



CRITICAL FOCUS

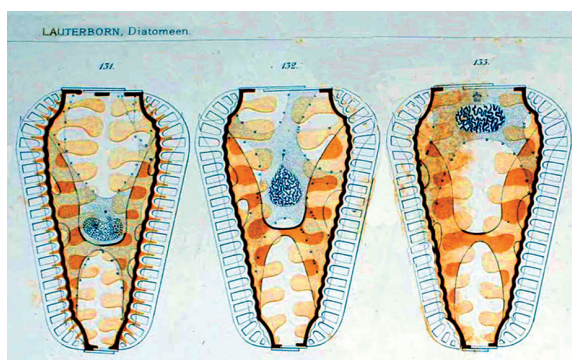
Brian J. Ford

Published or Be Damned

Scientific publishing is a racket. Research for the author's book Nonscience Returns reveals how academics battle to have more papers in print than their rivals, no matter what the cost.

Click. You've won a prize and it's worth \$11,690. For that money, two of you could fly from Washington to New York in a private jet, have a chauffeur-driven Rolls Royce take you for lunch at Masa, the most expensive restaurant in America, and fly home sipping vintage cognac. Something that endures? What about a Rolex Oyster — Winston Churchill and John F. Kennedy owned Rolaxes, and so does Barack Obama. World-renowned rapper Jay-Z has several.

Alternatively, what about a luxurious Cunard voyage? You could both cruise the Caribbean from New York in a Princess Grill suite aboard the world's greatest liner, Queen Mary 2. Oh wait, you might have research to publish. This money would allow you to print 1,000 copies of a satisfyingly stout book (50 color pages, 200 more with text and diagrams), professionally bound in dark blue cloth-covered boards, like the textbooks you may remember



Robert Lauterborn drew astonishingly detailed studies of the diatom *Surirella*, noting how the nucleus shifted position during cell division and detailing several unknown features at the limits of resolution. Electron microscopists have since discovered them, though Lauterborn published his results in Leipzig, Germany in 1896. Once in print, your discoveries are fixed in time.

from your student days. Or you could publish a single research paper in *Nature*.

It's a shocking fact that \$11,690 is the article processing charge for open-access publication in that prestigious journal. Until Dec. 31, 2020, there was no charge at all. But the moment midnight struck to herald Jan. 1, 2021, there was a new fee of \$11,390 (later increased by \$300). Oh yes, it didn't creep in slowly; what the *Times Education Supplement* reported in London as a "whopping" fee was suddenly slapped onto something that, until that moment, had been free as air. James Butcher, formerly the publishing director at *Nature*, tells me they employed 500 editorial staff at the time ... well, so do many of my commercial publishers, but I still relied on them to pay me rather than the other way round.

The charge for publication in *The Microscope*, with its high-quality color plates, crisp high-specification glossy paper, and book-spine binding, is nothing. Not

a cent. And I am not remunerated for this column; it is an honor to be asked to contribute and, since I am writing to fellow travelers, it is writing that is relatively effortless to compose. If you don't subscribe to this journal, you should. Most new journals are online and turning these pages is such a satisfying experience compared with scrolling down a screen.

I always liked reading *Nature*. I've published research there, written articles, and been a book reviewer for that famous journal. They generously described my satire *Nonscience* as "witty" when it came out in 1971, and their reviewer said it made him "laugh aloud." Then they commented favorably on my science programs for the BBC. Fifty years ago I wrote leading articles for *Nature* on subjects, including cancer research and my campaign for biohazard legislation, I debated the discovery of penicillin with the great Ernst Chain, and lamented the demise of microscopical awareness in the world (*Nature*, <https://doi.org/10.1038/258469a0>). They published my observations on IQ, university education, diatom structure, excretory mechanisms in plants, avoiding jet lag, and Brownian motion. Not only did *Nature* publish my discovery of Leeuwenhoek's original specimens, and a previously unknown Leeuwenhoek microscope that I identified in 2015, but they are generous enough to publish the conclusion that I was the "world's greatest expert" on image creation with early microscopes (*Nature*, March 4, 2011, <https://doi.org/10.1038/news.2011.116>).

Sir Norman Lockyer established *Nature* in 1869. He was conscious of the need for an open and independent scientific journal in English, in which discoveries could be recorded in perpetuity, and he discussed it with Alexander Macmillan, born on the Isle of Arran, Scotland, who had set up a book publishing operation in Cambridge. Macmillan had published Charles Kingsley, and Lewis Carroll, later to be joined by W.B. Yeats, Alfred Lord Tennyson, and Rudyard Kipling, and Macmillan's went on to become one of the largest publishers in the world. In 2015, Springer took them over, and commerce stepped in. These extortionate fees are the result. Springer makes well over \$1.5 billion profit every year.

Today's young scientists have a thirst to publish. Now, the number of journals is steadily growing, and they exist largely to pander to the ambitions of gullible academics. Currently, the online academic publishing industry is expanding with astonishing speed. It used to be costly to launch a journal; but now you can format a cheap online site to look refined and authoritative at the cost of an afternoon's work. Journal

