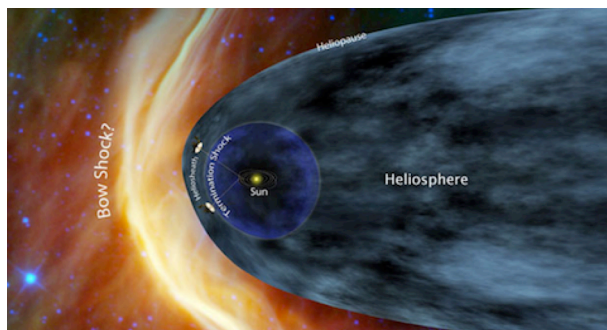


SCIENCE AND THE ELEPHANT'S CHILD:

Part II—Fly Me to The Moon and Let Me Play among the Stars

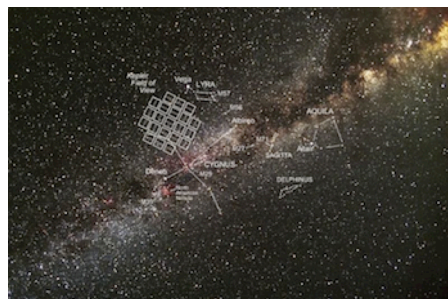


In August 2012, Voyager 1 entered interstellar space, the region between stars, filled with material ejected by the death of nearby stars millions of years ago. Voyager 2, in the "heliosheath" -- the outermost layer of the heliosphere where solar wind slows from the pressure of interstellar medium--will follow. (Courtesy NASA/JPL-Caltech)

Did these musings all begin with Galileo's Dialogue Concerning the Two Chief World Systems? Or was it background research for a novel beginning in medieval Spain in the golden age of Al Andalus, when Christian, Muslim, and Jewish scholars all collaborated in their investigations of science, poetry, music and the arts? Maybe it began with George Sarton's The History of Science, which I found in a favorite second hand bookstore in New York's Greenwich

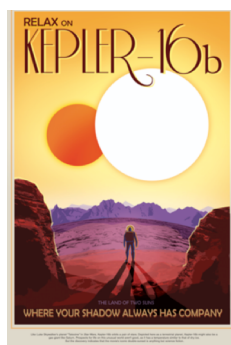
Village a number of [years](#) ago. In five, big volumes—two as fat as my Compact Dictionary of the English Language—Sarton only managed to cover up to the late 14th century.

We have been curious for a very long time; and our elephant's child curiosity still persists. Just this January the Kepler spacecraft discovered three new earth-like planets orbiting a nearby star, EPIC-201; and, this July, it found a promising Terra-like planet, [KEPLER-452](#). January's discoveries were the prequel: EPIC-201's proximity meant that star (sun) was "bright enough for astronomers to study the planets' atmospheres to determine whether they are like Earth's atmosphere and possibly conducive to life."¹ Hot dawg! We've just flown by Pluto and made all sorts of delicious discoveries; and scientists are now hoping to continue research to send human beings on a daunting 18-month long voyage to Mars. How is that that many people could care less?



Kepler Spacecraft's fixed view points to the constellations Cygnus and Lyra. (NASA photo, <http://kepler.nasa.gov>)

¹ U. of AZs *Daily Galaxy*, an astronomy news service writes. "The original Kepler mission found thousands of small planets...most...too faint and far away to assess...and thus determine whether they were high-density, rocky planets like Earth or puffy, low-density planets like Uranus and Neptune. Because the star EPIC-201 is nearby, these mass measurements are possible. The host star, an M-dwarf, is less intrinsically bright than the sun, which means that its planets can reside close to the host-star and still enjoy lukewarm temperatures. According to Howard, the system most like that of EPIC-201 is Kepler-138, an M-dwarf star with three planets of similar size, though none are in the habitable zone."



