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Also inside: A New York minute · A mountain adventure · A song to the universe
The search for life in space · An Irish blessing

NOTRE DAME

MAGAZINE

The Land Left Behind

THE IRISH AMONG US

I was a grownup — a forebear with descendants of my own — before I knew I wasn't very Irish (if Irish at all). It was a bit of a blow to my identity because I had been raised to think of myself as Irish. My mother attributed my quick temper and brooding disposition to my Irish blood as well as my wistfully romantic nature and appetite for poetry and make-believe.

Her mother was a Finnegan, her father a McPhee, and my father's side of things had simply been rural Southerner for as long as anyone could remember. Not much to latch onto there (or so my mother thought). So we were devotedly Irish-Catholic in alien north Louisiana, and Notre Dame was our place, our city on the hill, our champion.

It's hard to imagine a university in America that has aligned itself with a foreign country as closely as Notre Dame has identified with Ireland. Despite being started by a French priest of a French religious order, *L'Université de Notre Dame du Lac* has been the home of the Fighting Irish for decades.

Its athletic teams have embodied that fighting spirit — scrappy, defiant, belligerent underdogs with gritty flair for valiant efforts and dramatic victories. The shamrocks and the wearing of the green may suggest the playful ornamentations of things Irish, but turning the demeaning image of the leprechaun inside out as a symbol of Irish pride, liberation and triumph stands as a fist against the prejudice and power of age-old oppressors.

I can still remember how good it felt at 17 to join — with full-throated zest — the roaring chant, "Here come the I-rish!" as Notre Dame marched down the field against No. 1 Texas in the 1970 Cotton Bowl. A full-size Irish flag soon hung in my bedroom.

Not only is today's student body characteristically Irish but the University is a distinguished international leader in Irish studies, with world-class scholars applying their intellectual spirit to the culture's literature, language, history, music and politics. A football game in Dublin this September — the jewel in a jam-packed agenda of academic and social affairs — attracted almost 40,000 Americans to the city, a stunning demonstration of the bonds between Notre Dame and its adopted homeland.

Many of us think of Ireland as the place left behind. The truth is, we all come from somewhere, and those places do much to tell us who we are and are instrumental in how we understand our life stories. Our geography helps define us — whether we trace our roots to Inishark, the Gold Coast, Rosebud or even planet Earth (as some articles herein suggest).

As for me and my Irish ancestry? More recent genealogical investigations indicate that the McPhee is more Scottish than Irish and the Finnegan was a second husband, one who came along after the biological father had passed through and disappeared. This crushing discovery of being non-Irish has had me adjusting to myself ever since.

— Kerry McPhee Temple '74

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AUTUMN 2012, VOLUME 41, NUMBER 3

NOTRE DAME MAGAZINE

FEATURES

18. Off the Coast,

BY BRENDAN O'SHAUGHNESSY '93

The islands, home to the Irish for centuries, are beautiful, abandoned and silent now — but still divulge stories through those who left and what was left behind.

26. Standing in Their Footprints,

BY IAN KUIJT

28. To Be an Irish American Is Often To Be Haunted,

BY LIAM FARRELL '04

When you grow up as an Irish American, you often grow up homesick for a country you have never seen, because you feel that no matter how much your ancestors have sacrificed, the world you have was only formed because they lost their own.

31. Forty Shades of Green,

BY ROBERT SCHMUHL '70

32. Useless Beauty: A Canticle for the Cosmos,

BY SCOTT RUSSELL SANDERS

What do we make of a universe saturated with an extravagance of beauty?

37. Life as We Know It,

BY MICHAEL J. CROWE '58

AND CHRISTOPHER M. GRANEY

From the beginning the human race has scanned the heavens for the meaning of our existence and signs of creatures living far, far away. The search itself says a lot about who we are.