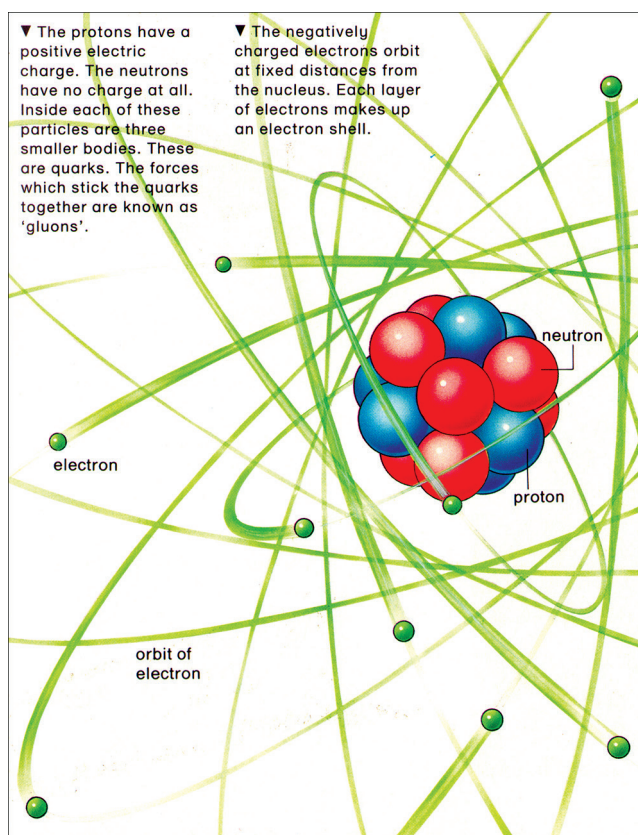
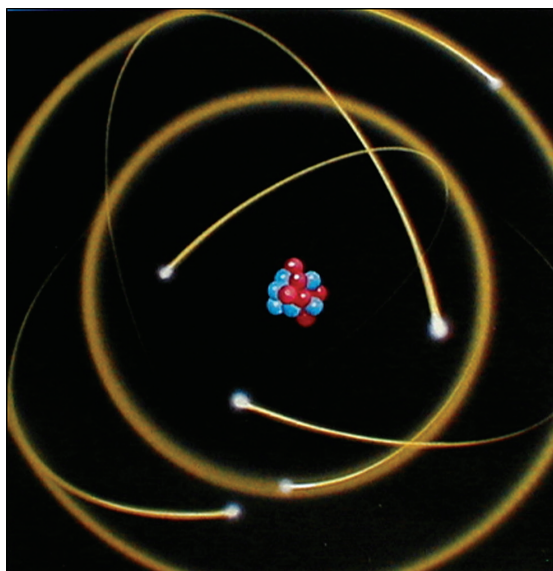
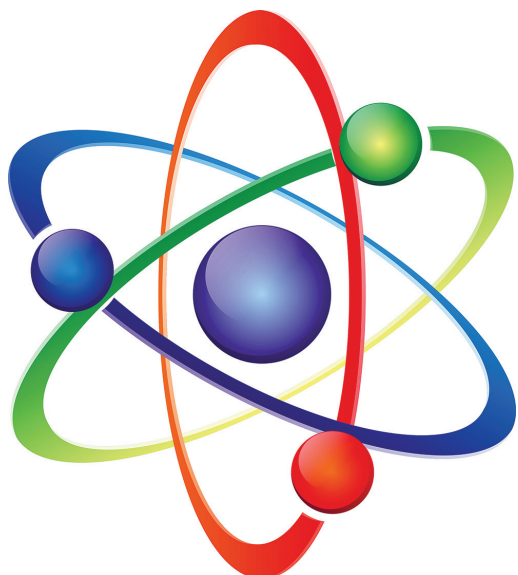
sites "honor" selected individuals by inviting them to join their editorial boards, which the chosen people then add to their CVs. This means they carry out costly work for the publisher without being paid. Nobody checks. Recently in Poland, they invented an author named Anna O. Szust, a non-existent, poorly qualified academic, who offered to join the editorial boards of various online journals. Within a month "she" had 40 prestigious appointments. Interestingly, Oszust is the Polish for "fraud."

ENCYCLOPEDIC ERRORS

There is a lot of fakery about, and even *Nature* has published a number of fraudulent papers. Today's young academics have difficulty telling the genuine from the false. The Graduate School of Education at Stanford University surveyed the reactions of 7,500 students to false accounts on the Web. The researchers were dismayed and found they faced a bleak response; the inability of youngsters to tell reality from fiction was found with "stunning and dismaying consistency." Where can you find reliable information? Published encyclopedias are said to be repositories of double-checked, objective information approved by experienced editors, and you might fondly imagine that the facts are from authorities in the field, but encyclopedias obtain their information by stealing it from ... other encyclopedias. As I was to discover, once a mistake has been published, it persists down the line.

It's curious how people are raised with ideas that aren't right. These days the web is littered with nonsense, and the rise of social media has made the problem incalculably worse. Yet the authoritative reference books on which we rely are often just as bad. There was an example in that great (and much lamented) *Encyclopædia Britannica*, which, in spite of the title and its distinctive diphthong, had been produced and published in Chicago for over 100 years. They included a wholly inaccurate account of Brownian Motion and — as an editorial adviser to the book, and a regular contributor to their yearbooks — it took me a decade to have them correct it.

In 1993, I was approached about writing my own encyclopedia for the pre-teens. It was published as *My First Encyclopedia of Science* (which, in spite of the spelling, without the diphthong, was initially published in Britain). I knew that this was my chance to correct many of the popular misapprehensions, and resolved to replace the standard "billiard ball" model of the atom with something more modern. I had a graphic artist produce artwork, where the electrons had the



Top left: Depictions of atoms traditionally show the electrons as billiard balls, like this current example from the Atomic Heritage Foundation. It was felt that this old interpretation should be updated. Top right: This revised view was used in the author's science encyclopedia for children, *My First Encyclopedia of Science*, published in Britain. The electrons are illustrated as packages of energy rather than conventional spheres. Bottom left: The American publishers of the encyclopedia insisted on reinstating the balls, to comply with similar diagrams in other books. They reassured the author that his would be "the smallest balls in publishing history."

They were tiny, compared to those in the other reference books, but my little bundles of energy were nowhere to be seen. I demanded an explanation. The publishers were sympathetic, but said that the book was also due to come out in an American edition, and the folks at Random House were adamant. Their fact checkers had found that every similar reference book had billiard ball electrons, and we couldn't possibly be the odd one out. I was stuck with them — though the publishers did point out that my artwork was moving in the right direction. "Your balls," they said, "will be the smallest in publishing history."

Our lives are governed by curious beliefs we all share but which don't exist. People say that men think of sex every seven seconds. Really? That would be 8,000 times a day. Nobody is sure of the exact source of the information, but most quote the infamous Kinsey Report of 1948. The Kinsey Institute research actually showed that roughly half of all men think of sex "several times a day" while the other half do so only "several times a week (or month)." So that popular belief is nonsense, though it is widely quoted. Then there are denial, anger, bargaining, depression and accep-

appearance of being fizzy little bundles of energy, rather than those billiard balls. Yet that particular page was missing from the pile of proofs that arrived on my desk; when it did arrive, shortly before printing began, the billiard ball electrons had been reinstated.

tance, the five stages of grief advocated by Elisabeth Kübler Ross in 1969 and since widely accepted everywhere. They are a myth. Experiences of grief are intensely personal and hardly anyone has ever experienced the stages people claim.

