

What a Piece of Work is Man: Humanism, Religion, and the New Cosmology

Theodore Roszak, California

Though they would be the last to admit it, scientists have the same weakness as the rest of us for folklore, by which I mean beliefs that bend the historical truth in order to teach a lesson. Think how often you've come across the story of the Copernican Revolution in astronomy. Before Copernicus, so we're told, the study of the heavens was dominated by human vanity. Popular science writers especially enjoy blaming the geocentric worldview on benighted religious authorities who believed human beings were so important that God placed them at the centre of the universe. Only scientists were courageous and clear-eyed enough to overcome such cosmic egocentrism.

For example, in a recent book *Full House*, Stephen Jay Gould asserts that "We once thought that we lived on the central body of a limited universe until Copernicus, Galileo, and Newton identified the Earth as a tiny satellite to a marginal star." In Gould's eyes, this was the first in a long line of proud scientific achievements, the goal of which was the "successive dethronement of human arrogance from one pillar after another of our cosmic assurance." Similarly, in *The Demon-Haunted World*, the last book he published before his death, Carl Sagan takes up the same cliché. Recounting all the wishfully foolish ideas that science has debunked, he places at the head of the list the notion "that there is such a place as the centre of the universe and that the Earth sits in that exalted spot."

No doubt both Gould and Sagan would be shocked to learn that the story they delight so much in telling is pure folklore. If they could find anyone whom ever believed that the centre of the universe was a privileged and exalted location, they would have found the rare exception. But as with all folklore, the truth is not what matters most. More important is the ethical subtext that clings to the tale, in this case the notion that pre-modern astronomy was dominated by pride. Scientists want desperately to believe they have more to contribute to our lives than a collection of facts and theories about the natural world; they want to offer us moral guidance as well as clear thinking. They believe that, by dislodging the Earth from the centre of the universe, science at one stroke thwarted human self-aggrandisement and called upon mankind to surrender its childish consolations. Like Gould, many scientists would describe themselves as "tough-minded intellectuals," brave souls who can do without the pretensions of cosmic importance that our weak-minded and infantile ancestors needed.

The bravado that attaches to the heliocentric worldview is so precious to modern science that one feels churlish to observe not only that it is wrong, but that it is exactly the reverse of the truth. Where Gould and Sagan find arrogance, they should find meekness if not grovelling self-abnegation; and where they credit science with a proper humility, they might do better to detect a certain smug presumption on their own part. Their familiar reading of the Copernican Revolution not only distorts religion, but science as well. In brief, it's bad folklore and out to be discarded.

Even a cursory survey of intellectual history should be enough to remind us that the geocentric cosmos is neither Christian nor Biblical in origin. It was inherited by Western Christendom from Greek astronomers who were the best scientists of their time. The Greeks, of course, did not see the cosmos as "God's universe;" nor did they regard centrality as a "privileged position." In the Ptolemaic system, geocentrism was a matter of naive empiricism. The Earth seemed motionless; the heavenly spheres appeared to move around

it. Heliocentrism, on the other hand, seemed contrary to observation. After all, if the Earth went around the sun, then one should be able to detect parallax -- the apparent movement of any sighted star against the distant heavens. Relying on the naked eye, no one could, not even Copernicus.

Since the goal of ancient astronomy was, like that of subatomic physics today, to "save the appearances," the Greeks sought to find a simple and consistent way to account for the observable data, even if one could not always explain why things were as they seemed to be. In this respect, the Ptolemaic universe not only appealed to everyday experience, but it was practical. It served as the basis for navigation until modern times.

Quite as important as achieving overall empirical consistency, Ptolemaic astronomy was created in obedience to the principles of Aristotelian physics. In Greek physics, the Earth functioned as the gravitational core of the universe. The centre was the bottom of Ptolemy's cosmos; that is why heavy things fell "down." Objects containing Earth moved toward the place where they "belonged," and indeed they accelerated as they fell because they were jubilantly approaching their proper sphere. This, again, had nothing to do with arrogance. Rather it derived from the qualitative bias of Aristotelian physics. It was assumed that, in a perfect Aristotelian universe, the core of the cosmos would be a solid ball of earthen matter, qualitatively the most ponderous of the four classical elements. Next would come a sphere of pure water, then a sphere of pure air, finally a sphere of pure fire, the latter two elements possessing the buoyant quality of "levity" that one observes in their tendency to lift toward the skies. But ours was clearly not a perfect universe; so in the world we inhabit, the qualities were seen to be intermingled chaotically. Hence, our lives were beset by restless movement, change, decay, and death. All this stood in stark contrast to the superlunary universe, where the fifth element, quintessence, reigned. Quintessence, from which the heavenly bodies were fashioned, was special and totally unearthly; it was weightless, imperishable, and moved perpetually in perfect circles.