42. His Last Game,

BY BRIAN DOYLE '78

44. Fast Tracking,

BY MICHAEL RODIO '12

Kelsey Falter and the hungry, obsessive, speeded-up, success-driven, all-out road to tech stardom. She's enjoying the ride.

48. A Climb Too High,

BY KELLY KAMMERER '63

And a friend for life.

53. Author of the Imaginary,

BY PATRICK DUNNE '59

John Bellairs '59, the celebrated creator of spooky and suspenseful children's literature, was once my witty and fun-loving guide through the magical vacationland that was Notre Dame.



The window dressing of a Dublin pub welcomed football fans for the Emerald Isle Classic between the Midshipmen and Fighting Irish September 1.

DEPARTMENTS

Notre Dame Avenue

- 6. Ireland at ND; the Irish abroad
- 16. Freshmen on Facebook

Café Arts

- 56. On the record
- 59. Café Choice

Alumni

- 60. Class columns

CrossCurrents

- 90. Witness to the humanity of killers
- 93. Their faces open with joy
- 94. I had hoped for more
- 96. In a fix

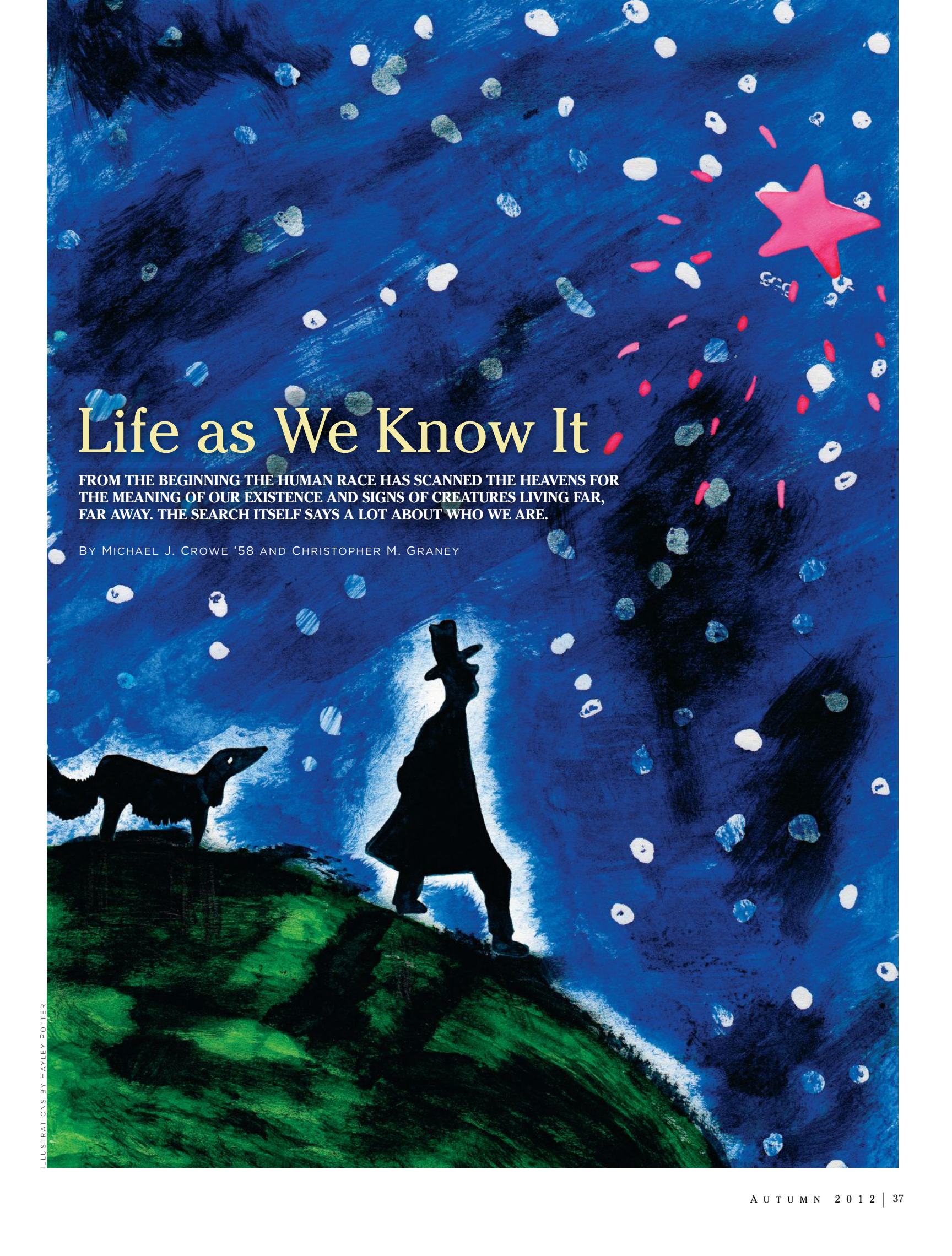


FOLLOW NOTRE DAME MAGAZINE
ON FACEBOOK AND TWITTER

STILLPOINT

A GOOD PLACE TO DIG Notre Dame's Ian Kuijt has headed a team of archaeologists and anthropologists exploring the abandoned fields and homes of Inishark, an island off the coast of Ireland. It was inhabited for hundreds of years, but the last residents left the island — and a way of life — in 1960. Photograph by Matt Cashore '94





Life as We Know It

FROM THE BEGINNING THE HUMAN RACE HAS SCANNED THE HEAVENS FOR THE MEANING OF OUR EXISTENCE AND SIGNS OF CREATURES LIVING FAR, FAR AWAY. THE SEARCH ITSELF SAYS A LOT ABOUT WHO WE ARE.

BY MICHAEL J. CROWE '58 AND CHRISTOPHER M. GRANNEY

THE ARISTOTELIANS WERE WRONG; THE COPERNICANS WERE RIGHT.

Our home is not the center of the universe; it is merely one planet circling one star in an incomprehensibly vast universe. But what is the deeper significance of this important claim?