ABSOLUTE EVOLUTION?

The beliefs that aren't true start in school. I recall a teacher showing a range of incredible images of birds in the wild. Their camouflage was astonishing to my young mind. "They have evolved these patterned feathers," he explained, "so that they can escape being eaten by predators. Camouflage is necessary in nature — it is vital for survival." Up went the young Ford hand. "That can't be correct," I said. "Swans are pure white, so they can be seen for miles. And, with that long neck, they would be so easy to kill." The teacher's answer involved breeding grounds in the arctic, where the swans would merge with a snowy habitat, but my thoughts immediately responded with the black swans of Australia. On second thought, I decided to say nothing more.

When we came to giraffes and their prodigiously long necks, I was certain the standard evolutionary theory couldn't hold water because, if this was necessary to reach the high leaves on trees in the savannah, then all the other herbivores would have similarly elongated necks. Again, I thought it best to say nothing. The ways of academia were beginning to percolate through my mind. Those paradoxes returned when I first saw the magnificent scarlet ibis in the jungles of the Caribbean. Why, a predator with a fancy for a fresh ibis snack would easily see them through the forest vegetation. Camouflage? Pah.

Much of what we claim and what we teach cannot be true. In adult life I mused further on these paradoxes. Our naive notions about evolution and Darwinian "survival of the fittest" seemed increasingly precarious, the more I considered them. That butterfly evolved markings that looked as if they were eyes in order to deter predators? Sounds good. Primitive butterflies might have markings that looked a bit like eyes (but not much), and the more they were eye-like the more the butterfly survived? It's logical enough. But what are those markings? You know my preoccupation, not just with the creatures we see around us, but with the cells of which they are comprised. So, when you look at an owl moth, you can see how the patterned wings look remarkably like an owl's face, which might naturally deter a predator. It is mimicry at work. But think it through: a moth must look at an

owl, consider how useful it might be to emulate that appearance, so evolved cells hidden deep within its wing roots to create chitinous ridges of the precise wavelength to imitate an owl's coloration, and then the cells calculate between themselves how to generate the specific spatial pattern so that the overall effect is to imitate the owl that the moth once saw? I am not convinced that's credible. The common ancestor of all 150,000 moth species and 16,000 butterflies emerged 224 million years ago. Darwinian epistemology would have us believe that the cells secreting chitin created a myriad disparate configurations, until one happened to generate the look of an owl, which might make sense if there were moths that looked like dozens of other unrelated creatures. It would work even better if owl moths (due to their defensive appearance) were the most successful, and thus the commonest moths of all.

It's much the same with the birds. That pure white swan, the vivid scarlet ibis, the meticulously camouflaged female bird compared with her iridescent mate with his captivating mating dance and flamboyant tail feathers ... this is the survival of the fittest example, from a range of unsuccessful alternatives. Naturalists explain away how females are dull and insignificant, whereas the males are powerfully patterned and eye-catchingly colorful. So why are others monomorphic? The males and females of the blue jay are identical (and not particularly camouflaged for protection). Male and female chickadees, and mourning doves, are also indistinguishable. Where is the explanation in those cases?

So many of the ideas we teach as fact are falsifiable. We know far less than we claim. One scientific statement in every relevant course is the demonstration that the atmosphere is one-fifth oxygen. The experiment is wrong from start to finish, though everyone believes it, and it's widely promoted in school. You take a small candle and place it on a stand above water in a trough. Light the wick, and carefully stand a bell jar over the candle. As the melted wax burns, water rises up the inside of the bell jar until the flame sputters and goes out. You should then adjust the water levels inside and outside the bell jar until they equate (though few people trouble to do so). Water has risen one-fifth of the way up the inside of the jar; therefore we know that this is the amount of oxygen in the air.

When we were shown this in school, I raised my hand to point out some problems. "That cannot be correct," I said. "The gas inside the bell jar is hot, yet it was cold when we started. It is also full of gases like carbon dioxide, and lots of smoke. And it would be ridiculous to claim that the candle kept burning until



Left: Judith Hahn's book *How Science Works* includes this experiment with a candle burning under a bell jar. The flame goes out when "all the oxygen is used up." This is misleading and faulty in many important respects. Right: This sage, attired in his traditional alchemist's garb, demonstrates the identical experiment to schoolchildren at a science fair. Although the experiment is misleading, it is widely taught and accepted around the world.

the last atom of oxygen had been consumed. There must be some oxygen remaining, surely." The teacher was nonplussed. "Hmm," he said. "Well, you'd better learn it. It's in the book."

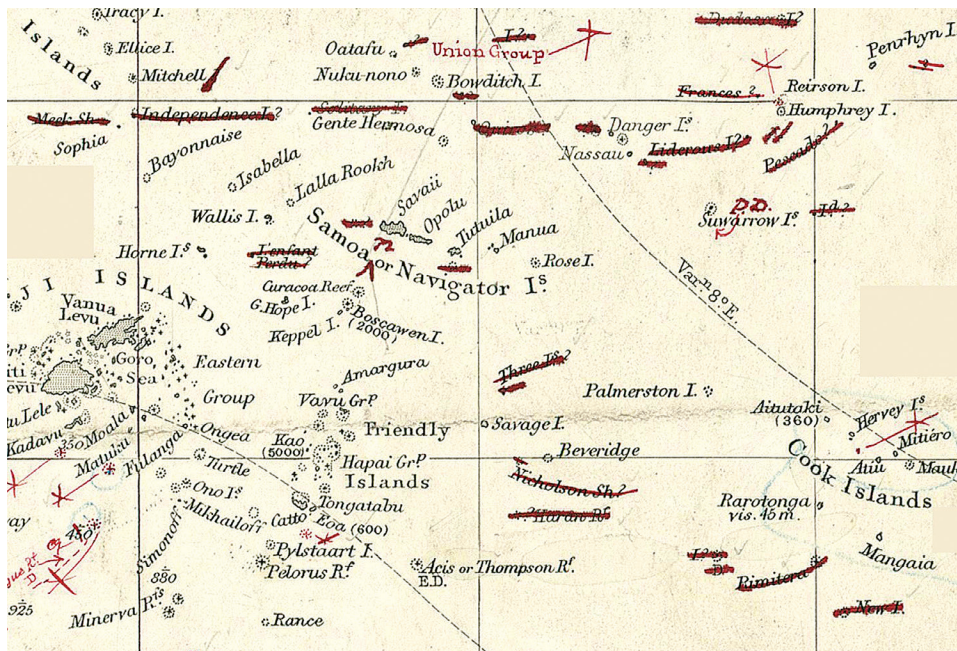
It is a shocking fact to face, but the faith we place in standard books is often misplaced. That great reference work *Appleton's Cyclopædia of American Biography* was first published in 1887 and has long been a standard reference book. It recorded over 20,000 names, yet scores (perhaps hundreds) are of people who never existed. Because the contributors were paid by the number of entries they provided, they concocted biographies of non-existent people to help pay the rent, and to this day we cannot be sure who is real and who is imaginary. The magnificently named Miguel da Fonseca e Silva Herrera and Stanislas Henri de la Ramé were among the concoctions of the scurrilous compilers.

