendo of discovery about such unintended consequences.

The root of the problem is that the side effects are not really side effects. They are a meaningful activity of the organism. As my colleague Craig Holdrege has shown in *Genetics and the Manipulation of Life*, the organism deals with a genetic or biochemical intrusion much as it deals with a disturbance of its external environment—by responding as an integral whole. This is true even in the plant. For example, when researchers inserted carotene-producing genes in tomato plants, the plants did produce more carotene. But the substance appeared in plant parts that normally don't have carotene (seed coats and cotyledons)—and the more the carotene, the smaller the plant became. Similarly, when herbicide resistance was genetically engineered into a mustard species (*Arabidopsis*), the generally self-pollinating plants started cross-pollinating at twenty times the normal rate. Such "side effects," whether obvious or subtle, turn out to be more the rule than the exception.

The reason is simply that the organism adapts to a disturbance with its entire being and according to its own distinctive manner of existence. Manipulating the parts forces a question that can be answered only by the governing whole: "Who are you? What sort of a unity are you trying to express?" Even when *our* aim is nothing more than effective, machine-like control, we cannot prevent *the organism* from responding in a meaningful and conversational manner. And if this is the case with a plant, it is certainly also the case with a child.

Given the difficulties and limitations involved in the various genetic technologies, the Council believes that "prophecies and predictions of a 'new (positive) eugenics' seem greatly exaggerated." But this does not relieve it of concern about the changes now afoot. Even prenatal screening for disease, already a common practice, may be "shifting parental and societal attitudes toward prospective children: from simple acceptance to judgment and control, from seeing a child as an unconditionally welcome gift to seeing him as a conditionally acceptable product."

In the second part of the chapter on "better children," the Council explores new pharmacological ways of altering children's behavior. It endorses the therapeutic use of behavior-modifying drugs in difficult cases, while questioning the casual reliance on drugs as a general strategy for obtaining well-balanced children. It notes that "most children whose behavior is restless and unruly could (and eventually do) learn to behave better, through instruction and example, and by maturing over time." Drugs short-circuit this learning process by acting directly on the body. As a result, the "beneficiaries of drug-induced good conduct may not really be learning self-control; they may be learning to think it is not necessary." The child may come to "look upon himself as governed largely by chemical impulses and not by moral decisions grounded in some sense of what is right and appropriate."

Making the distinction between behavior control and moral education is an important step. It helps to clarify the divide between the language of science and the language of life. But it should not lead us to imagine that we have harmonized the two styles of speaking. The dilemma remains: How do we bring the researcher's language of fact and control into dialogue with the parent's language of ethics and purpose? Wouldn't this be like bringing the sober, sophisticated world of the mature scientist into meaningful relationship with the naïve, morally infused world of the child?

The idea of any such convergence may seem outrageous. And yet, when the scientist offers the parent a menu of options for obtaining "better children," it is he himself who puts the questions of meaning, value, and purpose on the table. When the going gets tough, he cannot fairly retreat into the "silence of objectivity." He cannot reasonably say: "I offer you better children, but do not ask me what 'better' means or who the child is." This passive-aggressive refusal to engage the issue is least acceptable when coming from the person who forced the issue in the first place.

But scientists do have apparent reason for their reluctance to "come out of the closet" with their values. It has long been part of their discipline to refuse as best they can all explicit dealings with questions of value, and the practical benefits of this austere objectivity appear to have been spectacular. Viewed in this light, the latter-day quandaries of biotechnology look suspiciously like a trap, baited with all those metaphysical and discipline-sapping enticements that scientists have taken such great pains to flee. How, then, can we possibly ask the scientist, as a scientist, to participate in discussions about the moral education of the child or the moral implications of a genetic alteration? Don't we leave those topics for the ethicist?

More and more we do, which helps to explain the disjointed nature of the two conversations. The disjunction has long been canonized in the philosophical proverb: "You cannot get from facts to values." There is no way to get from state-

ments about *what is* to statements about *what ought to be*. "Is" and "ought" seem to come from different, incommensurable worlds. It hardly needs adding that the scientist is passionately committed to the factual and objective—to the *is*-ness of things.

