

'TIS A SIMPLE MATTER

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A hymn misheard for thirty years – Simple Gifts, taken as a cheerful paean to knowing little – turns out to have meant very nearly the opposite, and the correction opens onto the essay's real subject. Not simplicity but clarity; not the willingness to admit error but the architecture that keeps error correctable. A wrong century hidden inside a single word becomes a case of what the essay calls semantic fossils: ordinary usage preserving abandoned accounts of the world – sunrise, genes that “control,” markets that “decide” – and, in its sharpest form, obsolete agency, grammar that keeps an intentional actor after science has removed the mechanism that once required one. From there the argument enlarges: the Scientific Revolution as the invention of disciplined conversation with things that cannot converse; the instruments of the twentieth century multiplying the kinds of reality capable of answering; emergence and complex dynamical systems, where the ant queen merely lays eggs and apparent stability may sit one threshold from collapse; Lenin as an actor inside such a system rather than an engineer standing outside it, his question durable and his certainty not; and epistemic counterfeit, reasoning that borrows the look of inquiry while insulating itself from correction. Clarity, in the end, is an intellectual virtue in Aristotle's sense – a cultivated disposition to remain answerable to the object – and its obligation grows with every increase in human agency. We cannot choose the complexity of the world; we can choose whether our understanding remains capable of being corrected by it.

IFIRST HEARD THE Shaker hymn *Simple Gifts* sometime around 1995, at a May Day celebration in Los Gatos hosted by Anna Rainville, the kindergarten teacher of Brenda's children. I disliked it, although what I disliked was not really the hymn. I heard *simple* in its diminished modern sense: simple-minded; deficient in wit or understanding. “'Tis the gift to be simple” seemed a cheer-

ful little paean to the blessings of not knowing very much. And the language of gift and blessing bothered me. A gift implies a giver; a blessing, someone empowered to bestow it. That asymmetry is built into the grammar before one reaches theology.

I recently learned I was wrong about the hymn. The Shakers were not praising intellectual incapacity, but freedom from vanity, ostentation and unnecessary burden. Their simplicity described a life brought into proper proportion, “the place just right,” rather than a mind content with knowing little. The correction came only three weeks ago, and I was pleased by it. I had lost an error and acquired a better understanding of the hymn, which is usually a favorable exchange. I was improved.

The mistake was not merely that I knew too little about the Shakers. I had translated one of their words into the wrong century. *Simple* once carried meanings such as plain, unmixed, unpretentious and free of needless complication. Applied to a person, it could suggest an absence of guile rather than an absence of intelligence. The hymn was not recommending ignorance. It was praising moral economy.

At the time I heard it, I should perhaps have known to be more careful. At Grinnell College I had taken an eight-credit course called *The Age of the Scientific Revolution*, taught jointly by two professors from the sciences and two from the humanities. We did not read excerpts assembled to support a modern summary. We read Galileo’s *Two New Sciences*, Hobbes’s *Leviathan*, Locke’s *An Essay Concerning Human Understanding*, Newton’s *Opticks*, Molière’s *The Learned Ladies*, Voltaire’s *Candide* and other works in the intellectual company they actually kept. Looking back, I deeply appreciate what those four professors had given us. They were not teaching a chronology of discoveries. They were inducting us into four centuries of disciplined conversation with a world increasingly capable of surprising us. I still have the books in my library.

Somewhere during that year I learned that words possess histories of their own. *Wit* was not merely cleverness, but could mean quickness of apprehension, the ability to perceive relations, likenesses and distinctions. *Understanding* was not a stockpile of information but a faculty whose powers and limits required examination. *Reason*, *judgment*, *nature*, *experiment* and *proof* also occupied conceptual territory that a modern reader could easily flatten. One could recognize every word on the page and still misunderstand the argument because the furniture of thought had been rearranged.

Language is conservative in a more troublesome sense than merely retaining old words. It preserves earlier accounts of the world inside ordinary usage, even after formal understanding has changed. I have come to think of such expressions as semantic fossils. Like geological fossils, they are not mistakes. They preserve earlier environments. The difficulty begins when we mistake them for current field guides rather than evidence of where understanding once lived.