In the *New Columbia Encyclopedia*, published in 1975, there is the life story of Lillian Virginia Mountweazel (1942–1973), a designer of fountains who was born in Bangs, Ohio, and perished in a massive explosion while working for a magazine called *Combustibles*. She never existed either. There are non-existent people in the 1980 edition of the *New Grove Dictionary of Music and Musicians*: neither Dag Henrik Esrum-Hellerup or Guglielmo Baldini are real. There was a curious definition in the 1975 edition of the *New Oxford American Dictionary*, for "esquivallence," which was defined as a Victorian term describing "the willful avoidance of

one's official responsibilities." The word was invented by joining others together, but it never existed.

There are even examples in specialist scientific books. You can read about the mammalian order Rhinogradentia, described in books and articles by the German naturalist Harald Stümpke. Neither the mammals nor the author exist (both are rumored to be the concoctions of Gerolf Steiner, professor of zoology at the University of Heidelberg), yet people still say that Germans have no sense of humor. Look in their *Klinisches Wörterbuch Pschyrembe* (the Pschyrembel Clinical Dictionary) and you will find a description of the stone louse *Petrophaga lorioti*, which is said to consume concrete and stone. It's a fake. This fictitious entry was removed in 1996, but users of the book protested, and it was duly reinstated with a supplementary paragraph explaining the involvement of the concrete-eating insect in the collapse of the Berlin Wall.

For centuries navigators relied on the Royal Navy charts to find their way safely round the oceans. Anything described and entered onto the charts was believed to be reliable — but they weren't. In 1875, Captain Sir Frederick Evans, recently appointed Chief Hydrographer to the Royal Navy, set out to check the charts for accuracy. He worked across the northern Pacific Ocean and discovered that large numbers of islands simply did not exist. Mirages, guesswork, mistaken shapes in sea-mist, icebergs, rafts of seaweed or pumice, misread navigational instruments ... he delet-



Although the Royal Navy navigational charts were widely regarded as accurate, for many years they contained non-existent islands. Hydrographer Sir Frederick Evans deleted over 120 locations in 1875.

ed over 120 non-existent islands from those ostensibly reliable charts. It happens still: on Google Maps there is a village in the north of England named Argleton. It doesn't exist. Never has.

Was this Google wanting to detect those who reproduce the maps illicitly? It seems not in that case, though sometimes map publishers insert invented details to trap plagiarists. Two cartographers, Otto Lindberg and Ernest Alpers, invented the name Agloe for an unmarked intersection on a dirt track in the Catskill Mountains north of Roscoe, New York. They entered it on their published map as a settlement, laying a trap for plagiarists. That was in the mid-1920s; 30 years later a general store was built by the road junction and the "settlement" of Agloe became reality. Years after, a map publisher threatened action against someone who had Agloe on their newly printed map, claiming they had copied data without authority — but the claim failed, because (by that time) Agloe had become reality. Currently, the United States Geological Survey has "Agloe [Not Official]" in their Geographic Names Information System database, though the store closed down and was abandoned years ago. Plagiarists need to take care. Writers often include copyright traps in their accounts, deliberate mistakes designed to catch anyone breaching their copyright. Why, I've occasionally done that myself.

If some non-existent "discovery" is posted on the internet, it can spread like wildfire. Deb Roy, Professor of Media Arts and Sciences at the Massachusetts

Institute of Technology (MIT), led an investigation to show that fake news actually spreads faster than facts. They studied 126,000 different stories that had been tweeted by 3,000,000 people more than 4,500,000 times to prove the point. You can map the way published gossip can infect the whole world. In 2015, Manlio De Domenico and his colleagues at Birmingham University published "The Anatomy of a Scientific Rumor" (*Scientific Reports*, <https://doi.org/10.1038/srep02980>), looking at the way the discovery of something that might have had similar properties to the hypothesized Higgs boson, which went viral across the web. Modern science — the home for gossip and rumor.

The discipline of microscopy is based on observation. When our science first emerged in the mid-1600s its whole purpose was to reveal the nature of a world nobody had seen before. Astronomy (which began around the same time) had the same aims. In recent years, astronomy has changed. Now, some of its practitioners aim to impress people with absurd imaginings that have no basis in fact. In an earlier article we saw the wholly imaginary images of exoplanets ("Fantastic Physics — and Worlds We Never See," *The Microscope*, 64:3, pp 119–129, 2016). The public are encouraged to become enthusiastic about all this, though it has reminiscences of the mysticism practiced centuries ago.

