First Great Space Program: Skyscrapers of Green

By Howard Bloom

Abstract

We are told to live in harmony with nature, to learn her rules and to respect her boundaries. But that is not how nature works. Evolution breaks nature's existing rules and establishes new ones. For example, the first land plants had the audacity to break nature's most basic law—gravity. Yes, the first land plants had the gumption to open a path that would lead to the skies.

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If you have allergies and want to blame your sneezes on someone or something, try sex. Some 520 million years ago, giant societies of single-celled organisms dared to harness nature's wrath. These cheeky micro-beasts had the audacity to live on seacoasts and in ponds. Formally, these risk-takers are called cyanobacteria. We know them more colloquially as blue-green algae and pond scum.[1] What was the risk the pond scum faced? Periodically, their coasts and ponds dried up, and these wee beasties could not live without water.

But some of the pond scum did not take this natural disaster lying down. 1.2 billion years ago, they harvested Armageddon. They learned to adapt to dryness.[2] Then these widely scattered, arrogant scabs of green dared use their new skills to do something suicidal. They embarked on the first in a series of nature's great space programs. They set forth on a crusade to populate a toxic emptiness. They defied the natural order and left the waters behind. They turned their backs on the very womb of life—the sea. They became pioneers of a hostile, stony, doomscape we call "land."

About 750 million years later, these catastrophe tamers, these pioneering land developers evolved multi-cellular descendants, plants. The first plants were bryophytes.[3] They were mosses and liverworts. But when it came to space programs, bringing a thin and tentative coat of green to an impossible wasteland of stone was not enough. The first mosses and liverworts took things a step farther. They brazenly defied one of nature's most basic laws: gravity. They lifted tiny spore shafts to the sky and formed a green shag a breathtaking inch or two high.

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[1] Elizabeth Pennisi, "Land Plants Arose Earlier Than Thought—And May Have Had a Bigger Impact on the Evolution of Animals," https://doi.org/10.1126/science.aat3642.

[2] Philip C. J. Donoghue and M. Paul Smit, eds., *Telling the Evolutionary Time: Molecular Clocks and the Fossil Record* (Boca Raton, FL: CRC Press, 2004), 124.

[3] Patricia G. Gensel and Dianne Edwards, eds., *Plants Invade the Land: Evolutionary and Environmental Perspectives* (New York: Columbia University Press, 2001), 3.

An inch or two does not sound like much, does it? But that is the human equivalent of erecting a 28-mile-high building. They erected these skyscrapers all over the place. Yes, nature loves those who oppose her most. The mosses and liverworts were tiny swatches on a vast and murderous rock face: tiny huddles of green trying to stay intact and thrive on a landscape scraped and hammered by disaster. To flourish, they had to multiply. But how? By using three of nature's favorite sins: materialism, consumerism, and waste. First the mosses and liverworts upgraded an old technique that their ancestors in the sea,[4] bacteria, had invented—the spore. In sporulation—in spore making—you accomplish an impossibility. You pack your genome into a tiny baseball-or-egg-shaped bundle. A bundle so small that it's invisible to the human eye. A bundle a mere 24,500th of an inch. Then you shoot, lift, or drop your package of genes into a water current or a breeze and take your chances. You litter. You spread outrageous amounts of waste. And you do it very deliberately. Why?

You are hoping for something that will prove crucial to life—transportation. You are hoping to hitchhike. And you are entering a lottery. The more tickets you buy, the more your odds of winning. So, you gamble that two out of a billion spores will land in a corner rich in something to eat. You play the odds. And to do it, you make far more spores than can ever find a home.

You are materialistic, consumerist, and wasteful. Yes, you, a single individual, crank out spores by the trillions.[5] You use those spores to spread out like fingertips, feeling out opportunities. But to pull this off, you throw trillions of spores away. And those spores will someday become part of the invisible dust that makes allergy sufferers sneeze. So, nature used materialism, consumerism, and waste to explore. To feel out her potential. To find unlikely possibilities. But simply playing the odds wasn't enough. You early land plants reached out for something more. Something more than mere survival. Evolution drove you to innovate. You invented sex. Sex is one of the biggest mysteries staring us in the face. A mystery current science may understand far less than it thinks. A mystery that may challenge our very notions of the way this cosmos operates. Why?

Remember how Pierre Louis de Maupertuis agreed with Aristotle that nature always takes the shortest path between two points? But sex proves that this is radically untrue. Sex proves that nature sometimes invents not just new paths, but whole new highway systems, and those new highways can be bizarrely snarled and tangled. So snarled and

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[4] Jiasong Fang, Chiaki Kato, Gabriella M. Runko, Yuichi Nogi, Tomoyuki Hori, Jiangtao Li, Yuki Morono, and Fumio Inagaki, "Predominance of Viable Spore-Forming Piezophilic Bacteria in High-Pressure Enrichment Cultures from ~1.5 to 2.4 km—Deep Coal-Bearing Sediments below the Ocean Floor," *Frontiers in Microbiology* 8 (2017): 137. https://doi.org/10.3389/fmicb.2017.00137.

[5] George Wong, "Spore Dispersal in Fungi," www.botany.hawaii.edu/faculty/wong/BOT135/Lect05_a.htm. In ferns, "spores are produced continually and are unlimited in number": L. G. Hickok and T. R. Warne, "Laboratory Investigations with C-Fern™ (Ceratopteris Richardii)," in *Tested Studies for Laboratory Teaching*, Vol. 19, ed. S. J. Karcher (Irvine, CA: Association Biology for Laboratory Education, 1998), 146. www.ableweb.org/biologylabs/wp-content/uploads/volumes/vol-19/10-hickok.pdf.

tangled that even a hedge fund accountant could not keep them straight. If this were a thrifty cosmos, how could such flamboyant tangles possibly come to be?