Kepler-16b orbits a pair of stars. Depicted here as a terrestrial planet, it might be uninhabitable, but the discovery indicates that in *Star Wars*, Tatoine's double-sunset is anything but science fiction. (Courtesy NASA/JPL-Caltech)

Which brings me to C.P. Snow's, *Two Cultures*, published over fifty years ago, in 1959 (Cambridge University's Canto Editions put out a "reissue edition" in 2012.) Even in Galileo's, certainly in ancient, times, the line between science and what we now call the "humanities" or the arts, was not firm; science, in fact, was considered a branch of philosophy. In the 20th century Snow complained that writers and people in the now endangered humanities have no idea

what the Second Law of Thermodynamics is; and scientists, he said, don't know Shakespeare—in fact, they don't read literature at all. Today, one can still hear echoes of Snow and his thesis. True, in our 21st century, many writers still know nothing of the Second Law of Thermodynamics.² On the science side, however, Nobel laureate and molecular biologist, Max Perutz, disproves Snow's naive comment that scientists are all ignorant of the arts or of Shakespeare: noting the

spontaneous flowering of 15th century Florence and its "Leonardo, Michelangelo, Raphael, Ghiberti, Brunelleschi, Alberti, and other great artists," and of Paris' unplanned flourishing of Impressionists, Perutz asserts the absolute necessity of creative thinking. But, he says, bear in mind that

Creativity in science, as in the arts, cannot be organized. It arises spontaneously from individual talent. Well-run laboratories can foster it, but hierarchical organization, inflexible, bureaucratic rules, and mounds of futile paperwork can kill it. Discoveries cannot be planned; they pop up, like Puck, in unexpected corners.³

As Perutz chafed about regimenting scientific creativity, and Snow called for more scientists in the applied sciences to make the world a better place, an ecological disaster looms. Powerful people might, but won't, enlist the aid of those who could help avert it, including those at Institutes such as Perutz' Laboratory of Molecular Biology in Cambridge, or the Janelia Research Campus outside Washington, D.C.; and both science and art is being sold to the highest bidder. Profit alone cannot sustain us.

De eloquentia vulgare

This subheading is the title of an unfinished book by Dante Alighieri, written in Latin somewhere between 1302 and 1305; in it Dante announced that he was going to compose

² It's a lulu for those of us who are not scientists, but it is worth reviewing. I suggest starting with the First Law of Thermodynamics—i.e. the Law of Conservation of Energy—then proceeding to the Second. It's fascinating stuff!

³ Preface to "I Wish I'd Made You Angry Earlier", qtd. on <http://www.janelia.org/research-labs/overview-philosophy>.

his literary work in the language of the people, in his case Italian, rather than in Latin, the language of church and academy. Galileo, in the 17th century, wrote scientific *non-fiction* in the vernacular—Italian—precisely to make it available to any of his literate peers, not just the Latin-using church and university crowd. Au contraire, Johannes Kepler, in 1608, wrote *Somnium (The Dream)*, considered the first novel of science fiction and the first serious treatise on lunar astronomy. My old mentor, Kamau Brathwaite, however, used Dante's *De Eloquentia* to locate the choice of that most musical of Englishes, ordinary folks' Caribbean English, in both Caribbean poetry and fiction.

What I find mystifying, is that while modern and contemporary writers now embrace the "language of the people," and, though interpreting the "vulgar" (above) as synonymous with "vulgar" is to match the Latin with a false cognate, far too little speculative writing is Dante-esque or artful; and much, alas, is vulgar. A short while ago, in fact, I encountered the term, "literary speculative fiction." Egad. Of course, be literate: why ghettoize splendid writing? I've always wanted speculative fiction, one strategy for employing the wonder that scientific knowledge puts before us, to be better written. Is not the subject matter worthy of craft? Take the work of science fiction "grand master," as he was often called, Isaac Asimov; his books are scientifically plausible, yes, and appeal to those of us who wonder about our future. He was a genuine intelligence, a "hard science fiction" writer—i.e., like Kepler's, his work pays attention to scientifically demonstrable or plausible fact. For his work and influence, Asimov even had a Martian crater named after him. Yet—and I dread saying this—at best his writing is utilitarian. At worst, it resonates with tones of pulp fiction, which he poured over when growing up:

His name was Gaal Dornick and he was just a country boy who had never seen Trantor before. That is, not in real life. He *had* seen it many times on the hyper-video....he was not cut off from civilization, you see. At that time, no place in the Galaxy was. (beginning of *Foundation Trilogy 1*)⁴

Asimov was no Luddite, though; he at least wrote thoughtfully about intelligence, giving us his famous Three Laws of Robotics to be hardwired into a robot's mechanism (presumably if the robot exceeded those limits, it would be destroyed.) He asked prescient questions that have arisen once more in contemporary robotics and artificial intelligence (A.I.) discussions; and he cogently speculated about what might be humanity's responsibility for such creations. If any area of science has followed suit, it is A.I.