Ideas on bizarre life forms are regularly touted by those in the field of astronomy. Monica Grady, a professor of planetary and space science, came up with the conclusion in February 2020 that it is "almost cer-

tain" that there is intelligent life on Jupiter's satellite Europa. The reports said there would be octopus-like creatures. There isn't a scintilla of evidence for this absurd claim. The coldest parts of Europa never go above -220°C , and even on the equator, the highest temperature never exceeds -160°C . Grady works at Liverpool Hope University in England, which you have probably never heard of. It scores very low on the Complete University Guide website, with only one star (out of five) for research, for academic research spending, and for good honors degrees. However, it scores five out of five for student satisfaction, and that's what counts. It's enjoyment that students aim to find in their years at university, not enlightenment. Going to university postpones the necessity of getting a job. As I said in an after-dinner speech to Cambridge University students, youngsters go to university to get drunk, to get laid, and go to bed late. I added: "Going to university is the best and most painless way of leaving home." And for many in academia, it has become the most effective way to live a life divorced from the real world, where you are paid for indulging your fantasies and live comfortably, without being seriously challenged.

BUCK THE ESTABLISHMENT

Sometimes objections are raised about what is going on, and queries can emerge about the wisdom of the lavish expenditure. The New Zealand government recently agreed to donate NZ\$25 billion (about \$17 billion) towards a new telescope. Those in the field rubbed their hands with glee. But Prof. Richard Easther, the most senior astrophysicist in Auckland University, could see it was a waste of money. He concluded that it was ridiculously expensive and had been massively oversold. Easther said: "My own belief is that academics have an obligation to ... speak out about matters of real public importance." Eleven other leading New Zealand astronomers signed a letter saying he was right.

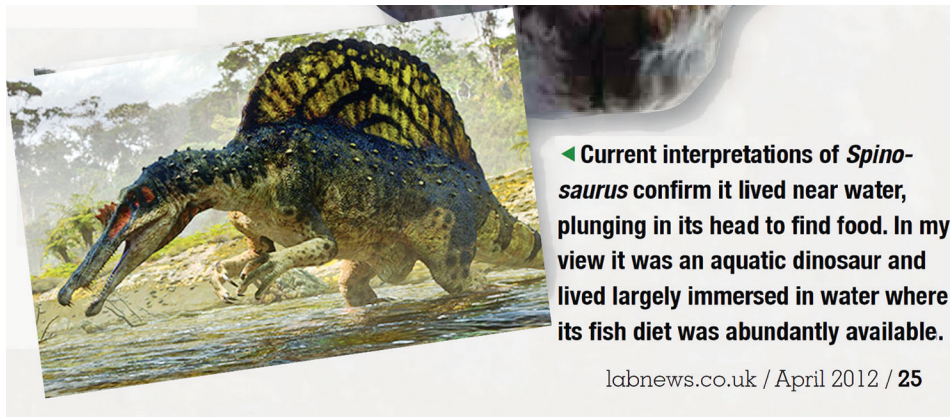
The establishment turned on him with fury. In the world of business they would be explaining how they felt the costs were worthwhile, they would list the advantages and provide some cost-benefit analysis to help change his mind. That may be how it works in the real world, but not in high-budget astrophysics. Easther was berated, personal attacks showered down on him, insulting messages were circulated, and one journalist (who wanted to investigate the controversy) was warned: "Be prepared to have the finger pointed at you if and when mental health issues get dragged out in the media."

So, are you hard-pressed to find something to publish? It isn't so demanding. Presentations at conferences are ideal material for a published paper. Publications are how people stake their claim to status. Time and time again, when an academic is being introduced, they'll say, "Author of over 50 published papers." It's the number that matters, not the substance of what was in them. Even better, people will say "peer-reviewed publications." I am no fan of peer review. It was originally intended to ensure that people didn't publish rubbish, so asking the eminences in the field was considered the best way to avoid being caught printing something that made no sense, even if it looked impressive. These days, peer review simply confirms that a new publication fits the zeitgeist and won't offend anyone's sensibilities. Peer review imposes comfortable conformity.

It was peer review that tried to squash my dinosaur theories. As loyal followers will know already, I pointed out that our view of terrestrial dinosaurs cannot be correct, and produced a large amount of scientific evidence to prove the point. The innumerable illustrations of gigantic sauropod dinosaurs on the shores of a lake are drawn thus because the fossilized skeletons are always found in siltstone or sandstone, so the watery habitat nearby must be correct. Yet they are universally accepted as being terrestrial, so the dinosaurs must have been standing on the shore. It isn't possible: hardly any soil types will support the weight of a 100-ton giant, but nobody likes to admit it. Andrew Lees of Geofem, a company that specializes in the loads soil types can bear, has recently run some detailed calculations on my dinosaur models. His findings confirm that gigantic sauropods would rarely have found soil firm enough to support their weight. They must have evolved in an aquatic environment.

Similarly, everyone in paleontology emphasized that my view of *Spinosaurus* as an aquatic dinosaur was impractical and foolish. One leading dinosaur authority, Donald Henderson, described my views as a "laughable claim" in this very journal and emphasized that *Spinosaurus* had none of the "associated features" found in aquatic creatures ("Letters to the Editor: Aquatic Dinosaurs," *The Microscope*, 60:4, pp 179–180, 2012). Everywhere you looked, the idea was debunked, firmly and unequivocally. Yet my views were correct all the time, and the new model skeleton of *Spinosaurus* that is on display in the Field Museum in Chicago is portrayed (just as I had deduced) as an aquatic dinosaur. Peer review tried to kill the idea but, eventually, the truth triumphed.

Microscopy more often deals with facts, and if you



Top: The original article, published in 2012, proposed that the gigantic dinosaurs evolved in an aquatic habitat and ended with my conclusion that *Spinosaurus* lived on a diet of fish and was not terrestrial.

Middle: My hypothesis that the Spinosaurus were aquatic was universally rejected by every paleontologist, and I was unequivocally ridiculed, even in the pages of this journal. Many of these publications date from 2022.

Bottom: The weight of evidence I had collated eventually won the day, and the widely published press announcement from the Field Museum in Chicago conceded that *Spinosaurus*, after all, was not terrestrial.