What is more, sex may force us to throw away Charles Darwin's idea that evolution is driven by a struggle for survival.[6] As we will soon see, sex is not just a survival device. It is a macromolecular dazzle. It is an intricate ballet that exceeds your wildest dreams. The existence of sex implies that this cosmos is not in a struggle merely to hang in there. This cosmos is in a competition for extravagance. A mad rush for the power to exult, to rejoice, and to do a victory dance.

Remember, the dust of space has done the very opposite of what Lord Kelvin's heat death predicted. Instead of falling apart in a random whizzle, instead of tumbling into a formless fizzle of entropy, space dust comes together in galaxies. What is the swirl of a galaxy but a victory dance over our very heads? So is sex. To invent sex, you, a land plant 420,000 years ago, did not take the simplest path. You did not simply split in two and make an identical copy of yourself. And you did not make kids by packing spores with the simplest, thriftiest thing, a complete packet of genes. You did not just pack a spore with an everything-you-need-to-start-your-own-plant kit. A deed that in itself would have been mind-exploding. No, you did not take the shortest path. You did not bank on the tried and true. You did not simply keep the chains of genes you inherited from your ancestors, then pass them down to your kids the way that you'd gotten them.

In fact, you did not "reproduce." We speak of sex as reproduction. But, to repeat, you did not reproduce. You did not make carbon copies of yourself. Instead, you performed some serious genetic engineering: risky and expensive genetic tinkering. You worked to create something the cosmos had never seen before. Something utterly unique. Something totally untested and untried. Something that could help a curious cosmos scope out her next impossibilities. You generated one-of-a-kind offspring. You created extraordinarily different individuals. To make those one-of-a-kinds, you reshuffled your genes. In fact, you reshuffled your entire genome.

Which means that the greatest example of flamboyance in this universe, the greatest example of nature's urge to splurge, is right here, teasing the back of your mind as you read this sentence, and teasing the back of my mind as I write it.[7] Yes, the cosmos' greatest display of materialism, consumerism, waste, and vain display is sex.

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[6] "Struggle for existence," "survival of favoured individuals and races" (278), "survival of the fittest" (128) "natural selection," (279): Charles Darwin, *The Origin of Species by Means of Natural Selection: or, the Preservation of Favored Races in the Struggle for Life*, Vol. 2 (New York: Appleton, 1897).

[7] Pamela Paul, "When Thoughts Turn to Sex, or Not," *New York Times*, December 9, 2011, www.nytimes.com/2011/12/11/fashion/sex-on-the-brain-studied.html.

Photos by Jondi Whitis (left) and Radic Smykowski (right)

About the Author: Howard K. Bloom is author of: The Lucifer Principle: A Scientific Expedition into the Forces of History ("mesmerizing": The Washington Post), Global Brain: The Evolution of Mass Mind From The Big Bang to the 21st Century ("reassuring and sobering": The New Yorker), The Genius of the Beast: A Radical Re-Vision of Capitalism ("Impressive, stimulating, and tremendously enjoyable": James Fallows, The Atlantic), and The God Problem: How A Godless Cosmos Creates ("Bloom's argument will rock your world": Barbara Ehrenreich).

Howard Bloom has been called the Einstein, Newton, Darwin, and Freud of the 21st century by Britain's Channel 4 TV. His work has been published in the *Washington Post*, the *Wall Street Journal*, *Wired*, *Psychology Today*, and *Scientific American*. He heads the Space Development Steering Committee and a space advocacy group that includes former governor of New York State David Paterson, Newt Gingrich, former head of the House Science Committee Robert Walker, and retired three-star general Steve Kwast. One of Bloom's books, *Global Brain*, was the subject of a symposium by the office of the Secretary of Defense, with representatives from the State Department, DARPA, the Energy Department, IBM, and MIT.

Bloom's base was in microbiology and theoretical physics. But in the 1970s and 1980s, he went on a field expedition into a territory he knew nothing about, the dark underbelly where new myths and movements are made, popular culture. He founded and ran the biggest PR firm in the music business, helping to build or sustain the careers of Michael Jackson, Prince, Bob Marley, Bette Midler, Billy Joel, Paul Simon, David Byrne, Peter Gabriel, AC/DC, Queen, Kiss, Aerosmith, Joan Jett, Billy Idol, ZZ Top, Chaka Khan, Grandmaster Flash and the Furious Five, and Run DMC.

He went back to his science full time in 1988. Since then, he has written articles for peer-reviewed journals or given lectures at scholarly conferences in twelve different scientific fields, from quantum physics and cosmology to evolutionary biology, neuroscience, governance, information science, and astronautics. Says Joseph Chilton Pierce, the author of *Evolution's End* and *The Crack in the Cosmic Egg*, "I have finished Howard Bloom's books, *The Lucifer Principle* and *Global Brain*, in that order, and am seriously awed, near overwhelmed by the magnitude of what he has done. I never expected to see, in any form, from any sector, such an accomplishment. I doubt there is a stronger intellect than Bloom's on the planet."

Editors' Notes: Howard Bloom once again lends his particular brand of iconoclastic genius to the pages of this journal. Fittingly, this paper explores the ways in which evolution, and sexual reproduction in particular, excel at breaking rules—and (literally) rising above adversity. His second person narrative invites the reader to be a part of this process of innovation, and it is up to each of us, as scholars and as human beings, to respond by applying these principles to our lives. ***Gordon Arthur and Mark Wagner.***