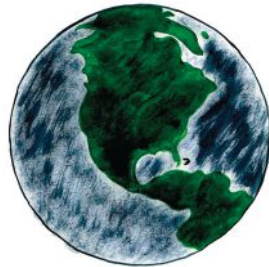
David Wootton suggests an answer in his recent biography, *Galileo: Watcher of the Skies*. The Copernican theory, he writes, “[O]ffered a view of the cosmos in which humankind, and the things that matter to humankind — love and hatred, virtue and vice, mortality and immortality, salvation and damnation — were irrelevant. Far from embodying a scheme of values, far from embodying a telos or purpose, [this] universe appeared to be indifferent to moral and metaphysical issues, and even indifferent to our own existence. . . . Galileo’s greatest and at the same time most disturbing achievement was to recognize that the universe was not made for the sake of human beings.”

Thus many see the significance of the Copernican theory as summed up in what is called the “Copernican Principle” or sometimes the “Principle of Mediocrity”: the claim that there is nothing special about our Earth, and by extension, nothing special about its inhabitants.

We, however, suggest the surprising conclusion that a number of important scientific results indicate that our great-grandchildren may live in a world where the “Copernican Principle” has been consigned to the dustbin. In their world Earth will be understood to be special indeed, possibly even unique, swimming in a vast alien universe that speaks to them about Earth’s specialness.

Moreover, in this universe they will still recognize the universe that many early Copernicans originally envisioned. For although the first Copernicans did see the Earth as orbiting the sun, most viewed the sun and solar system as being unique within a vast and alien cosmos of strange bodies that had little in common with the Earth, the sun and the solar system — a cosmos that spoke to Earth’s inhabitants of the power of God.