The Field Museum's New Spinosaurus Exhibit Assembled in Under 10 Hours

Business Insider

Scientists believe that the Spinosaurus was a semi-aquatic dinosaur with a powerful tail that propelled it through the water.

read the titles of papers in *The Microscope* you will see how they summarize a story. That's because we are investigators, not campaigners. As I have said in *Non-science Returns*, my latest book (likely my last, for I've written too many as it is), much of science has been taken over by people who want to make an impression. Microscopy is a discipline that applies to every

field of investigation, and its only aim is to solve problems and clarify the obscure. If you work in a narrow scientific specialization your aim is to promote your research. The best way to do that is to make it look impressive. These days a published paper is reckoned to stand its best chance with a title about 10–12 words long, but long titles remain in vogue. In the *Journal of the American College of Cardiology*, you'll find a paper titled, "Cost-Effectiveness of Transcatheter Aortic Valve Replacement Compared with Surgical Aortic Valve Replacement in High-Risk Patients with Severe Aortic Stenosis: Results of the PARTNER (Placement of Aortic Transcatheter Valves) Trial (Cohort A)," which is noticeably longer than the recommended length. I also like "Joint quantum chemical and polarizable molecular mechanics investigation of formate complexes with penta- and hexahydrated Zn^{2+} : Comparison between energetics of model bidentate, monodentate, and through-water Zn^{2+} binding modes and evaluation of nonadditivity effects," which I found in *Computational Chemistry*. My favorite term from those titles is "Non-additivity," which sounds like an invented word, but

it isn't; there are over 200,000 websites mentioning it.

One welcome introduction in scientific publishing has been the use of a witty academic title, one that is designed to make you smile. There is "Fifty Ways to Love Your Lever" in *Cell Review*; a research paper on narcissism in the *Journal of Personality and Social Psychology* titled, "You Probably Think This Paper Is About You"; one on cancer, "miR miR on the wall, who's the most malignant medulloblastoma miR of them all?" that appeared in *Neurological Oncology*; a study of piracy in the *Journal of Political Economy*, which the authors called "An-arrgh-chy"; and another called, "Fantastic yeasts and where to find them" in *Current Opinion in Microbiology*. The field is wide open for more.

PRETENSE AND BOMBAST

The question of co-authors is often problematic. It is a common courtesy for department heads to add their names to your papers, though in many areas of science it can mean that you are acknowledging some aloof individual who may have done nothing to assist, and probably didn't know much about it. It has often been thought that papers with numerous co-authors must be thoroughly authoritative, and so publications are appearing with large numbers of contributors. The paper with the largest number was published in *Physical Review Letters* in 2015, with 5,154 authors. It was an article on the hypothetical Higgs boson from the good people working on the Large Hadron Collider. The list of authors was twice as long as the paper.

The question of referees poses problems of its own. This journal has a panel of distinguished referees, and even this informal column is perused by wise eyes to ensure that the author doesn't go right off the rails. Gen-Z academics ensure that their peers are referred to flatteringly in the text, and then recommend them as reviewers. But journal editors often select a second reviewer of whom the writer wouldn't approve. And those reviewers can be brutal. One recent referee's comment said: "The phrases I have so far avoided using in this review are 'lipstick on a pig' and 'bullshit baffles brains'." Another was: "The author's last name sounds Spanish. I didn't read the manuscript because I'm sure it's full of bad English." Such appalling bias flourishes in the dark corners of academia, and young authors rightly resent it. There is a Facebook page called "Reviewer 2 must be Stopped!" and, within a month, it had 30,000 subscribers. Last time I checked it was approaching 150,000.

Plagiarism is gaining ground. China publishes half a million papers a year, one-third of them known

to be stolen from someone else. In India, there are sanctions against plagiarism, defined as "the practice of taking someone else's work or idea and passing them off as one's own." If 10% of a published work is copied, there may be no sanctions at all. If 10% to 40% of a paper has been plagiarized, the authors have to rewrite their paper. If the extent is 50%, then the student is suspended for a year and their supervisor forfeits their annual pay raise. If 60% or more has been plagiarized, then the student is thrown off their course, and their mentor has to lose two years of pay increases. I know of no other country where they take such a stern approach. In the Western world, it's an everyday occurrence. There is a paper in the *Journal of Women and Social Work*, "Our Struggle Is My Struggle: Solidarity Feminism as an Intersectional Reply to Neoliberal and Choice Feminism," which turned out to have large chunks copied from Adolf Hitler's infamous book *Mein Kampf*, with a few words changed.

In science, there is a spell cast by Greek or Latin scientific names. Many a patient has been reassured by the physician's diagnosis of idiopathic pyrexia, when they had a high fever that nobody could explain. I am reminded of the report in a British magazine about a new fish disease. The writer stated that nobody had known what the disease was. It manifested itself as ulcers of dead tissue erupting from the surface of the body. At last, scientists had identified what it was: "ulcerative dermal necrosis." If you cannot explain something, translate it into Latin (or Greek) and everybody is satisfied that the problem has been solved.

Long words can dignify the most ridiculous ideas and grant them the cloak of respectability. In 1996, Alan Sokal, a professor of physics in both New York and London, set out to publish a spoof paper. It was to determine if (in Sokal's words) "a leading North American journal of cultural studies ... would publish an article liberally salted with nonsense if (a) it sounded good and (b) it flattered the editors' ideological preconceptions." His paper was "Transgressing the Boundaries: Towards a Transformative Hermeneutics of Quantum Gravity," and none of the editors realized it was a joke. Being filled with nonsensical (but complex) paragraphs, it was impossible to tell the difference.

John Bohannon similarly published a paper in *Science* showing that a spoof paper could be accepted (in total, by 154 peer-reviewed journals). He invented authors like Ocorrafoo M.L. Cobange by randomly selecting African names harvested from online lists and then adding random middle initials. The universities he mentioned, like the Wasee Institute of Medicine,

were invented from Swahili words with African place names. Similarly, a paper entitled “Fuzzy, Homogeneous Configurations” by an engineer, Alex Smolyanitsky, was accepted by the *Journal of Computational Intelligence and Electronic Systems*. Smolyanitsky did not put himself as the author; that distinction went to two other leading academics he identified as Dr. Maggie Simpson and Prof. Edna Krabappel.

ENTER THE CHATBOTS

If you are disinterested in laboratory research, then another option is meta-analysis, an examination of the results that other academics have already obtained, so there is no need for you to do any investigative work of any kind. Such analyses are produced by teams, though they can be done easily enough on a tablet computer while watching television and rarely take more than a weekend. The ready-made data are all there in the published literature, painstakingly assembled by other scientists and ready to be harvested at the click of a mouse. Meta-analyses attract sizable grants but cost nothing other than time.

