shift of emphasis from traditional aims towards environmental protection linked with resource conservation and by-product recovery which, in turn, will offset operating costs.

Although slender by comparison, Dudley's book merits attention as raised nitrate levels are one way in which European Community standards for drinking water have been increasingly breached in Britain. Moreover, the significance of nitrates in food and water is an issue on which researchers disagree, vested interest looms large and public suspicions run high. Dudley carefully presents information on nitrate entry into diets and the putative link between nitrate, nitrosamines and cancer, and punchy sections on "kicking the nitrate habit" consider the costs, politics and methods for reducing nitrates in drinking water, food and the environment. (Curiously, options for nitrate removal receive scant treatment by Gray.)

The chemistry given by Dudley, however, would have benefited significantly from rigorous scientific editing; he has a general and confusing tendency to refer to any form of nitrogen as nitrate. This reservation apart, the extensive up-to-date source material will make this a useful popular science book, addressed to the concerned layman rather than the informed specialist. □

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Summing up

Ian Stewart

The Development of Newtonian Calculus in Britain 1700–1800. By Niccolò Guicciardini. *Cambridge University Press: 1989. Pp. 228. £35, $54.50.*

WHAT happened to mathematics in Britain in the period after Newton? It is often held that the subject entered a lengthy period of decline, caused by an obsession with the newtonian approach to calculus and an unwillingness to follow the continental usage of Leibniz. Newton's notation for differentiation was to put a dot above the appropriate symbol, and this period is therefore referred to as the "dot-age" of British mathematics.

Is this a fair picture, or is the dot-age a myth? To answer these questions, Guicciardini takes a careful and informed look at what actually happened when British mathematicians took up Newton's ideas. The first part of his book describes how calculus began to diffuse into public consciousness, mostly through the medium of lectures. It tells how the calculus itself was developed by people such as Brooke Taylor, James Stirling and Colin Maclaurin. It examines the controversy over the logical foundations of calculus that came to the boil in 1734 with the celebrated criticisms by Bishop Berkeley.

The second part describes the flood of textbooks that followed these criticisms, the widespread interest in mathematics among amateurs, and the flourishing of mathematical societies. We read of the work of Colin Maclaurin on the attraction of ellipsoids and John Landen's anticipation of some results on elliptic integrals. The third part is devoted to the attempts to reform the calculus that were made around 1800, initiated by John Playfair and taken up by William Wallace and James Ivory in Scotland and John Brinkley in Ireland.

Finally, the author sums up his conclusions. A crisis did occur, but it set in later than is usually imagined. Lack of contact with continental mathematics was more to blame than adherence to any particular symbolism. Throughout the decline, many mathematicians were aware of the problem and fought to put it right. Eventually, this school of thought triumphed; then to some extent it rewrote history and the myth of the dot-age was born.

The author perhaps places a little too much value on the achievements of eighteenth century British mathematicians in developing calculus. Some good work was done, contrary to the myth; but it pales into insignificance compared with the contributions of Euler, Lagrange, Laplace, the Bernoullis and the hordes of continental mathematicians who made the subject the core of mathematical physics. The dot-age may be a myth, but the myth contains more than a grain of truth.

The book, which is documented in great detail, will be of value to anyone interested in this particular period of British mathematics. It also provides a much-needed reminder that mathematical ideas are transmitted through teaching and cultural influences as well as through research. □

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■ Also recently published by Cambridge University Press, *The Preliminary Manuscripts for Isaac Newton's 1687 Principia, 1684–1686* comprises photo-facsimiles of Isaac Newton's manuscripts originally published in 1687. The manuscripts are selected from the unmatchable collection of Newton's writings in Cambridge University Library. Newton's *Principia* are considered to be the most influential work that has appeared in the field of mathematical physics and astronomy. In this volume, the manuscripts are annotated by D. T. Whiteside. Price is £60, $110.

Causes and consequences

Simon Wain-Hobson

Retrovirus Biology and Human Disease. Edited by Robert C. Gallo and Flossie Wong-Staal. *Dekker: 1990. Pp.409. $99.75.*

HERE is yet further confirmation that human retrovirology is a most complex and fascinating field. I used to think, having worked on hepatitis B virus, that HBV had everything. Yet the human immunodeficiency viruses (HIV) are just that much more subtle. (I shouldn't quibble as both are, after all, retroviruses of sorts.) In the 400-odd pages of *Retrovirus Biology and Human Disease*, we are swept through animal and human retroviruses, molecular biology, epidemiology, pharmacology and, of course, clinical AIDS. The editors aim to provide a picture as complete and as broad as possible of the mediagenic yet frightful disease AIDS.

The plan of the book is not surprising, given that Robert Gallo is an editor. The book starts with a historical overview and continues with a walk through bovine and feline leukaemias and their retroviruses, in particular the feline virus, which causes more immunosuppression than leukaemia. These viruses were among the first retroviruses found to be involved in real (out of the laboratory) disease. They pointed the way, even though it was long, to the human T-cell leukaemia viruses (HTLVs). In some ways, the casualty of the search for oncogenic human retroviruses were the ungulate lentiviruses which caused catastrophic sheep loss in Iceland during the 1930s and 1940s. As it happened, the AIDS (or immunodeficiency) viruses turned out to be the first human/primate lentiviruses discovered. It is therefore appropriate, and comforting, to see the ungulate lentiviruses included in a book on human retroviruses.

