

Free Radicals and Forbidden Fruit

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A few years ago, I wanted to write a book that would seriously question the way the scientific quest is now conducted.

I am of the generation that, as children, saw men first walk on the Moon. That same magic year – 1969, the year of Woodstock – the giant Boeing 747 carried its first passengers, introducing the era of cheap air travel. Yet incredibly, my parents introduced me to old people who'd been my age when the Wright brothers first flew. My lifetime was surely going to see *awesome* things happen.

Forty years later and counting, it's been pretty disappointing. The many Big Science projects since have been pale failures by comparison. President Nixon's 'War On Cancer' came to little. The Shuttle turned out to be *more* expensive and *less* safe than the amazing Apollo hardware. Concorde no longer flies. Clean, cheap fusion power remains as far off as ever.

Almost everything we think of as a modern wonder was in fact conceived pre-1969. The Hubble telescope, for example, is essentially a clone of an early model spy satellite, the KH-11, workhorse of the 1970s. The Internet is great but its first version, ARPANET, went live in 1969. There were applications very like the World Wide Web just ten years later: one that older people will remember was used by travel agents to make flight and hotel bookings. By 1981 my cheap home computer did perfectly good word processing, video games, and even let me access my work electronic mail. Thirty years later, my desktop machine is theoretically faster, but actually takes longer to boot up.

Here is a personal story that illustrates how progress has slowed. The father of a friend spent his career at Britain's leading fusion centre, near Oxford where I live. When he came there in the 1950s, the scientists were working out of prefab buildings in primitive conditions. They did not care: in a year or two they would crack fusion, and then move on to new jobs, greening the Sahara or building spaceships, doing something *exciting*. That was how big science projects had worked up till then.

Time passed, and the project grew, but the goal receded. Comfortable office blocks were built. And one day it dawned on him that fusion would not be solved in his time.

He had a job for life. By then he had a wife, a family on the way, responsibilities. He could see the advantages of a permanent post. And yet, now long retired, a great wistfulness still comes over him when he remembers those early days, when he and his colleagues were about to transform the world.

My book would question the processes of modern science. One issue was the nature and inertia of big institutions. Another, what was already called by insiders ‘the tyranny of peer review’: the way the current system rewards small steps and diligent work, while blocking big game-changing ideas that would inevitably spoil someone else’s lunch.

My then editor loved the proposal, and developed it into an excellent sales pitch. His oversight committee turned him down flat. He worked for the publishing arm of a famous scientific institution: his committee pointed out that the dinosaurs I was criticising were the very same projects they themselves were approving and funding!

I now regard that decision as a blessing in disguise: my real ambition goes further. Let me recommend three entertaining books that, between them, cover the arguments I wanted to make.

The vintage *Parkinson’s Law* has just been reissued as a paperback, with a commentary by Leo Gough to bring it up to date. Wonderfully witty, retired British civil servant Parkinson describes how any task can expand to fill the time and resources available – however tiny the task, and however vast the resources. One example he found was the British Admiralty, which doubled its staff even as the number of battleships it directed shrunk by two-thirds. Parkinson would have loved a new exemplar: paper studies for the Space Station consumed billions of dollars over many years, without a single bit of hardware being built. Legitimate theoretical problems to solve? Hardly – the Americans and Russians had both *already* operated successful space stations, back in the immediate post-Apollo era.

Robert Ehrlich’s *Nine Crazy Ideas In Science* identifies scientific issues that are not as cut-and-dried as a layperson might believe, and empowers readers to think for themselves about notions that are not the current orthodoxy. I have some reservations about particular chapters, but in general he succeeds admirably. One of my most depressing moments talking to a member of the publishing fraternity was hearing an editor of popular science books, possessor of an English degree, denounce Ehrlich,

lamenting that someone should dare to tell the public about ideas which were not ‘official’! Part of the job of a science writer is to enable readers to share the joy of speculation. Ehrlich is very careful to identify to what degree individual ideas he discusses can be taken seriously. Of course, the twist is that some are probably far from crazy.

A brand new book, *Free Radicals* by Michael Brooks, does a good job of debunking the idea that scientists do (or even should) play by the rules, queuing up in an orderly fashion to wait humbly for their ideas to be sanctified by an Infallible Process of peer review. He gives dramatic examples of how badly the process works when it comes to evaluating highly innovative ideas: the bureaucratisation of science leads to mediocrity, over-emphasis on mundane micro-advances. One leading researcher he quotes is Martin Rees, who has served as both Astronomer Royal and President of the Royal Society. You could hardly find a more establishment scientist. Yet Rees now thinks it vital that there is a forum where speculative papers can be posted, to see if they can garner support without first running the gauntlet of peer review censorship.

All three books illustrate one central theme: any kind of establishment tends to become the enemy of progress. This leads to a horrifying thought. Could it be that the absence of breakthroughs in the last forty years has come not in spite of, but actually *because* of, the huge growth and institutionalisation of modern science?

The most constructive way to prove this is to find specific, important opportunities which the scientific community has failed to follow up. This is the subject of my new series *Forbidden Fruit*. I have started with fusion. One of the physicist-engineers I most respect has described fusion as the hardest goal the human race has ever set itself. Fusion is not a complicated process. The conditions for it occur naturally in the interior of every star, whenever atoms start to collide at high speed. However, there’s a big difference between understanding the rules of a game, and finding winning strategies. There are very good reasons (which those engaged in the development know perfectly well) why neither building giant magnetic bottles nor zapping things with powerful lasers – the ‘official’ programs – are likely to lead to the Holy Grail of limitless cheap, clean power anytime soon.

There are many alternative routes to fusion. Some are dubious or arcane – ‘cold fusion’ is a cautionary tale. But several others are promising enough to have won

substantial funding from an extremely tech-savvy generation of Internet billionaires. There are comparisons to the tale of the aircraft and the airship. Right up to the late 1930s, the big government money continued to go into airships, flying in the face of physics, finance, and the engineering track record. It was only the pressure of imminent war that finally made the authorities see sense: as a result, we now enjoy a wonderful age of cheap, safe air travel.

It's time for the Wright brothers to ride again. *Fusion Is Easy*, which will appear as a Kindle book shortly, contains a somewhat cynical (but heartbreakingly truthful!) history of the pursuit of fusion power by the government-academic route, and a description of the genuinely promising paths to success. Please read it, and make up your own mind. A quarter of a millennium ago, the Scientific Enlightenment which led to the Industrial Revolution started in Scotland. If progress is to resume, and with it secure economic growth, we must return to its guiding principle: Think For Yourself.

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A slightly different version of this piece appeared in Aberdeen University's Au magazine. Feedback to ColinBJ – at – gmail.com is welcome.