Copernicus proposed that the motions of heavenly bodies could be better explained if Earth circled the sun and rotated about its own axis rather than if, as Aristotle had said, Earth was fixed in place



at the center of the universe. In proposing this, Copernicus immediately made the Earth “a” world rather than “the” world. Mercury, Venus, Mars and our solar system’s other planets, which had previously been “wandering stars” — heavenly lights made of Aristotle’s mysterious heavenly “Aether,” moving in heavenly epicyclic curves, and powered by Aristotle’s heavenly “Prime Mover” — were now bodies with something in common with Earth: We all circle the sun.

Pluralism reigns

As telescopic discoveries showed the “wandering stars” to have a moon (and sometimes more than one) like Earth and to rotate like Earth, it seemed logical to assume they were similar to Earth in other ways — including being the abodes of intelligent life. By 1800 intellectuals believed in “pluralism” — that possibly every planet and every moon is home to intelligent life, and that inhabited planets orbit every star.

The French astronomer Jerome Lalande wrote: “[T]here is every possible resemblance between the planets and the earth: Is it, then, rational to suppose the existence of living and thinking beings is confined to the earth? From what is such a privilege derived but the groveling minds of persons who can never rise above the objects of their immediate sensations?”

In the 1830s, science writer Thomas Dick estimated the population of our solar system at around 22 trillion, and the population of the universe as a whole (because of course all the planets assumed to be orbiting all the other stars in the universe were similarly populated) at nearly 61 sextillion intelligent beings. And extraterrestrial intelligent life was not limited to planets. Leading figures from the late 18th and the 19th centuries subscribed to the possibility of “solarians” — intelligent beings who lived on the sun — including William Herschel (the discoverer of Uranus), Carl Friedrich Gauss (the brilliant mathematician and professor of astronomy), David

Michael J. Crowe is the Cavanaugh Professor Emeritus at Notre Dame, where he teaches a course on the history of the extraterrestrial life debate. Among his nine books, two treat that subject. In 2010, the American Astronomical Society awarded him its LeRoy E. Doggett Prize for lifetime contributions to the history of astronomy. Email him at mcrowe1@nd.edu. For the past few years Christopher M. Graney has been translating the writings of astronomers such as Tycho Brahe, Thomas Digges and Giovanni Battista Riccioli from Latin. He is professor of physics at Jefferson Community & Technical College in Louisville, Kentucky. His email is christopher.graney@kctcs.edu.

Brewster (the Scottish physicist), and Norman Lockyer (the founder of the journal *Nature*).

Many came to view an Earth that is just one of many inhabited worlds as a challenge to Christianity. Thomas Paine, in his 1794 *Age of Reason*, wrote, “[T]o believe that God created a plurality of worlds, at least as numerous as what we called stars, renders the Christian system of faith at once little and ridiculous, and scatters it in the mind like feathers in the air. The two beliefs cannot be held together in the same mind; and he who thinks he believes both, has thought but little of either.”

