Book Review

Detective Stories

David Warsh (11/23/2003); warsh@comcast.net (reprinted, with permission, from a previously published column on www.economicprincipals.com)

Towards the end of his life, the great historian of science Thomas S. Kuhn turned for pleasure to detective fiction. Having exhausted himself in the controversies that he had sparked about the growth of knowledge, the physicist-turned-philosopher explained in a late-in-life interview that he still enjoyed the unambiguous solution of a good mystery. As his scholar daughter said to him one day, "It's the only thing I can read that doesn't feel like work." "That's it!" replied her pop.

The rest of us, holiday-seeking-busmen of a more ordinary stripe, may enjoy reading stories in which scientists themselves are the detectives. We are all part-time epistemologists, after all, especially we reporters. At least four unusually interesting books about great scientific investigations have come across my desk recently, three of them by journalists and the fourth by a leading professional historian.

Why should persons interested in economics - say, in development economics in countries as different as Vietnam and Venezuela — read the history of technology and science at all? Because, among other reasons, it is in the growth of knowledge that economic history begins.

Before you can think very hard about the choices people make, you have to know something about how the choices that are available to them change over time. That's where science and technology come in - technology first, then, more powerfully, science. To know something about how new knowledge happens is to know something of how it diffuses.

There is, for example, the very readable short biography of Isaac Newton by former New York Times science reporter James Gleick. "He pushed open a door that led to a new universe," writes Gleick, "set in absolute time and space, at once measureless and measurable, furnished with science and machines, ruled by industry and natural law."

So what's it worth to you to know that gravity started out in young Isaac's notebooks as half a linked pair, "gravity" and "levity"? — gravity meaning the tendency to descend downwards, levity the tendency to rise, as sparks fly up from a fire.

Here you can follow the adventures of Newton's mind as he discards the possibility that the "matter causing gravity" must "pass through all the pores of a body" until it reaches the "large cavitys and inanitys to containe it in" in the "bowels of the earth," before mysteriously ascending to the periphery again, lest "all the streames meet on all sides in the midst of the Earth" and become "coarcted into a narrow room & closely press together."

Before your eyes you see the strikeovers in his notebooks. Of a cannonball: "violent motion is /made/ continued either by the aire or by /motion/ force imprest or by the natural gravity in the body moved." Eventually the concept of gravity as a force emerges, a theory so fully integrated with mathematical experimentation that it is considered by insiders to have been proved. But not before Newton has inquired into virtually every kind of phenomenon readily accessible to the senses in the 17th century: rainbows and tides, comets and coins, magnets and vacuums, salts and sulphurs, not to mention the plague, the Bible, and the odds of dice.

Gleick takes special pains to locate Newton in his times and to make clear that, in many respects, he belonged to the pre-Newtonian world. He was born in 1642, twenty-six years after Shakespeare's death. He spent almost as much time on alchemy as on physics. He was immersed in scientific quarrels, religious controversies and, as Master of the Royal Mint in his later years, obscure matters of monetary policy.

Indeed, Gleick sides with John Maynard Keynes, who insisted that "Newton was not the first of the age of reason. He was the last of the magicians, the last of the Babylonians and Sumerians, the last great mind which looked out on the visible and intellectual world with the same eyes as those who began to build our intellectual inheritance less than 10,000 years ago."

If there is a shortcoming in the story here, it has to do with the possibility that, unless you are related to him — he had three half-sisters — you may not feel any very pressing need to reconsider the significance of Isaac Newton to our lives and times. What he learned, writes Gleick, "has entered the marrow of what we know without knowing how we know it." But for the author of "Chaos: Making a New Science" and "Genius: The Life and Science of Richard Feynman," Newton was an obvious choice, and Gleick is a superb writer, if slightly hyperbolic reporter.

A guy who doesn't get enough credit is Adam Smith's old friend and literary executor James Hutton. Jack Repcheck does him justice in "The Man Who Found Time: James

Hutton and the Discovery of the Earth's Antiquity." Hutton was a leading figure in the Scottish Enlightenment, a remark- able intellectual conjunction of intellectuals in Edinburgh that included Smith, Hutton, David Hume and Joseph Black, the discoverer of carbon dioxide.

In the social context of this "Athens of the North," Repcheck describes the series of controversies among natural historians of the earth that led to Hutton's "breathtaking discovery" at Siccar Point along the coast of the Firth of Forth south of Edinburgh in 1788 — a certain pattern of older rock amidst the new that demonstrated irrefutably, at least to trained minds, that the earth was immeasurably old.