These were the teachings of the most rational and empirical scientific thinking of the ancient world. It was a self-consistent and logical system that had nothing to do with privilege or vanity. Greek cosmology stayed admirably free of moral interpretation for a great deal longer than, say, evolutionary biology did in modern times at the hands of Social Darwinists. There were, however, certain ascetic schools of thought in the Greek world that derived a moral lesson from this world-picture. For Pythagorean and Platonic philosophers, heavy matter was at the bottom of the universe metaphorically as well as physically. The body, as a material object, was made from the "lowest" of all substances: hence it was impermanent, perishable, mortal. Moral perfection and epistemological clarity soared high above in a changeless, spiritual realm far beyond the flesh.

Moral teachings like this were not the basis of ancient science; they were a metaphysical overlay that was quite dispensable. But once Christianity entered the picture, natural philosophy took a back seat to theology. Christians, especially of an Augustinian persuasion, readily seized upon these hierarchical distinctions to support their moral code. They eagerly made much of the fact that the Earth was at the "bottom" of the universe, the most distant point from God. In contrast, heaven and the seven orders of angels were at the "top." In their view the lowly Earth was the only fit habitat for human beings who had "fallen," or bottomed-out both morally and physically. Far from being in a privileged position, the human race lived in the cesspool of creation where all the gross, decaying, flawed things in the universe flowed together. That is what it meant to be at the "centre." Centrality could be

pressed to an even deeper level of degradation. For what, after all, did Christians believe lay at the core of the Earth, deep in its fiery volcanic interior? Hell, filled with all the damned souls that had yielded to the temptations of the flesh. Dante went one step farther. In his *Divine Comedy*, one finds Hell at the centre of the universe, and at the centre of Hell one finds Satan, frozen into the final icy circle of damnation.

This darkly misanthropic view was carried forward into the Reformation. For example, the seventeenth century Christian divine John Wilkens believed that "bodies must bee as farre distant in place as in Nobilitie. ... The Earth is a more ignoble substance than the other Planets, consisting of a more base and vile matter." Calvin was even more emphatic. "If God had formed us of the stuff of the sun or the stars, or if he had created any other celestial matter out of which man could have been made, then we might have said that our beginning was honourable. ... But ... we are all made of mud, and this mud is not just on the hem of our gown, or on the sole of our boots, or in our shoes. We are full of it, we are nothing but mud and filth both inside and outside." It would take the new science to teach us that even mud, slime, and dirt are wondrous in their complexity and fertility.

We are creatures of "vile matter." That is the true, historical meaning of being at the centre of the Ptolemaic universe. Not pride, but guilt. Not privilege, but radical unworthiness. Centrality meant fallenness. For Christian theologians, that cosmological connection served to excoriate human presumption. By the time modern science made its appearance, the war upon human vanity was old business. The new development on the scene, with which science allied itself, was Renaissance humanism. Proudly outspoken humanists dared to court ecclesiastical displeasure by reversing this dark calumny upon the Earth. Pico della Mirandola, arguing for the "dignity of man," was striking a bravely innovative note in western culture. Shakespeare, caught between two worldviews, could turn either into great poetry. Here he is invoking the dour, old cosmology that taught us our lowly place in nature, far below the magnificence of the starry heavens:

*Look how the floor of heaven
Is thick inlaid with patinas of bright gold;
Theres not the smallest orb which thou beholdst
But in his motion like an angel sings,
Still quiring to the young-eyed cherubims.
Such harmony is in immortal souls;
But whilst this muddy vesture of decay
Doth grossly close it in, we cannot hear it.*

But then here he is echoing the rising humanistic spirit of his day:

What a piece of work is man, how noble in reason, how infinite in faculty . . . In action how like an angel! In apprehension how like a god!

The bard's Puritan contemporaries would have rushed to agree with the first passage but they would have cried "blasphemy!" at the impertinence of the second.

Ironically, then, scientists like Gould and Sagan, in their effort to lower the status of humanity, are unwittingly allying themselves with the misanthropy of premodern theology. But if they wish to score points against their hypothetical religious opposition, they would do better to move in exactly the opposite direction. It is humanistic modern science that has

shown us the hidden glories within "base and vile matter" and the astonishing capacity of the human mind, even within its "muddy vesture of decay," to understand nature.

We may also have reached the point where we can dispense with another, closely related scientific cliché, namely that the size of the Earth is a measure of its insignificance. How many times have we heard it said that we live on an infinitesimal planet orbiting around a third rate star on the edge of a minor galaxy adrift in the infinite void? The Earth may be a mere speck when it comes to size, but what does that have to do with value? If science has taught us anything, it is that physical stature implies nothing regarding significance. The tiniest things in nature, down to the level of the quarks, reveal remarkable complexities worthy of a lifetime's study.