Adult T-cell leukaemia/lymphoma, its epidemiology and its virus are dealt with next, followed by HTLV-II. This last is an odd fellow in that there are so few cases of HTLV-II. But, sadly, a recent apparition among intravenous drug users means that we are going to see more of this virus.

HIV is extensively covered, from the fine minutae of the *vpu* gene to problems of treatment by the drug AZT and of vaccines. The chapters on this virus are rather mixed, ranging from vistas to laboratory results. HIV-2 is treated as a HIV-like virus, which will serve only to confuse. The simian viruses get short shrift, which seems unfair as they represent the only way to test hypotheses as to precisely which genetic locus or loci are

important to the induction of AIDS. Furthermore, these viruses are central to vaccine development, particularly given all the difficulties of working with chimpanzees.

The book is not as homogeneous as could be desired. There are a few chapters which may be digested by the seasoned retrovirologist but will pose problems for others. The other difficulty is the explosion in the field since the discovery of HIV-1: in the space of only six years, seven primate or monkey viruses and a cat virus have been discovered, and bovine immunodeficiency virus has been resurrected. The field is expanding so rapidly that nobody can spare the time to update the standard reference work, *RNA Tumour Viruses*, either because the task is so daunting or for fear of being out of date as soon as the book hits the press. Even conference volumes are often too late. This one is about on target but is bound to be *depassé* within a year or so. Already there are important omissions. Perhaps the only solution is to produce frequent reviews and volumes like this one. Yet this very problem only confirms my belief that this is a fascinating field. □

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Nuclear family

John Galloway

Grand Obsession: Madame Curie and Her World. By Rosalynd Pflaum. *Doubleday: 1989. Pp. 496. $22.50.*

I DEFY any romantic novelist, alive or dead, to have plotted a better story than that of the Curies — who I suppose were the original nuclear family. Marie Curie began life as (variously) Marya or Manya (as here) Sklodowska in mid-nineteenth century Poland, a country crushed under the Czarist heel. Brought up in a free-thinking, exciting, liberal home she later supported her sister Bronya's medical studies by acting as governess in the intellectually stultifying household of the supervisor of a sugar-beet factory. She fell in love with the dashing son of the house, but it was not to be. He needed a better marriage, one to keep him in the style to which he intended to become accustomed, than one to clever — but poor — Manya.

Then on to (relative) poverty and academic obscurity as a student in Paris. Marie's ambition was resisted all the way by the intensely snobbish, conservative and militantly anti-women French scientific establishment. But she married the brilliant Pierre Curie and together they won the Nobel prize for physics. Eight years later she won the Nobel prize again, this time for chemistry — and this time on her own.

On to the next generation. Daughter Irène married clever, charming Frédéric Joliot, who may or may not have had an eye for the main chance in marrying into the by now world-renowned Curie dynasty. In 1935, the couple repeated the triumph of the earlier generation by winning the Nobel prize yet again — for their discovery of artificial radioactivity. Irène and Frédéric played a major part in defeating Germany in the Second World War, by persuading the French government to buy up stocks of heavy water. And Frédéric went on to head the French Atomic Energy Commission.

But there is a more darkly ironic and tragic side to the tale. All four Curies fell victim to the very success of their research. Pierre tripped and fell under a dray and his head was crushed, an accident very probably caused by absent-mindedness brought on by breathing radioactive radon. Marie and Irène probably both died of leukaemia induced by radiation. Frédéric went one better. Dismissed from his post because of his politics — he was an ardent communist and the Americans didn't like that — he died of cirrhosis of the liver, probably caused by polonium toxicity. A nice symmetry there, Poland starting the Curies' story and ending it. But Frédéric was vindicated. Charles de Gaulle wrote his epitaph "I am the one who made him head of the Atomic Energy Commission. I am very satisifed with what I did and I would do it again."

See what I mean? The story is the stuff of an unparalled romantic epic novel. And Rosalynd Pflaum sensibly exploits its possibilities in this very readable, and well worth reading, biography. But the story is not a novel — although as Richard Ellmann has pointed out, modern novels have led us to expect to see the worst in the subjects of biographies as well as the best. And this brings us to the book's weakness — none of the characters seems to have a worst. Irène may have been a bit surly at times, but that's about the limit. Marie may have seen more than was strictly prudent of the married Langevin, and here a real scandal ensued. But the relationship seems to have been more the occasion for it than a real cause. Was Frédéric a cynical opportunist and philanderer — the dark side of his cleverness and charm? I never found out.

Does the book throw any light on the nature of science? It certainly describes some of it ably enough. A little while ago, David Hull reviewed the new edition of *The Selfish Gene* by Richard Dawkins (*Nature* **342**, 319–320; 1989). Hull wrote, "scientists give every appearance of being addicts and science is their vice". In the addiction stakes, Marie was a 200-a-day woman. Not for her a fellowship at a comfortable Oxford college; she worked 12 hours a day in a leaky hangar in the back yard "in conditions that no self-respecting heavy labourer would have tolerated". And she worked for nothing. That's what I call addiction. And, of course, one of the salutary messages the book provides is how an addiction for the esoteric ideas of atomic physics led so rapidly to their becoming influences that

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A family apart — Marie Curie with her husband, Pierre, and their oldest daughter, Irène, in 1904.