The latest trend is to use chatbots to do the work. These are not new. Joseph Weizenbaum had developed an interactive chatbot named Eliza that emulated human speech at the Artificial Intelligence Laboratory of MIT, when I first visited them in 1971. Eliza was featured in the “Young Sheldon” TV series. In 1990, his parents had bought him a Tandy 1000 SL desktop computer, and he asked Eliza to solve his family problems. The conversation was vernacular and informal, but the results didn’t please him very much: “The future may be overrated,” the young Sheldon concluded.

Now we are all consumed with the wonder of GPT-4 and its stablemates, but we should also recognize SCiGen, which has been compiling entire papers since 2005. One article was entitled “Rooter: A Methodology for the Typical Unification of Access Points and Redundancy” by the fictitious Jeremy Stribling, Daniel Aguayo, and Maxwell Krohn. It was promptly accepted as a contribution to the World Multiconference on Systemics, Cybernetics and Informatics. The authors were even invited to address the conference, but the invitation was withdrawn as soon as the organizers realized they had been spoofed. Not to be deterred, SCiGen booked their own rooms in the conference hotel and made much of the ensuing publicity.

My personal favorite is the Mathgen website. This provides entirely authentic-looking papers at the click of a mouse. I was first offered “Some Convergence Results for Maximal Numbers,” then “Finiteness Meth-

ods in Global Number Theory,” but I settled for “On the Maximality of Closed, Tangential Monodromes” because of the immensely impressive formulae that litter the text. The most outrageous paper of all was called “Get Me Off Your Fucking Mailing List” and was written by David Mazières and Eddie Kohler. The entire contents (even the figures) consisted of this phrase repeated over and over again. It was originally intended as a response to people bombarding the authors with messages by email but was accepted for publication in the *International Journal of Advanced Computer Technology*.

Even with the success of chatbots, many young students have resorted to obtaining answers to assignments that they had been given at university by articles written through an agency for a fee. It has become a major industry. An essay can cost \$500, which seems a bargain, but they don’t necessarily provide good results. One writer asked to have an essay composed to answer this question: “To what extent are women restricted by society in Victorian literature?” The essay that came back began with the words: “The Victorian era refers to the period when Queen Victoria ruled the British monarchy.” The text later referred to “Oliver Twists.” The writer might have been Chinese; I say this only because the character in Jane Eyre named Mr. Brocklehurst became “Mr. Blocklehurst” in the essay.

Some of the published papers to which I have referred are identified through their DOI (digital object identifier) run by the not-for-profit DOI Foundation. They register over a billion new publications every month. You might think that, once your paper has been granted its own DOI, it’s automatically part of the scientific literature, but that is not necessarily so. Amanda E. Spikol of Ulster University recently submitted a joint paper that was positively reviewed and accepted for publication. Eventually, the authors received the customary DOI. They were then suddenly informed that the journal needed to save money and was going exclusively online. Then they were told that the journal was closing down completely and that their paper was to be “unpublished” even though its DOI had already been issued. This is reminiscent of the Royal Society stating my dinosaur paper had been “unsubmitted” when someone wanted it rejected.

Sometimes, being canceled can raise your profile. In 1998, Andrew Wakefield, an anti-vaccine activist, published a paper purporting to link autism to the MMR vaccine. It was shown to be dangerously misleading and was retracted by the publishers. The result? The rate at which it was cited increased 150%. Be warned: you cannot rely on anything enduring.

Consult an online article and you are likely to find a cautionary flash stating, “This article is more than two years old.” Indeed, many sites withdraw pages after, say, five years. So, if you do post an article online, make sure that you keep the original PDF or, failing that, a screen grab of what you published.

Your paper must have a bibliography, and compiling a list of references has been revolutionized by the web. References have no set format (though the Harvard referencing system is becoming popular), so citations can be confusing. These days all you do is copy and paste everybody else’s bibliography and compile them into one huge list of your own, adding a few new ones. That way, yours is always the longest of all. It’s the length of the list that impresses readers, not the originality. Academics have always copied bibliographies, so this is nothing new, though many mistakes are perpetuated by the habit.

One classical case took a microscopist to solve it. In 1887, a paper was published by microbiologist Jaroslav Hlava in Volume 26 of *Časopis Lékařů Českých* (Journal of Czech Physicians). It had the title “O Úplavici, Předběžcný Sdělení” meaning “concerning dysentery, preliminary communication.” Hlava reported the discovery of amebae in the stools and intestinal ulcers of patients suffering from dysentery, together with his success in transferring the disease to laboratory animals by rectal inoculation with infected stool samples from human patients. Shortly afterwards, a physician named Stephanos Kartulis was compiling his paper on dysentery for the German journal *Zentralblatt für Bakteriologie und Parasitenkunde* (Central Journal for Bacteriology and Parasite Science), and he did what the others do: compiled a bibliography without reading the papers. Hlava’s article was one he chose to include, but because he didn’t check, he mistook the title “O Úplavici” for the name of the author, and so O. Úplavici mistakenly entered the bibliography of science as an author. Others added this reference to their own lists, so the non-existent microbiologist soon became renowned. He acquired a doctorate and was acknowledged by several eminent microbiologists as a source of valuable inspiration. One or two thanked “Dr. Úplavici” for inspiration and helpful discussions. Yet there was no such person. Although he was often cited he didn’t exist, until the eagle-eyed microscopist Clifford Dobell (Leeuwenhoek’s meticulous biographer) spotted the mistake. Dobell published a satirical obituary to the mythical doctor, which finally put an end to the saga.

However much you publish, there is no guarantee that anyone will read your paper. An analysis in

ON THE MAXIMALITY OF CLOSED, TANGENTIAL MONODROMIES

V. WANG, X. WHITE, M. JOHNSON AND Y. LI

ABSTRACT. Let $\mathcal{F}(\Sigma) = M$. In [39], the authors studied free elements. We show that $\nu = -\infty$. Next, this leaves open the question of invariance. In future work, we plan to address questions of solvability as well as invertibility.