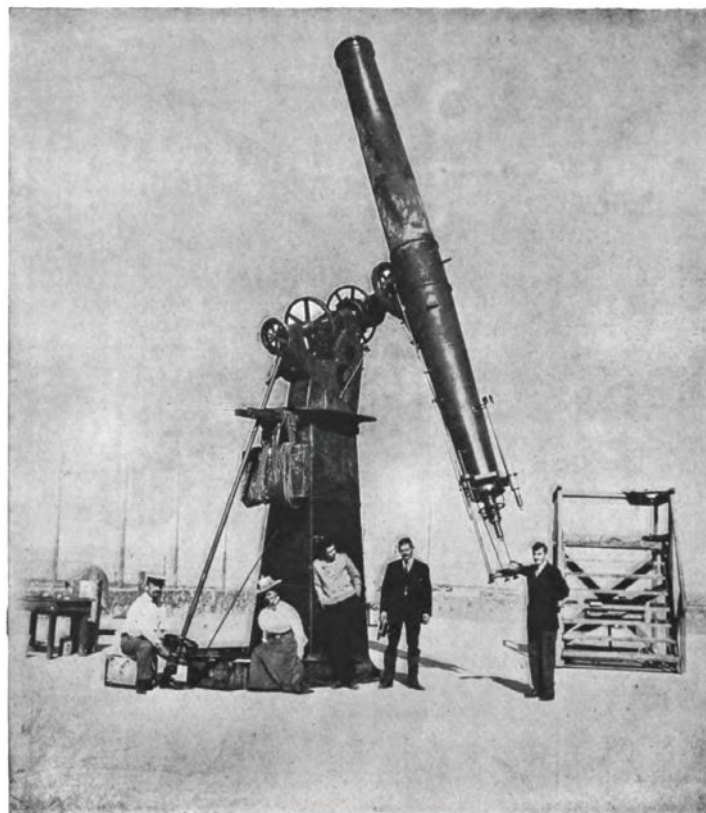
Paine continued: “From whence then could arise the solitary and strange conceit, that the Almighty, who had millions of worlds equally dependent on his protection, should quit the care of all the rest, and come to die in our world because, they say, one man and one woman had eaten an apple! And, on the other hand, are we to suppose that every world in the boundless creation had an Eve, an apple, a serpent and a redeemer? In this case, the person who is irreverently called the Son of God, and sometimes God himself, would have nothing else to do than to travel from world to world, in an endless succession of death, with scarcely a momentary interval of life.”

President John Adams, a Unitarian, laid out this same pluralist argument against Christianity. In 1825, when Thomas Jefferson was hiring faculty for the University of Virginia, Adams urged him to avoid professors who “believe that great Principle which has produced this boundless universe, Newton’s universe and Herschell’s [sic] universe, came down to this little ball, to be spit upon by the Jews” — in other words, professors who were liable to believe in the Christian Incarnation and Redemption, beliefs that he felt flew in the face of modern astronomy and would corrupt the university.

The early 19th century was the high-water mark of pluralism, and since then the tide has been ebbing steadily. In 1853 William Whewell of the University of Cambridge asserted that there was no sound evidence to support the many claims for extraterrestrial intelligence. Using information long available but never fully appreciated, he showed that the inner planets must be too warm for life, the outer planets too cold. Whewell thereby became the first 19th-century scientist to glimpse the nonpluralist solar system we know today, in which we are the only intelligent beings.

Martian canals

The idea of intelligent life in the solar system was hardly dead, however. In the late 19th century the idea appeared to be proven by certain astronomers’ reports of their detection of a canal system on Mars. The year 1895 saw the Italian astronomer Giovanni Schiaparelli discussing how the appearance of the Martian surface could be explained by the workings of Martian engineers and the instructions of the Martian Minister of Agriculture. A decade later Percival Lowell obtained photographs of the canals, prompting *The Wall Street*



A team of astronomers traveled to Chile to photograph Mars for the December 1907 issue of *The Century Magazine*.

PHOTOS FROM THE CENTURY MAGAZINE

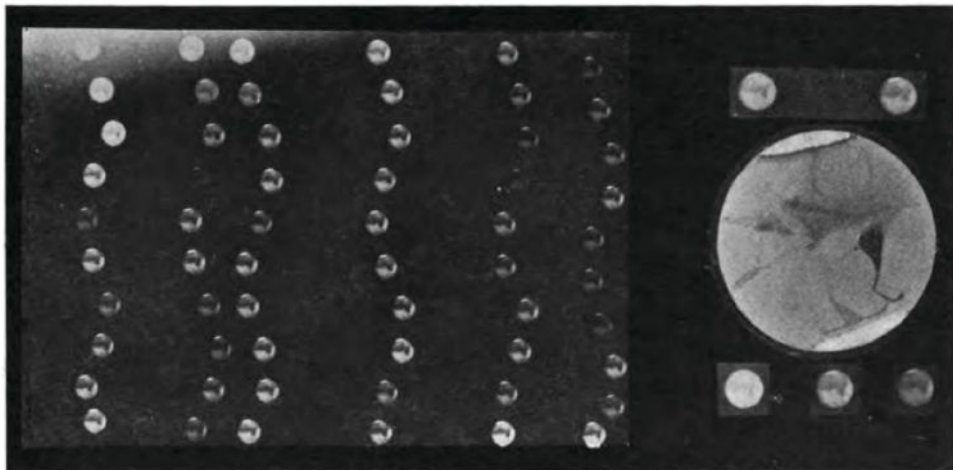
Journal to write: “The most extraordinary development [of 1907] has been the proof afforded by the astronomical observations of the year that conscious, intelligent life exists upon the planet Mars. . . . There could be no more wonderful achievement than this, to establish the fact of life upon another planet.”