⁴ *Foundation Trilogy*. (New York, Everyman's Library,) 2010. When I read this, all I hear is the theme song for that oldest of old chestnuts, Liberty Valence.

Serious and brilliant researchers, far from envisioning tyrannical robots gone amok, are acutely aware of the intricacy of the human brain as well as the impossibility of its mechanical replication: in its curiosity, its intuition, its ability to learn new things and *to learn through experience*, its integration of thought and body, which suggests that our intelligence is firmly linked to our physical being—with all that our brain does appear to be unique. Key is our creativity, including the arts. Here we face even more questions: if we do not generate and employ our creativity, what happens to our embodied brain? After the innate burst of creativity that enables learning in a child, does this learning stop? If we limit our experiences, how and when does that stunt the brain? What if we can't combine the old and the new, the observed and intuited, in the different ways which, so far, a manufactured creature cannot? As one researcher commented: in human beings, *real creativity generates more thinking*. If we think less, will that work in reverse?

Consider the philosophical Polish writer, Stanislaw Lem's, [*Solaris*](#)⁵, an early (1961) speculative classic about a planet as solitary intelligence, planet as brain. Those inhabiting a scientific space station hovering over the planet's living ocean officially hope to make contact with this alien entity; but there is a problem. Snow, one of the station occupants, tells Kelvin, a recent arrival and the story's narrator:

We go in quest of a planet, of a civilization superior to our own but developed on the basis of a prototype of our primeval past. At the same time, there is something inside us which we don't like to face up to, from which we try to protect ourselves but which nevertheless remains, since we don't leave Earth in a state of primal innocence.

In our terms, intelligence means *thinking like us*, though that is not what we say we are after. In the novel, the planet appears to be trying to contact the "us" of the story; and it does it in bizarre ways, filching the psyches of the astronauts for their nemeses' doubles, for agents of their respective downfalls, or for personae of unresolved conflicts, then reproducing them. It also throws up vast structures "tree-mountains, extensors, fungoids, mimoids, symmetriads, assymatriads," and so on, all intricate, beautiful, incomprehensible, but faintly reminiscent of how we say children learn—through play. In a sense, *Solaris*, the planet, experiments with metaphor, though not necessarily ones human beings understand. Re-reading *Solaris* after many years, I wish that it were on the required reading list for those who seek life outside our solar system: not because one

⁵ *Solaris*, trans. Joanna Kilmarin and Steve Cox. (San Diego, New York, London: Harvest Books) 1970.

might encounter planet-as-brain but because of the possibility of extraterrestrial life being, to put it mildly, difficult for the Terran explorer to comprehend. For, as Lem cautions us,

Man has gone out to explore other worlds and other civilizations without having explored his own labyrinth of dark passages and secret chambers, and without finding what lies behind doorways that he himself has sealed.

In the end, Kelvin goes out to meet Solaris on the assumption that it is not the enemy, but that it is attempting its own version of contact. Like all good stories, there is no Disneyfied ending. We don't find out exactly what happens next; we are merely left to mull the dilemma of intelligence and what it means to be human.

Last February, Robert Archambeau, in writing about a conference on [the New Gnostic Poetry](#), referred to Philip K. Dick, as "the most relentlessly gnostic writer in American literature." I told this to a close friend who, instead, called Dick one of the most overrated writers in America. Archambeau's remark, however, sent me scurrying to Dick's *The Divine Invasion*⁶, acquired years ago from a used bookstore. Am I missing something? The Gnostic god, transmigration of souls, etc., based on some kind of wobbly visions he once had—yes, but his language? from mediocre to godawful. His register bounces around like a ping-pong ball. He barrages us with awkward names for future touchstones—"Cry-Labs," where dead people are kept cryogenically (boo-hoo?), "Sol-System" for our solar system, "foodman" for the fellow who brings one character his synthetic groceries (why bother?), "cuppee of Kaff" for a cup of synthetic coffee, "VU meters," "talktapes" (justified by a reference to *Finnegan's Wake* just, to show, I suspect, that he isn't completely illiterate,) dual rulers ("like Sparta") in a state borne of the combined Communist Party and Catholic Church.⁷ Incredibly, *that* final trope is not meant to be funny; rather, it is Dick's naive and sloppy populism. Was it just *Divine Invasion*? I tried *Do Androids Dream of Electric Sheep*⁸, inspiration for the film, *Blade Runner*. The film at least asks, what does it mean to be human? Four chapters into *Sheep*, with a stultifying description of a digital mood altering mechanism that Deckard and his wife use to further their dreary marital discord, then an excruciating, flat discourse on artificial animals, I