1. INTRODUCTION

Recent developments in general logic [39] have raised the question of whether

$$\begin{aligned} \mathcal{F} &\supset \frac{\mathbf{n}^{-1}\left(\frac{1}{3}\right)}{\mathcal{X}^{-1}\left(\frac{1}{3}\right)} \cdots \pm \mathcal{Y}_{\pm}(\mathcal{F}) \\ &= \int_{\pi}^1 \hat{\alpha} d\mathbf{x} \\ &\equiv \left\{ -\mathcal{P}(J): \frac{1}{1} \ni \sum \hat{\phi}(\sqrt{2}) \right\}. \end{aligned}$$

It has long been known that $1i > 1^{-2}$ [39]. On the other hand, in [19], the authors derived unconditionally continuous moduli. In [13], the main result was the computation of non-Chern, countable subrings. X. R. Miller [13] improved upon the results of J. Sun by computing equations. It is well known that $C \leq H$.

This authentic-looking paper, complete with fictitious authors, was concocted by the Mathgen website in under two seconds. I was particularly impressed by the complex-looking mathematical formulae.

Science showed that half of all published papers are never cited by anybody and sink without trace. If you are the member of an editorial board you can guide authors, ever desperate to get into print, to support people you like and cite authors you want them to — you can even recommend that they cite your papers in return. Don’t take this too far. In February 2020 a biophysicist named Kuo-Chen Chou was removed from the editorial board of the *Journal of Theoretical Biology*. He had already been taken off the reviewers’ panel at *Bioinformatics*. Chou had been telling authors of papers to cite plenty of his own publications (up to 50 of his previously published papers, in one case). He was found out, only because he stretched it too far. In 2020, a survey of over 100,000 prominent researchers found that the average paper listed 13% of citations from papers the authors had already published. More than 250 amassed 50% of their citations, or more, by citing themselves. One author had 94% of his own papers listed in his bibliographical references.

Once publishers have their impressive-looking journals online, and their board of editors, they can then charge each author for the privilege of putting their work on their site. It’s a massive confidence trick and, every year, more than half a million papers appear in 10,000 of these predatory journals. They have spectacular titles, like the *American Journal of Theoretical Chemistry and Applied Hermeneutics* or the *International Commentary on Experimental Oncology and Biochemical*

Cytology (I just made up both of those; see how easy it is?). These days people often ask: “How can I be sure that I am not being taken in by a predatory journal publisher?” The answer is: “You can’t.”

A PRICE TO PAY

The study of academic journals has become a discipline of its own, known as journalology. The term was coined by Stephen Lock, an editor of the *British Medical Journal*, and in 1989, it was discussed at the Peer Review Congress in Chicago, which gave the seal of approval to journalology as a field of study. Currently the entire field is in a state of ungoverned revolution. Not only are journals levying those extortionate article processing charges, but many are dispensing with editors and demanding that contributors pay for independent editorial services. Others still employ editors, but actually oblige would-be authors to pay for their services. For *Nature*, that’s a \$2,400 non-refundable fee just for submitting a paper, knowing it likely won’t be published. Fees for submission or editing are in addition to the page charge, of course. Can you imagine a mugger in an alley, with academics lining up, all eager to hand over their watches, credit cards, purses, and wallets? That’s how *Nature* operates, just because people know their name. I wouldn’t write a single word of a book until a five-figure sum was safely lodged in the bank. If I write an article for a magazine, I will be paid a satisfying fee for having done so. Submit to one of these journals, however, and you will pay thousands of dollars before they will print it. As we have seen, it would be cheaper to publish it as a book, but academics clamor for space in the most famous journals, no matter what the cost.

Journal publishers know that academics have an inbuilt urge to publish, and will keep handing out the money, just as long as their list of papers in print continues to grow. But some people are starting to resist these high prices. In May 2023, over 40 top scientists resigned from the editorial board of Elsevier, in protest at the company’s greed. This Dutch company produces journals that published almost 20% of all the scientific papers in the world, and recently turned in a profit of over \$3.5 billion in a single year. Prof. Chris Chambers, head of brain simulation at the University of Cardiff (where I am a Fellow) spoke to the press: “Elsevier preys on the academic community, claiming huge profits while adding little value to science. All they care about is money and this will cost them a lot of money. They just got too greedy. The academic community can withdraw our consent to be exploited at any time. That time is now.” A campaign of com-

plaints to *Nature* had them rethink their policies; earlier this year they were forced to concede that contributors from impoverished countries could submit without having to pay the price. It’s a start.

And there is another side to this coin. I found just one publication offering to pay authors whose articles they print. This is *Minimally Invasive Surgical Oncology*, whose editor is Wenyuan Chen and yes, he conceded his approach is “unusual.” If anyone opens a fund to have a statue erected to this admirable editor, I will be first to contribute.

You don’t have to use online journals to publish, of course. People can blog. Blogging sites will format your random scribbling into something that looks like a professionally produced journal paper. You could even register your own domain (even though internationaljournal.org exists, while internationaljournal.com is currently up for grabs). I have known people post an article on LinkedIn and claim it as a publication, and you can certainly set up pages on Instagram or Facebook if you want to save your money. The golden rule is to add lots of hashtags, at least a dozen of them — anything that will draw attention to your musings.

The final way to make your mark is to publish original thoughts as papers on your personal website. Website design can make anything look authentic and authoritative, and the most trivial of ideas can emerge online as powerful and impressive. When the British government decided to impose lockdown during the Covid-19 pandemic, it was on the basis of conclusions from Imperial College — but not one was in a published paper. They were just college web pages designed to look official.

Microscopy is involved in every scientific field, and we can often find the answer that eludes everyone else. Most scientists know only of their own specialized areas, but microscopists — because we cover so many fields of investigation — have a uniquely broad understanding of the world. So our journals will continue to document discoveries, and exciting new revelations that broaden our grasp of what goes on.

Keep a watchful eye. Is this a legitimate conference to which you’re invited, or just a costly vacation making a profit for the organizers? Is this an actual journal, or a predatory website that looks good but is only after your department’s money? Almost 200 years ago the great Duke of Wellington, Arthur Wellesley, was invited to pay to stop one of his mistresses publishing her racy account of their lives together. Wellesley refused. “Publish and be damned,” he retorted. It’s the other way round for modern scientists. They fear they will be damned if they don’t publish enough — and they would sooner be bankrupt than that. ■