Simple was one such fossil. *Sunrise* preserves an abandoned astronomical frame. We still say *sunrise*, and would understand one another less well if we did not. Genes still "control"; markets "decide"; evolution "selects"; and machines "remember," each expression carrying a little more agency than the underlying mechanism warrants. Such language is often harmless shorthand, but it ceases to be harmless when the metaphor begins doing explanatory work. I see formal knowledge advancing while ordinary grammar continues to offer the previous world.

The language of *Simple Gifts* preserves obsolete agency of another kind. A gift has a giver, a blessing one who bestows it, and grace a source from which it descends. The Shakers had an explicit theological account of that asymmetry. One need not share it to notice that the agency has already been constructed by the language. Human beings are conversational animals, and our most immediate explana-

tions are adapted to other human beings, whose intentions, attention, deception and purposes matter greatly. That competence is so fundamental that we repeatedly extend it beyond its proper domain. Storms become angry, markets nervous, evolution ingenious, history purposeful and machines manipulative. Animism is not merely an error left behind by scientific education. It is a recurrent consequence of applying a powerful social faculty to systems that do not possess the reciprocal structure of social life.

My misunderstanding of the hymn belongs to a longer sequence of corrections. The word had changed; my interpretation had not accounted for the change; later knowledge altered the account. I am thankful when that happens. This is not because being wrong is pleasant, or because every objection deserves assent. Criticism may be careless, interested or simply mistaken. But when someone properly demonstrates that my account does not fit the thing described, my understanding of the natural or human world has improved. I lose some consistency with a previous version of myself and gain a better correspondence with the object. This is virtuous.

Correction is often experienced primarily as a social event. Someone has won an argument, someone has lost one, status has shifted and faces must be saved. The informational content becomes entangled with the identity of the person who supplied it. Yet the person is, in an important sense, the carrier of the correction rather than its source of value. My objective is correspondence with the world, not consistency with the previous self. That is why I have gradually come to prefer *clarity* to simplicity.

Simplicity remains a genuine virtue in many things human beings make. A tool may improve when unnecessary parts are removed. A proof may reveal a relation more directly after needless machinery has been discarded. A sentence may acquire force by saying no more than is required, and the Shakers were right that a life can be burdened by

display, vanity and accumulation. The error begins when simplicity is promoted from a virtue of construction into a presumed property of reality. The natural world is not one of our artifacts and has no obligation to conform to our preference for economy.

The history of science is usually told as a succession of theories. It is equally a history of enlarging the set of entities and objects with which disciplined conversation is possible. But this metaphor requires care. A star, a cell and an ecology do not converse with us. They possess no intention to explain themselves and no shared language in which misunderstanding can be repaired by further discussion. The conversation is radically asymmetrical. We formulate a question, arrange an observation or experiment, and construct methods capable of registering consequences that bear upon it. The burden of interpretation remains with us.

The Scientific Revolution developed methods for asking questions of things that cannot converse. The seventeenth century invented new ways of asking reality questions; the twentieth century multiplied the kinds of realities capable of answering them. The telescope and microscope opened two opposed immensities, outward into the heavens and inward into living and material structure. During the second half of the twentieth century those openings widened almost explosively. Radio telescopes revealed a sky unavailable to vision, electron microscopes disclosed structures below the resolving power of light, and spectroscopy extracted composition and motion from radiation. Satellites made the planet observable as a coupled system, while spacecraft converted distant planets from moving points into places with geology, weather and history. Molecular genetics and sequencing made heredity legible at scales earlier biology could not reach, and digital imaging, computation and increasingly sensitive detectors converted otherwise inaccessible signals into information that could be examined, compared and acted upon.

Science did not teach nature to answer. It taught us how to recognize when an observed consequence bore upon the question we had asked. These instruments did not merely add facts. They created new channels through which existing accounts could be constrained.

I was born in 1954, near the beginning of this extraordinary enlargement, and have watched the reachable domain of knowledge change profoundly during my lifetime. Much of my professional life was spent in one small part of that enterprise, working with imaging, computation, sensors and systems that transformed signals outside ordinary perception into usable representations. The practical lesson was persistent: an image is not the object, a signal is not the cause, and a model is not the system. Each is an instrument whose usefulness depends upon preserving a defensible relation to what produced it. Relationship and conversation, with The World.