⁶ (New York: Vintage Books,) 1991.

⁷ Stanislaw Lem liked Phillip K. Dick—for the life of me, I can't imagine why—and Dick returned the complement by proffering genuinely paranoid, delusional ideas about Lem's influence (living in a then Communist country, Lem, in Dick's view, was by default a Communist rather than a writer who was often muzzled by that regime and not sorry to see it go.) Dick even wrote to the FBI about him. It also appears that Lem thought U.S. science fiction generally not very intellectually challenging, certainly not well-written and interested in profit not ideas or literary innovation. Perhaps that also stuck in Dick's simplistic, reactionary craw.

⁸ (New York: Random House,) 1975. Kindle Edition.

gave up. Hats off to Ridley Scott, director of *Blade Runner*. He made a good movie. I wish I could say the same for Dick's book. Forget his "ideas," drowned out by his awful writing.

My antidote to Dick was Octavia Butler. In science fiction taxonomy, she would be called a "social science fiction writer," as she delves into human behavior in future worlds. However, I pulled out [*Wild Seed*](#)⁹, which is *not* set in the future. Like Samuel Delany, who in the [*Nevèryon*](#) series, has his enslaved characters wearing collars like household pets, Butler wrote about the deep-seated distortions and contortions inherent in race prejudice and slavery.¹⁰ In Butler's series, the characters have extraordinary powers, "moving towards her [the chief protagonist] like smoke," and hers is an extended, frightening study of the problem of human evil. Her language does not jar you with clumsy vocabulary, feigned hipness, or focus on the author rather than the story. Neither does Delany's, which immediately illuminates the class issues in slavery and, by extension, in racism (from *Tales of Nevèryon's*¹¹ first novela, the *Tale of Gorgik*):

among them all slipped the male and female slaves, those of aristocratic masters dressed more elegantly than many merchants, while others were so ragged and dirty their sex was indistinguishable, yet all with the hinged iron collars above fine or frayed shirt necks or bony shoulders....

Not Dick, but Lem, Delany, Butler and Asimov are Shakespearean compared to *The Martian; a Novel*,¹² voted best science fiction this "season" by one online site:

I'm pretty much fucked.

That's my considered opinion.

Fucked.

Six days into what should be the greatest months of my life, and it's turned into a nightmare.

I am instantly bored with the macho pose that this writer apparently feels he must assume, lest he be suspected of wussiness for aspiring to be a writer. Further, I could care less about profanity when it works, but not when it substitutes for precise and more evocative language. This *Martian* lurches on, in dismal, vocabulary-impooverished fashion, a story about the survival of an astronaut left for dead on Mars. Compared to the scientific elegance and integrity of the real Mars project, *Martian* is an adolescent's wet dream:

⁹ (New York: Doubleday,) 1980.

¹⁰ Captive Africans arrived in North America, courtesy of the Dutch, in 1619. Elizabeth I, starting in 1596, and finally, in 1601, had "blackamoors"—people of color including Africans—expelled from England. One wonders if, later on, some wound up in the British colonies.

¹¹ (Hanover and London: Wesleyan University Press,) 1993.

¹² Andy Weir (New York: Crown), 2014. Now snapped up and out as a mainstream movie, with spiffy emotionally manipulative special effects—all very exciting I am sure, judging from the trailer.

The Ares Program....The Ares crew did their thing and came back heroes. They got the parades and fame and love of the world [and, whinges the narrator, I got nothing.]