Look at the world through more child-like eyes, however, and the situation is wondrously transformed. The question becomes not how do we get from an "is" to an "ought," but the reverse: How do we manage to narrow our value-laden world to a mere statement of fact? For we *do* start with terms like "good" and "evil," "ugly" and "beautiful," "meaningful" and "purposeful." Historically, a narrowing down is exactly what happened. By all accounts the ancients experienced themselves as living within an ensouled world—one thoroughly drenched in perceptions of goodness and value. Even the *physis* or "elementary substance" of the early Greek philosophers was, as Francis Cornford remarked, not only a material thing but at the same time a "soul-substance." Further, "the properties of immutability and impenetrability ascribed [by some Greek philosophers] to atoms are the last degenerate forms of divine attributes."

What is true historically is true also of the individual biography. The child, too, lives in an ensouled world. His incessant questions of meaning and purpose ("Why … ?") testify to an inborn conviction that the underlying reality of the world is psychic and voluntary, bearing an obligation to sustain good and reasonable appearances. Only with maturation does the child slowly gain a world of fact—an is-world to set beside his birthright-world of congenial value.

But this birthright is never truly relinquished. Look at the mature human being—in the life of family and community, work and recreation, friendship and enmity, politics and education—and you will be hard pressed to find a single act, word, or gesture that is not suffused with value and purpose. This is true even of the scientist in his laboratory, who, if he could really drain all his actions of their valuative content—say, by treating his colleagues like objects or treating his sophisticated instruments like junk—would be dismissed as a psychopath.

We do not find a realm of psychically disinfected fact within the human sphere—except in the intellectual constructions of modern science and its philosophy. These constructions take place according to certain restrictive rules, and the historical acceptance of the restrictions was a matter of choice. Moreover, the choices amounted to a decision, conscious or otherwise, to exclude from consideration everything meaningful and psyche-laden—everything that did not serve the insistent drive toward a world of mere fact. Only by reconsidering these choices can we see the loss of vision entailed by modern science, and perhaps how science remains parasitic upon the less denatured reality from which it arose.

The child who asks about the red leaves of autumn is asking about red, not the wavelengths and frequencies of a physics text. He lives within a vivid world

of sense qualities. This is why the Dutch psychologist, Jan Hendrik van den Berg, conceives the following exchange:

> "Why are the leaves red, Dad?" "Because it is so beautiful, child. Don't you see how beautiful it is, all these autumn colors?" There is no truer answer. That *is* how the leaves are red.

Of course, this is not the final or complete answer. As the child gets older, the answer could be enriched, not diminished, by understanding the interworkings and so called "mechanisms" of a natural world that remains qualitative through and through. But a fateful choice intervened to alter any such understanding.

Beginning with Galileo, there was a conscious disregard of *qualities* within science—and this for the simple reason that qualities, as every child knows, are inescapably freighted with psyche. We experience qualities "in here"—within consciousness. But what is insufficiently realized is that we also experience qualities "out there," in the only external world we have. We cannot characterize a world—any sort of world—without qualities. Subtract all qualitative content from your thoughts about things and there will be no things left. Try to imagine a tree without color or visible form, without sound in a breeze, without the smell of sap and leaf, without felt solidity, and the tree will have ceased betraying any sign of its existence. If you are inclined to redeem the situation with talk of molecules or subatomic particles, try to characterize *those* without appealing to qualities.

It is fine to say, "We get from the qualitative world to the realities of hard science by dealing only with what can be quantified." But the phrase "what can be quantified" is puzzling, since it has no meaning if we cannot say anything significant about the "what" we are quantifying. Given a set of quantities, we have to know what they are quantities *of* if we are to know anything at all about the actually existent world. And how do we characterize a "what" without qualities?

Of course, scientists do in fact rely on their awareness of qualities. Otherwise, the world would have completely disappeared and they would have nothing to explain. It's just that the discipline of science does not explicitly recognize the sense world in its own terms—the qualitative terms that a truly observation-based science needs to address in order to remain grounded in empirical reality.

A second historical choice, less conscious in its origins, was to proceed by a certain *method of analysis*, assigning ultimate explanatory significance to the furthest products of the analysis. The problem here is that one never stops to consider a thing in its own terms. The fiery tree of autumn resolves into root, branch, and leaf, the leaf into cells, the cells into organelles, the organelles into biochemicals … and so on without end, down to the most remote subatomic entities. "Without end" because there could be no satisfactory end. If understanding

must be given in terms of analysis, and if the analysis were ever to stop at some fundamental, unanalyzable thing, then that thing (upon which all else is erected) must, according to our method, stand as an incomprehensible mystery, no more approachable than divine fiat.