By unjudgingly taking all things great and small into its purview, the science of our day has discovered an extraordinary fact about the "vast impersonal cosmos." We now know that in an expanding or inflating universe, time, size, temperature, and atomic/molecular complexity are intimately related. All these evolve through a unique history. It is only in a universe of a certain age and size that the heavy elements essential to life could ever have come into existence. In a "smaller" universe (meaning in this universe at any time before the most recent several billion years) nucleosynthesis could not yet have taken place, nor would the requisite cooling have occurred. Far from being humiliatingly dwarfed by the size of the cosmos, life on Earth has emerged from a process of stellar evolution that required this much time and this much expansion. At least with respect to the appearance of an inhabited planet, the universe is exactly the "right" size. As John Gribbin and Martin Rees put it, "the conditions in our universe really do seem to be uniquely suitable for life forms like ourselves." Or, to put it more flippantly, but no less accurately: "hydrogen is a light, odourless gas, which, given enough time, turns into people." Meaning that hydrogen could only weave itself into life in a universe just this big, no smaller.

Scientists continue to struggle with the baffling interplay of chance and coincidence in nature, especially when coincidences threaten to add up to the appearance of design. For example, in 1992 the COBE satellite sent back messages that have been called the most important finding in the history of science: "the Holy Grail" of cosmology, as Michael Turner of the University of Chicago termed it. Another member of the COBE team, George Smoot, remarked, "If you're religious, it's like seeing God." COBE was launched to make minute measurements of the cosmic background radiation that is the vibrant relic of the Big Bang. Until COBE, that radiation seemed to be absolutely uniform in all directions, which left cosmologists unable to account for the galactic structure of the cosmos. Where did the galaxies come from in a universe that was formlessly smooth in all directions? COBE discovered that there are irregularities in the background radiation, which the project directors attributed to early cosmic turbulence. From that turbulence came "topological defects" in space; and from defects "clumps" formed that might have produced the gravitational clustering that transformed primordial matter into galaxies.

"Lumps," "clumps," "defects," "turbulence." These are the words most often used to summarise the results of COBE: curiously lack-lustre terms to describe the "Holy Grail of cosmology." They are also highly misleading when one realises that not just any old "irregularity" will do to build a galaxy. It must be the "right kind" of irregularity. No doubt when the process is fully understood, it will be added to the lengthening list of cosmic coincidences that just happen to make the universe a fit home for living, thinking beings.

Words like "lumps" and "clumps" are left over from the agnostic science of the late nineteenth century; they are casually dismissive phrases that are meant to avoid the implication of intelligent structure. But one can use very different images to describe what COBE uncovered.

Clumps have also been depicted as gravitational "seeds" from which galaxies sprout like flowers of fire. In any case, when the COBE findings were reported to the world, members of the research team were willing to call their discovery "the handwriting of God," as if their astonishing discovery required some grander rhetoric than science itself could provide.

When Stuart Kauffman titles his book *At Home in the Universe*, or when Hubert Reeves tells us we are the "children of this universe," they are doing no more than drawing metaphorically upon what the best cosmological thought of our time tells us about the place of life in the nature of things. We may no longer be at the centre of the universe, but we do inhabit the frontier of unfolding cosmic time. And that makes us, at the very least, participant observers in a universe that would seem to have gone to remarkable pains to make life possible. Reeves, who is among the most moving of the new cosmologers, puts it this way:

There was this old attitude that . . . people do not belong here, that we are an impossible chance, . . . that we're foreign to this universe. I think what cosmology shows is that this is not true. We are a product of the evolution of the universe. And we are in the same history, in the same evolution as the stars and the frogs. We are all part of the same universe and all part of the evolution, which has led to different objects, aspects, beings and in this sense we belong to this universe . . . we are made out of stardust.

Stardust. What would Calvin say had he lived to know that we are indeed created from "the stuff of the sun or the stars"? Would that brighten his dark vision of humanity?

Nothing has greater religious significance in modern science than the service it has done in redeeming nature from the inferior and fallen status to which mainstream religions of the past so often condemned it. The new cosmology and the sciences of complexity have returned us to that humanistically relevant universe with which modern science began its proud history. There may be hard-headed types in the sciences who still feel compelled to debunk and belittle, but they are beginning to look rather like the adversaries Galileo challenged in his famous debate on the new world system. For a variety of reasons ethical, theological, literary, and metaphysical Galileo's foes simply could not let go of the familiar old Ptolemaic cosmos. So too in our time, scientists who have taken their stand in life on what Bertrand Russell once called "the firm foundation of unyielding despair" will no doubt do the same, continuing to speak of our living planet as lost in the stars, adrift in the void, a result of mere chance, a cosmic absurdity, etc., etc.

But the universe no longer seems to be on their side.

Prof. Theodore Roszak is the author of several works that explore the relationship of science and religion, among them *Where The Wasteland Ends*, *The Voice of the Earth*, *The Memoirs of Elizabeth Frankenstein*, *and most recently* *The Gendered Atom: Reflections on the Sexual Psychology of Science*. *He teaches at California State University, Hayward.*