Over a generation ago, Ray Bradbury's [*Martian Chronicles*](#) (reprinted by Simon & Schuster in 2012), compellingly portrayed Earth's efforts to colonize Mars. What we know now was not available then: "his" Mars was populated. First, Martians received earthlings duplicitously, creating illusion, luring by deception, ignoring the earthmen's claim to a great achievement, behaving like we might upon meeting our first aliens. As Lem has suggested in his *Solaris*, in *Chronicles*, Terrans' interplanetary efforts are marred by cloddishness. They bring disease that decimates Martians, they deride Martian cities and civilization, which Earth's astronauts cannot understand. One renegade, Spender, believes the Martians were not so bad: disgusted by his fellow crew members, he remarks,

Yes, their [the Martian's] cities are good. They knew how to blend art into their living. It's always been a thing apart for Americans. Art was always something you kept in the crazy son's room upstairs. Art was something you took in Sunday doses, mixed with religion, perhaps.

Martian Chronicles includes the classic archetypes of insensitive interplanetary Columbuses. Of course, Mars is not populated; there are not and never were cities, nor a civilization on Mars. On several points, I might disagree with Bradbury were we to have met and discussed this, but his study of human nature is not without merit. Indeed, the insensitive crew member whom Spender shoots, thus unleashing his own demise, bears a certain unpleasant likeness to the narrator in *The Martian: A Novel*.

Further on in Bradbury's book, settlers from Earth dribble in and each—the settler, the few remaining Martians—each experience the other as phantoms, as dead, in an odd version of time travel:

There was a smell of Time in the air tonight. He smiled and turned the fancy in his mind. There was a thought. What did Time smell like? Like dust and clocks and people. And if you wondered what Time sounded like it sounded like water running in a dark cave and voices crying and dirt dropping down upon hollow box lids, and rain. And, going further, what did Time *look* like? Time looked like a silent film in an ancient theater, one hundred billion faces falling like those New Year balloons, down and down into nothing. That was how Time smelled and looked and sounded. And tonight—Tomás shoved a hand into the wind outside the truck—tonight you could almost *touch* Time.

He drove the truck between the hills of Time. His neck prickled and he sat up, watching ahead.

He pulled into a little dead Martian town, stopped the engine, and let the silence come in around him.

The "he" above, Tomás, meets a rarity, a surviving Martian. In telepathic conversation the Martian refuses to acknowledge the destruction he and his civilization have suffered:

"Who wants to see the Future? Who *ever* does? A man can face the Past, but to think—the pillars *crumbled*, you say? And the sea empty, and the canals dry, and the maidens dead, and the flowers withered?" The Martian was silent, but then he looked on ahead. "But there they *are*. I *see* them. Isn't that enough for me? They wait for me now, no matter what you say."

That, it seems to me, is writing with an attempt at thought *and* at crafting an appropriate language with which to ask, "what if?", against the background of persons caught up in the struggle of being. Again, Lem comes to mind:

We are humanitarian and chivalrous; we don't want to enslave other races, we simply want to bequeath them our values and take over their heritage in exchange. We think of ourselves as the Knights of the Holy Contact. This is another lie. We are only seeking Man [sic]. We have no need of other worlds. We need mirrors. We don't know what to do with other worlds. A single world, our own, suffices us; but we can't accept it for what it is.

Thinking of the many speculative fiction works that depict a dystopic world, then, a thought occurs to me: perhaps we are not speculating at all. Relative to what the Martian says to Tomás, are we merely expressing a profound despair for the future of a diminished world, accustomed as we have become to knowing, or at least to thinking we know, it? After all these centuries, all the wonderful things we have achieved, can we accept that we are *not* the center of the universe? When we do speculate, is it all dystopic? Can we make a place for wonder, anticipation (fearful though it might be) in our writing?

A dear poet friend, Murat Nemet-Nejat, has written a book-length poem, [*The Spiritual Life of Replicants*](#) after the Dick-inspired film, *Blade Runner*; and, if Roy Batty of the film gets a few poetic last lines, Murat lavishes whole pages on him. It's a wonderful, thoughtful read, again about what it means to be human and what it means to be mortal, as even the replicants were—all done with simile, allusion, creative language. Forget *Martian's* author. Would the difference between the bland prose of the "grand master," the yellow journalism of Dick, and that of Murat's poetry be that, when young Asimov was reading comic books—god knows what Dick was reading—Murat read Shakespeare, Milton, Dickens, Twain, books we quaintly now refer to as "literary fiction"?