Analysis is an essential direction of movement in all scientific cognition. But if it is not counterbalanced by an opposite movement, then we can never say anything about *what is there*—what is presenting itself as this particular thing of this particular sort. We can speak only of the elements it consists of. But this hardly helps, since we can say nothing about these elements in their own right, but must refer instead to what they consist of. We have no place to stop and say, "Behold *this*." By itself alone, the method is a way of never having to face anything. No wonder, then, that neither the evolutionary theorist nor geneticist ever sees in the organism a creature of which we might stop and ask, "Who are you?"

A one-sided method of analysis, in other words, brings us to a kind of emptiness. And again, we must say: science is not really so empty. The scientist is always recognizing the insistent presence of things in the world—significant wholes—even if the nature of this recognition receives no formal or systematic acknowledgment alongside the analytic cleaving of wholes into parts. After all, you are not likely to set about analyzing a thing if you have not first glimpsed it, at least intuitively, as a significant entity in itself. But your preferred method of analysis does not encourage you to attend to this whole in its own terms. If it did, you might find yourself caught up in something more like a conversation and less like the manipulation of mere parts.

These historical choices—to reject qualities and to proceed by a one-sided method of analysis—confront scientists with a problem that looms so threateningly near and so incomprehensibly large that ignoring it is almost the only option. If, however, we could get up the courage to face the problem squarely, it might suggest to us that we can never shrink the child's rich cognitive inheritance all the way down to an is-world of mere fact. We can approach this endpoint only in modern physics, and we achieve the approach only by depriving our theoretical constructions of their content. The reassuring certainties we enjoy in these constructions are the formal certainties of mathematics. But they alone cannot give us a world or help us make sense of the world we now have. Some of the greatest physicists, in their more child-like, soul-searching moments, have admitted as much. As Einstein once remarked:

> As far as the propositions of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality.

Likewise Sir Arthur Eddington wrote:

> [Our knowledge of physics] is only an empty shell—a form of symbols. It is knowledge of structural form, and not knowledge of content. All through the

> physical world runs that unknown content, which must surely be the stuff of our consciousness.

And Richard Feynman confessed: "we have no knowledge of what energy *is*"—and this same cognitive darkness overshadows the other key terms of our physics, such as *mass*, *force*, *motion*, *time*, and *space*.

You may think it strange to arrive at puzzles of physics in a discussion of biotechnology and its application to children. How have we gotten so far afield? But in an analytic era, with its inevitable fragmentation and intense specialization, recovering a single, unified language for approaching the child means realizing that far afield is not really far afield. The most fateful, scientifically developed "drug" we administer to the child may not be some highly specialized biomolecule bathing his neurons; it may be the scientific worldview saturating his consciousness. One way or another, we conduct a gravely significant conversation with every child. If our language remains that of fact and control, then the language itself will dehumanize the child as much as the biochemical and genetic ministrations that are such natural consequences of the language.

In *Beyond Therapy*, the President's Council on Bioethics has shown how revealing a second, value-centered language can be. But the decisive question remains whether we can bring the two ways of speaking together in a harmony of meaning: Can we, for example, learn to approach the human genome in the spirit of the child's soul-piercing "Why?" or the parent's quizzical "Who are you?" Might it be that real breakthroughs in genetics—breakthroughs of understanding rather than of technique—await our ability to look at the organism qualitatively, in its own meaningful terms? And if we do so, will we not find the whole speaking through every part, so that the child's genome can, when approached in the right spirit, be discovered as part of the child's—*this* child's—revelation of himself? Is not our receptivity to this revelation the prerequisite for entering into a conversation with the child about his "betterment"?

These questions, like those of the child, may seem hopelessly large and impossible, ill-fitted to the science we are comfortable with. But perhaps what makes them discomfiting is our long habit of turning away from them, and our attempt (always unsuccessful) to escape the meaningful and living language adequate for framing them.

If we could transform our dealings with the child into a genuinely two-way conversation, it might prove healing, not only for the child, but for us adults and our science as well. Then the most important thing might not be our perhaps impertinent question: "How can we make you better?" Rather, it might be how the child's innocent simplicity can counterbalance our sophisticated but one-sided adult constructions. If the child does bring a task, part of it may be to help *us* become a little more child-like in facing a value-soaked world—fearless in

addressing the world with impossibly large questions, and fearless as well in listening for impossibly large answers.

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