The enlargement of observation did not reveal a world becoming progressively simpler. It revealed structure across scales. Biologists spent much of the twentieth century discovering that each supposed fundamental level, once reached, opened unexpectedly onto another beneath it. The gene was expected to simplify heredity. What followed was several decades in which observation and increasingly sophisticated models showed why heredity was less simple than anticipated.

Within genes are exons, introns and regulatory sequences. Genes operate within networks whose behavior depends upon molecular interactions, cellular states and developmental context. Cells exist within tissues, tissues within organs, organs within organisms. Organisms exist within populations, populations within communities, and communities within ecologies shaped by climate, geology, competition, cooperation, predation and evolutionary history. These are not interchangeable descriptions of one mechanism at different magnifications. A sequence matters only within machinery capable of inter-

preting it, while ecological relations help determine which sequences persist.

Emergence is one consequence of such organization. An ant following simple local rules can contribute to a colony-wide search strategy that no individual ant represents or directs. Trails, recruitment and changing concentrations of pheromone allow the colony to explore, reinforce productive routes and abandon poor ones. The queen is not a Hobbesian sovereign ruling by divine right. She neither governs the colony nor assigns its labor. She lays eggs. The apparent intelligence of the colony arises from interactions among many limited agents, while the larger strategy exists only at the level of the system they collectively form.

The same general difficulty appears beyond biology. Orbital systems can remain within a recognizable region of phase space for very long periods before resonance or accumulated perturbation carries them into another family of trajectories. Climate histories likewise contain extended regimes interrupted by comparatively rapid transitions when coupled feedbacks carry the system across a threshold. Stability over ordinary intervals does not imply distance from a boundary in the larger state space. Things change, for reasons. We have begun to glimpse some of them.

Complex dynamical systems may be deterministic without being usefully predictable over long periods. Small differences in initial conditions can be amplified, feedback can change sign, and gradually accumulating causes can produce abrupt transitions. A complete parts list is not always a complete explanation, and a precise governing equation is not necessarily a practical forecast. The important discovery was not merely that nature contains many parts. It was that complexity possesses architecture, memory, thresholds and transitions. And some of the apparent stability is only surface.

Politics is also so. Institutions may appear durable while legitimacy,

administrative capacity, material conditions and elite cohesion change beneath the visible surface. Once a threshold is crossed, developments that had seemed improbable can become rapid and self-reinforcing. Lenin's career belongs to such a history, and I will return to it. The title of his essay *What Is to Be Done?* still asks the necessary question.

A simple account may still be correct, but simplicity cannot be the test. Parsimony is useful when two explanations account equally well for the evidence. It is not permission to discard evidence until equality has been manufactured. Such a model is admirably simple; so is the simplistic world it orders, once everything that contradicts the model has been placed outside it. Merely wrong.

Search for clarity asks a different question: what structure must remain visible for the account to be faithful to the phenomenon under examination? The answer varies with the object. Another person may correct us in speech. A society variously responds through records, institutions, consent, resistance, evasion and unintended consequences. An ecology produces changes in populations, flows and dependencies, often across periods longer than ordinary political attention. The cosmos provides photons, particles, spectra and gravitational effects registered by instruments. These are radically different relationships between observer and observed, and they require different methods because the paths by which error becomes visible to understanding and query differ.

A clear account distinguishes observation from inference, measurement from extrapolation, mechanism from analogy and demonstrated capability from anticipated improvement. It exposes the assumptions on which the conclusion depends and identifies the conditions under which the account must change. It does not promise certainty. It reveals where uncertainty resides and how further evidence could reduce, enlarge or rearrange it. And clarity asks for iteration.

When I began thinking about this essay, I thought it was about simplicity. It was not. It was about *correction*.

Corrigibility is more than a willingness to say that one was wrong. It is an architecture. Inquiry must preserve the paths by which a mismatch between account and consequence can be detected and allowed to propagate back into the model. Experiments preserve calibration, replication and the possibility of failure; arguments expose assumptions and allow inconvenient quantities to constrain their conclusions; institutions preserve records, dissent, comparison and independent observation.