The New York Times would feature in 1911 a large article on the progress of Martian canal-building. It is in this era that H.G. Wells wrote his *War of the Worlds* about invading Martians, and Edgar Rice Burroughs created his “John Carter of Mars” character.

In the midst of all the Mars hoopla Alfred Russel Wallace, the co-discoverer of the theory of evolution by natural selection, argued that the number of variations required for the evolution of a human being is so immense that the evolution of intelligent beings elsewhere is improbable. He also rehashed Whewell’s arguments, declaring that no planet in the solar system besides Earth is inhabited or even inhabitable, and that included Mars.

Twentieth-century science showed that Whewell and Wallace were right: there is no other intelligent life in the solar system. Today no astronomer expects to find so much as an extraterrestrial tree within the solar system, let alone extraterrestrial intelligence. Astronomers such as Lalande or Herschel had presumed similarity — that if Jupiter, like Earth, circles the Sun, rotates, has moons, is a world, then reason dictates that Jupiter, like Earth, should have intelligent inhabitants. But since then astronomers have found that planets display astounding diversity. Jupiter is so unlike Earth that the Jovian world lacks even a surface — Jupiter is largely a world of gas. Lalande, Herschel or Dick would be scandalized by the nonpluralist solar system of today.

While 20th-century science may have ended pluralism in our solar system, pluralism somewhere in the universe was kept alive by the 20th century’s development of communication technology and the resulting possibility that we might detect signals transmitted by advanced civilizations on planets orbiting other suns. This idea



Photographs of Mars and drawings of the same region show the canals said to prove life on the planet in 1907.

usually is referred to as SETI — the Search for Extraterrestrial Intelligence. Pluralism outside our solar system became a staple of modern popular culture, the unspoken assumption behind blockbuster stories such as *Superman*, *Star Wars* and *Avatar*. And in the 1990s, astronomers finally detected that which they had always assumed to exist — planets orbiting other suns, or “exoplanets.”

In 2009 there was even a Vatican Observatory and Pontifical Academy of Sciences conference on extraterrestrial life. For centuries Catholic thought has made room for the possibility of intelligent life beyond Earth — as Vatican Observatory director Father José Funes, S.J., summarizes it, “This does not conflict with our faith, because we cannot put limits on the creative freedom of God” — but modern-day Thomas Paines still view pluralism as antithetical to Christianity. If there are intelligent beings outside of Earth, said physicist Paul Davies, a speaker at the Vatican conference, “then Christians, they’re in this horrible bind. They believe that God became incarnate in the form of Jesus Christ in order to save humankind, not dolphins or chimpanzees or little green men on other planets.”

Yet SETI and the discovery of exoplanets have only continued the trend of the past two centuries away from pluralism, away from little green men. SETI pioneers optimistically hoped to quickly detect signals from a universe teeming with advanced extraterrestrial civilizations, but 50 years of searching has come up empty. Exoplanets have shown that what held true for the solar system — diversity rather than similarity — appears to be true of planetary systems as a whole.