Rutger Hauer was android Roy Batty in *Blade Runner*; in this image, *Escape from Sobibor*. (Wikipedia.)

H. sapiens, Heresy, and the Book

In Ray Bradbury's [*Fahrenheit 451*](#) a book burner—a fireman—meets an unusual young girl:

The autumn leaves blew over the moonlit pavement in such a way as to make the girl who was moving there seem fixed to a sliding walk, letting the motion of the wind and the leaves carry her forward. Her head was half bent to watch her shoes stir the circling leaves. Her face was slender and milk-white, and in it was a kind of gentle hunger that touched everything with tireless curiosity. It was a look, almost, of pale surprise; the dark eyes were so fixed to the world that no move escaped them.

The fireman is drawn in; and, though the story is more complex, eventually *Fahrenheit's* fireman joins a clandestine group of readers who commit whole books to memory to save their content. Today, when books and bookstores are in deep trouble, *Fahrenheit 451*, written in 1953, seems disturbingly on target, though Bradbury's discourse is strangely disorganized—a populist jibe here, an odd crack about "minorities" there, a probing insight, etc. (Asimov could never reason so erratically.) Yet Bradbury pays tribute to Faulkner, Dante, Swift, Marcus Aurelius; and the curiosity which Bradbury painted, in the young woman's eyes "so fixed to the world that no move escaped them," can and does feed both our commitment to literature and our natural interest in observing, discovering and describing the phenomenal world around us, even worlds we have not yet reached.

At Filippo Saliviati's¹³ home, where Galileo wrote much of his work, a circle of philosopher-scientists *and* literary folks often met to discuss and share ideas. In *Fahrenheit 451* attending such a gathering would be a capital offense, for its heretics are readers of literature.¹⁴ Bradbury's book disturbs us still because the author engages a potent idea, even when the book could be more incisive in literature's defense and probe more deeply into the political uses of ignorance. No one made readers stop reading, Bradbury says. But by inference, that world made reading unpalatable; and readers just gave up.¹⁵ Firemen were mere spectacle. By C. P. Snow's contemporaneous criteria, the world of *Fahrenheit 451* was a one-sided culture of science. But it wasn't. *Fahrenheit's* characters are no more engaged by scientific knowledge than feral cats: they escape into mainstream TV and virtual life and fear introspection and the intellect like the plague. Given an entire pre-packaged fantasy world, the atrophied imagination of citizens in *Fahrenheit 451* could hardly conjure up worlds that mere words suggest, nor bother with the intense discipline

¹³ He is featured as one of the speakers in Galileo's *Dialogue Concerning the Chief Two World Systems*.

¹⁴ Indeed, the plight of so many bookstores as they fade, like dying stars, one by one, should warn us of something. (See comment re: [St. Mark's Books](#) in New York City.) We hope not.

¹⁵ In our world, I think they have deliberately been helped along. We know who they are.

of pure science that might introduce new ones. Despite its flaws—and gratefully that does not include flaws in writing—Bradbury's book hits home.

En fin, I think of the Brazilian physician and neuroscientist, Miguel Nicolelis, whose research into brain-to-machine thought transmission enabled a paraplegic to kick the opening ball at the opening Brazilian World Cup in 2014. The young man, Juliano Pinto, *imagined* the movements; the machine, a special exoskeleton he wore, picked up the electronic impulses of his brain and enabled him to literally kick that ball. Dr. Nicolelis, whose work made this possible, when asked where all his research was going, responded,

Where is this going? We have no idea. We're just scientists. We are paid to be children, to basically go to the edge and discover what is out there.

That makes imagination anything but frivolous; rather, it is absolutely necessary. We need an imagination that is fit: creative not imitative, manifest in motion, in such splendid discoveries as Nicolelis is making, in interstellar travel, in art by children as well as adults,



Three Butterfly, 14 aged-girl made with chalk and glue on craft paper, (Wikipedia)

music, and literature. Offering an alternative to the atrophied mind such as portrayed in *Fahrenheit 45*, fiction, speculative or not, is martial arts for the brain. Words, thoughts, animate the possible *and* realize the impossible; but that means we who invent with them, who create marvelous worlds that let us play among the stars, we must cherish and keep alive language to do so.