The Scientific Revolution did not merely introduce better instruments. It developed arrangements through which correction could survive the individual investigator: publication, replication, public demonstration, common measures, preserved records and criticism by people who had not participated in the original claim. These were not guarantees against error. They were means by which error could become durable enough to be examined rather than disappearing with the authority of the person who made it.

Clarity is therefore not merely a property of expression. It is a cultivated habit of remaining answerable to the object of inquiry. Aristotle would have recognized the form. Ethics, in his treatment, concerned acquired dispositions of perception, judgment and action rather than obedience to a catalogue of rules. A virtue was not what one occasionally professed, but what one had trained oneself reliably to do. To prefer clarity is ethical in that sense. It is a habit of doing justice to the object, which includes allowing an account to fail when it no longer fits. The practice is usually less elevated than the formulation: check the arithmetic, expose the assumption, preserve the measurement, distinguish what was observed from what was inferred, and remain grateful when the mismatch appears before the consequences become expensive. Keep trying.

Much public discourse imitates the visible forms of disciplined inquiry while declining its corrective obligations. It contains numbers, diagrams, citations, forecasts and technical vocabulary. The conclusion, having arrived before the evidence, is gracious enough to let the numbers, diagrams and citations accompany it in manicured form. This is *epistemic counterfeit*: not error itself, since every serious inquiry contains error, but insulation from correction. Favorable assumptions are treated as forecasts, adverse couplings as peripheral details, missing mechanisms as implementation problems, and failed predictions as evidence that success has merely been delayed. The account appears coherent because every source of contradiction has been placed outside its chosen boundary. The opposite of clarity is not complexity. It is insulation.

The consequences become more serious as knowledge becomes agency. Molecular biology does not merely describe living systems; it permits their alteration. Planetary observation does not merely record climate; it reveals consequences of industrial activity while technology increases the scale of that activity. Computation does not merely expose patterns; it enables systems to classify, predict, recommend and control at social scale. Every increase in human agency enlarges the ethical obligation to remain corrigible. And our powers now tremble at the edge of those in *Forbidden Planet*.

Our collective capacity to decide what should be done has not advanced at anything like the same rate. Lenin's *What Is to Be Done?* remains one of the indispensable political questions. His confidence that it admitted a durable answer has aged considerably less well. The late imperial order did not decline smoothly toward October 1917. War, administrative failure, military collapse, food shortages, factional organization and the disintegration of authority interacted across several levels. The February Revolution altered the political state space, the provisional order proved unstable, and the Bolsheviks exploited

a narrow and rapidly changing set of conditions. The regime that followed was not doctrine applied to passive material. Civil war, economic breakdown, coercion, institutional competition and repeated emergency altered both the available choices and the character of the system itself.

Lenin's failure was not that he asked what must be done. Every increase in agency renews the question. His failure was to treat the answer as capable of becoming final, so that contradictory evidence appeared not as information but as opposition. The program could preserve its certainty only by reducing its corrigibility. The question survives; the certainty has not.

The Shakers were addressing another problem. Their simplicity was an ethic of proportion in ordinary life. They sought to remove what was unnecessary so that what mattered could be more fully attended to. That remains intelligible, and perhaps increasingly valuable. They were not asking nature to become simple. Nor aspiring to a lack of wit and understanding.

Inquiry asks something different. It must remove confusion without removing necessary complexity, abstract without pretending that omitted structure has ceased to exist, and simplify presentation without disabling the means of correction. When I first heard *Simple Gifts*, I mistook simplicity for a blessing of limited understanding bestowed by *theos*. The later correction did not merely rehabilitate a hymn. It clarified a distinction I had not yet made. Simplicity removes what is unnecessary. Clarity preserves what must remain visible. And I was improved.

I remain grateful for the correction. My earlier interpretation was coherent, economical and *wrong*. The better account required a history of language, a more faithful understanding of Shaker practice and a willingness to let a familiar word become differently understood.

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whether our understanding remains capable of being corrected by it.