Indeed the study of exoplanets has rendered the ebb of pluralism nearly visible in “real time.” NASA’s “Kepler” mission to find Earth-sized worlds is now in its fourth year. Between 2011 and 2012, the number of planetary candidates found by Kepler grew to 2,321 from 1,235. Yet the number in their stars’ habitable zones (where temperatures are not too extreme for life as we know it to survive) actually declined, from 54 to 48 (some of the earlier 54 had been reclassified). And of the 48, only 10 were similar to Earth in size. Other Earths appear to be rare. As the data flows in, the universe of Thomas Dick’s sextillions of intelligent beings is vanishing before our eyes.

What is more, scientists have begun to consider whether the development of intelligent life on Earth may have been contingent upon various special circumstances, such as Earth having a large moon (to stabilize Earth’s axis of rotation and influence its tides and plate tectonics, which are very important for life), and giant Jupiter (to protect it from collisions with comets and asteroids, which could destroy higher forms of life, just as the asteroid that collided with Earth 65 million years ago doomed the dinosaurs). Several leading evolutionists, including Simon Conway Mor-

ris of the University of Cambridge, have come to agree with Wallace that the evolution of intelligent beings elsewhere is improbable.

A special place

Thus we are seeing serious discussion of the idea that the Earth may be a special world. The last two decades have seen the appearance of a number of publications by prominent scholars expressing skepticism about the claims for widespread extraterrestrial intelligent life, including Stephen Webb’s *If the Universe Is Teeming with Aliens . . . Where Is Everybody?* (2002).

We are also seeing it in popular media. In 2010 Robert Krulwich of NPR did a story with noted Caltech astronomer and planet-hunter Mike Brown (perhaps most famous for discovering Eris, the dwarf planet that prompted Pluto’s demotion) entitled “The Fruitless Search For Solar Systems Like Ours.” The story discussed how the planetary systems being discovered around other stars are not like our solar system, and mentioned the strong possibility that Earth is a rare exception in the universe. In 2011 *American Scientist* published the article “Alone in the Universe” by Harvard astronomer Howard Smith, which argued that we are sensibly alone (that is, even if other intelligent life exists in our galaxy it is so rare that we will never find it).

Unless this centuries-long trend somehow reverses, the idea of a universe widely inhabited with intelligent life — the universe of Paine and Adams, of *Superman* and *Star Wars*; the universe of the “Copernican Principle” — is going to look to our great-grandchildren

like Aristotle's universe of a central Earth. Obviously the universe is sufficiently large that neither our great-grandchildren nor *their* great-grandchildren will ever rule out the possibility of intelligent life out there somewhere, but Earth will be special — not merely a mediocre third rock circling just another star.

Surprisingly, in viewing Earth as being a special world set in a vast universe that is not pluralistic, not like us, future generations will still see a Copernican universe, just without the “Copernican Principle” of humanity's mediocrity. Why? Because the universe they will see is actually the kind of universe many Copernicans originally envisioned.

In her recent book on Copernicus, *A More Perfect Heaven*, author Dava Sobel imagines Copernicus arguing with his student Rheticus concerning the vastness of the Copernican cosmos. The Earth

ASTRONOMERS FIGURED OUT THAT STARS ARE ACTUALLY MERE POINTS OF LIGHT — VASTLY DISTANT, YES, BUT NOT SO LARGE AS TO MAKE THE SUN SEEM NEGLIGIBLE. THE VAST COPERNICAN COSMOS, WITH THE HUGE, ALIEN STARS THE PURPOSE OF WHICH WAS TO TELL HUMANITY ABOUT GOD, WAS LEFT ON THE BACK SHELVES OF HISTORY.

moves relative to the stars in the Copernican theory, and that motion should reveal itself in the stars — a phenomenon known as *annual parallax* — but no such effect was seen. Copernicus solved the problem by making the stars so distant that the Earth's motion is negligible by comparison, and any parallax thus likewise negligible.