This was explosive news in world in which church fathers reckoned from counting the Bible's "begats" that the Creation had occurred no more than 6000 years before. And the infant science of geology in short order led to paleontology — all those peculiar fossil bones — and in due course to the theory of evolution. Repcheck's account is as thrilling a story as any adventure of Sherlock Holmes, and a whole lot easier to read than historian Charles Coulston Gillispie's 1951 classic, "Genesis and Geology."

Even more obscure is Leon Foucault. He is brought to life, however, by Amir D. Aczel in "Pendulum: Leon Foucault and the Triumph of Science." It was the self-taught physicist Foucault who, in 1851, with a pendulum suspended from the ceiling of the Panthéon in Paris, demonstrated conclusively to a crowd of notables including the future emperor of France Napoleon III, that the earth revolves on its axis.

Big deal, you say? How Gallic? Hadn't Galileo, Copernicus and Giordano Bruno made all that perfectly clear? And yet the effect of Foucault's experiment was profound. Church scholars finally abandoned their half-hearted defense of the Biblical view of a stationary earth and embraced the heliocentric, Copernican interpretation of the universe as a result of his demonstration. Modernity was permitted to proceed.

Various smug certainties on the part of those demi-gods of abstraction, Laplace and Poisson, were overturned as well. Another chapter was written in the long relationship between the mathematical and the experimental traditions.

Perhaps most significant, Foucault invented the gyroscope in the course of his investigations, a device that maintains its direction in space even as the earth rotates beneath it. For 47 years the gyroscope remained a toy — until an Austrian engineer rediscovered it and, having learned to keep it spinning with the application of a little electricity instead of a string, used it to steer a torpedo, whereupon a considerable guidance industry was born.

Aczel is a truly gifted storyteller. “Pendulum” is constructed around a beautiful little map of the triangle of left bank locations with the Luxembourg Gardens where the story unfolded — Foucault’s house, the Observatoire de Paris and the Panthéon. To read it is a near-substitute for a quick visit to Paris.

But the greater triumph of the book is to provide a glimpse of science being done in a national capital — a neighborhood where men of political power routinely go to lunch with those who have won their influence through intellectual achievement. From the coup d’état that established it in 1851 to the defeat of the French army by the Prussians near the little town of Sedan that ended it in 1870, the Second Empire was a remarkable efflorescence, as colorful and distinctive as the uniform of a Zouave.

That leads directly to “Einstein’s Clocks and Poincare’s Maps: Empires of Time,” by Harvard University historian Peter Galison. And this is a very special work. Where the first three books involve the retelling of old stories — the dissemination of that which was previously-known — Galison’s effort involves the creation of much that is new. He, too, is interested in the nexus between the practical and the theoretical. And to illuminate it, he chose an apparently simple problem — the synchronization of clocks.

“If you want to synchronize two clocks,” writes Galison, “you have to start with one, flash a signal to the other, and adjust for the time that the flash takes to arrive. What could be simpler?” Yet with the solution to the clock-coordinating problem — or rather the non-solution of it — the last piece of a great puzzle fell into place, he says. Relativity replaced the concept of absolute time, and Albert Einstein supplanted Isaac Newton as the figure who had penetrated nature’s deepest mysteries.

All this went forwards under the stimulus of commercial development — and a great race for supremacy to establish standards in technologies such as railroads and telegraphy among the English, the Germans, the French and the Americans. Galison writes:

“It was a world where the highest reaches of theoretical physics stood hard by a fierce modern ambition to lay time-bearing cables over he whole of the planet to choreograph trains and complete maps. It was a world where engineers, philosophers and physicists rubbed shoulders; where the mayor of New York City discoursed on the conventionality of time, where the Emperor of Brazil waited by the ocean’s edge for the telegraphic arrival of European time; and where two of the century’s leading scientists, Albert Einstein and Henri Poincaré, put simultaneity at competing crossroads of physics, philosophy and technology.”

The economic forks in the roads came only a little later.

“Einstein’s Clocks and Poincaré’s Maps” is a genuinely difficult book, not made any easier by the political arguments and fads that bedevil the history of science in the present day — the same arguments that drove Tom Kuhn to detective fiction twenty years ago. But if you want to know something about what goes on at the highest levels of science — about what it means to catch up, thrust ahead, fall behind — it is a terrific goad to meditation.

A few years ago the journalist John Crewdson wrote something similar about the battle between French and American scientists in the 1980s for priority in the identification of the AIDS virus. That was an even harder book than this. But then that’s the point. A hundred years ago economic development was about electrodynamics. Today it is about software and biotechnology.

I am not suggesting that you need to read all this. But a nation that doesn’t train people to speak these languages has no strong stake in the development game. And an economic historian who doesn’t have some sense of the impact of the growth of knowledge on ordinary lives is no historian at all.

David Warsh; warsh@comcast.net (reprinted, with permission, from a previously published column on www.economicprincipals.com)