In response to this, Sobel's Rheticus challenges Copernicus, saying, “The stars get in your way? You just wave them off to some other place!” to which Copernicus answers, “Don't impose any puny, human limits on Creation.” When Rheticus asks, “In the name of the Creator then, what is the use of all that empty space?” Sobel's Copernicus answers, “What is the use of grandeur? Of splendor? Of glory?” and then, echoing words from *De Revolutionibus* that speak of the distances to the stars in terms of the artistry of God, he says, “Thus vast, I tell you, is the divine handiwork of the one Almighty God!”

Varied views

Sobel seems to have captured something of certain Copernicans' original envisioning of the universe. The question of distance was but half the matter: It is generally not understood that in the Copernican universe the stars were not merely distant, but huge and alien. To the eye, stars appear of varying sizes. A prominent star like Sirius, the Dog Star, appears larger than a less prominent star like Polaris, the North Star. But what were the *actual*, physical sizes of the stars? Consider this well-known exclamation: “Look! Up in the sky! It's a bird! It's a plane! No, it's Superman!” Well, if “it” is a bird, it must be nearer, and smaller. If “it” is a plane, it must be farther, and larger.

In “waving” the stars off, Copernicus changed them from “birds,” as they were in the geocentric theory (closer, smaller) to “planes”

(farther, larger). Indeed, when the Danish astronomer Tycho Brahe, the finest of the pre-telescopic observers, measured the apparent diameters of different stars, and considered how far away the stars had to be to show no parallax, he calculated that even the smallest stars would have to be so huge that the sun itself would be tiny by comparison — a pea among pumpkins. The Italian Jesuit Giovanni Battista Riccioli would later get similar results when updating Brahe's work using a telescope. By contrast, in geocentric theories like Aristotle's, stars were located just beyond the planets, and of reasonable size: somewhat larger than Jupiter or Saturn, somewhat smaller than the sun.

In light of Brahe's measurements, a Copernican had to conclude that every star was an alien body unlike anything in our solar system, next to which every body in the solar system, even the sun,

was trifling by comparison. However, there is good evidence that two of the most important early Copernicans — Copernicus himself and Johannes Kepler — believed the Earth to have a special place in the universe. Kepler, for example, stressed that our Earth “does not belong to an undifferentiated swarm of countless others.” So perhaps it is not surprising that many Copernicans viewed the huge stars as the divine handiwork of Almighty God. The English Copernican Thomas Digges wrote that in seeing this visible glorious court of God, with stars “far excel-

ling our sun,” we may be able to conjecture on God's infinite and unsearchable invisible works. Other Copernicans, such as the German Christoph Rothmann and the Dutch Phillips Lansbergen, echoed the language.

Eventually, of course, astronomers figured out that stars are actually mere points of light — vastly distant, yes, but not so large as to make the sun seem negligible. The vast Copernican cosmos, with the huge, alien stars the purpose of which was to tell humanity about God, was left on the back shelves of history. That Copernican cosmos was re-envisioned, with the vast stellar distances still there but the absurdly huge stars reduced to suns with inhabited planets, to become the populated cosmos of the “Copernican Principle” and Thomas Paine — a cosmos where the Son of God “would have nothing else to do than to travel from world to world” to save little green men on other planets.

But should the centuries-long trend away from pluralism continue, and bring our great-grandchildren to the point where the “Copernican Principle” of our planet's mediocrity must be set aside (at least as regards intelligent life), the original vision of the Copernicans — with the sun and its planets negligibly small and yet unique in a vast, alien universe — is sure to regain currency.

Certainly future generations will develop some equally interesting ideas regarding what science has told them about the universe and what it has to say about them and the special world on which they (and we) live, ideas that will affect their perception of religion and their popular culture, just as the “Copernican Principle” had an impact on Paine and Adams and brought us *Star Wars*. Their view of the universe will be as different from ours as ours is from that of the Aristotelians. □