discover the history of the word from its first tentative appearance in 1834: an article in the *Quarterly Review* laments the fragmentation of science, as reflected in “the want of any name by which we can designate students of the knowledge of the natural world collectively... some ingenious gentleman proposes that, by analogy with *artist*, they might form *scientist* ... but this was not generally palatable”. In 1840 William Whewell (said to be the last man to know everything) re-invented the word and in time it stuck. But look down the column of adjoining entries on your screen and you can find what we were spared: “*Sciencer, Obs.* A professor of a particular science”. And then there is the magnificent, and much-needed, conceit, “*Scientaster* [... after *poetaster*] A petty or inferior scientist”, coined by the physiologist Michael Foster in 1899; a quotation follows from Foster’s biography of Claude Bernard.

The physical sciences seem to me to do better on the whole than biology, perhaps because the corpus of knowledge is less diffuse. Here, under *flavour*, are the six flavours of quarks; *string theory* and *superstrings* get crisp definitions; *Higgs* appears, attached to *boson*, *field*, *mechanism* and *particle*; and, going back a little in time, *Debye* surfaces under *Debye effect*, *Debye–Hückel theory*, *Debye–Scherrer method*, *Debye temperature* and *Debye unit*. Here, too, is *buckminsterfullerene*, complete with a quotation from Harry Kroto in *Nature*. The besetting fatuity, still found in many dictionaries, of recording stoichiometric rather than structural chemical formulae has been largely but not entirely expunged, so the peptide *melittin* from bee venom comes out as $C_{131}H_{229}N_{39}O_{31}$ (who counted?). *Sulfur* — in the American and now internationally sanctioned spelling — is not in evidence. Prefixes for large units do better than those for small: we find *giga-* and *tera-*, but not *atto-* and *zepto-*.

As to biochemistry, all the most familiar proteins seem to be present and quite a number of others, although some definitions (*actin* for instance) are in sore need of revision. We have *transferrin*, *ferritin*, *laminin*, *reverse transcriptase*, *spectrin* and *ankyrin* even, but no *integrin*, *fibronectin*, *clathrin*, *calpain* or *G-protein*. *Oncogene* and *homeobox* are in, but *apoptosis* is missing and so are *T-cells* or *T-lymphocytes*, *genomics* and indeed *PCR*. In the revised M–MAH sliver, I looked for and found *magainin*, first isolated from the skin of the “clawed toad” — but *Xenopus*, I am assured, is not a toad, but rather a clawed-toed frog. Missing is *MHC* (major histocompatibility complex), ubiquitous enough, arguably, to qualify for inclusion. Of course, the *OED* does not purport to be a textbook or encyclopaedia of science and somewhere must draw an arbitrary line between the barely useful and

the totally recondite, but among the lacunae are expressions that a journalist, for instance, might well want to track down.

The dictionary is diverting on misuses that have become irretrievably embedded in common speech. *Parameter* (first spotted in a mathematical tract in Latin by one C. Mydorge in 1631) receives separate definitions in conic sections, crystallography, mathematics, electricity and statistics, but also “In extended use: any distinguishing or defining characteristic or feature ...”, with a quotation, fittingly enough, from *New Sociology* (“We would then say that a social theory has a human-nature parameter” — ah, so!). A *quantum jump* is not only a transition between stationary states of a quantized system, but more especially “*transf.*, a sudden large increase or advance”, also now known to politicians and estate agents as a *quantum leap*.

The online format of the *OED* is friendly and responsive. A click of the mouse will bring up or hide pronunciation, etymology, quotations (2.5 million of them and, to my mind, the greatest treasure of all) and a date chart showing the development and decline of usages. You may retrieve quotations from any one author, and relate them to particular words; you may bookmark entries and you may search for your favourite cliché (“sick as a ...”). If you are unsure of a spelling you can enter a question mark in the middle of your word or use an asterisk (wild card) to denote an undefined number of letters. This will allow you, if you are so inclined, to play word-games. So, for illustration, a reader in a newspaper recently asked whether any words existed in which a single consonant appeared three times in tandem. Well, a brief search of the *OED* for words of the type, ‘sss’ at once yielded *bossship* and one typo.

Today’s science, with its headlong pace of progress and its ever-shifting frontiers, probably makes impossible demands of the *OED*’s editors, and it will be interesting to see how they grapple with it between now and 2010.

Meanwhile, we should celebrate a great and noble assertion of intellectual virtues and an inexhaustible source of pleasure, to those at least who can afford to or otherwise get at it. H. L. Mencken, journalist, lexicographer and sage, thought that the completion of the first edition of the *OED* in 1928 should be marked in Oxford by public revelry — “military exercises, boxing matches between the dons, orations in Latin, Greek, English and the Oxford dialect, yelling matches between the different colleges, and a series of mediaeval drinking bouts”. I fancy I can see the benign shade of Sir James Murray, surrounded by his team of indexers, celebrating out in cyberspace with a small dry sherry. ■

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When silence is not a true option

The Woman Who Knew Too Much: Alice Stewart and the Secrets of Radiation

by Gayle Greene

University of Michigan Press: 2000. 336 pp. \$35, £19.95

Sunetra Gupta

“Practising medicine without asking these larger questions is like selling groceries across the counter,” said Alice Stewart when asked why, at the peak of a career in clinical medicine, she had decided to abandon it in favour of practising epidemiology.

In 1945, the importance of identifying the risk factors of infectious diseases was becoming obvious, and efforts had already been made to define and understand the ecological processes underlying the spread of infection. The Institute for Social Medicine had been established at the University of Oxford in 1943, reflecting the recognition that it might also be worthwhile to investigate the causes of non-infectious diseases such as cancer. These diseases might have “discoverable origins in social, domestic, or industrial maladjustment”, according to the institute’s founder, John Ryle. Ryle died in 1950, and the institute was diminished to the Social Medicine Unit and its building taken away. Stewart, who had been Ryle’s assistant, was given a readership and made its head with a budget so small that there was “barely enough to light a gas fire”.

It would have been perfectly possible for Stewart at this time to keep up some semblance of research and devote the rest of her time to her country garden, not to mention the lively intellectual circuit in which she had a singular place as the lover of the distinguished literary critic, poet and mathematician William Empson. However, according to her biographer, “epidemiological investigation engaged her like a piece of detective work”, and in 1950 Stewart set about organizing a retrospective case control study to identify risk factors for childhood cancer on a grant of £1,000 from the Lady Tata Memorial Fund for Leukaemia Research.

“I spent those £1,000 on railway fares traveling the length and breadth of England, going to each public health official, saying ‘here are the questionnaires, will you help?’,” said Stewart. From this incredible effort came the startling revelation that a single obstetric exposure to X-rays significantly increases the risk of an early cancer death. The Oxford Survey of Childhood Cancer, as it came to be known, continued for 30 years, beyond Stewart’s retirement in 1974.

She relocated to the University of Birmingham, and found “an empty corridor

connecting two temporary buildings” to house the 23,000 manila envelopes containing the questionnaires. The findings of the Oxford Survey met with some opposition at a time when X-rays were routinely used for such things as measuring feet in shoe shops. However, they were eventually upheld by large-scale, long-term studies, leading finally to official recommendations against taking X-rays of a fetus.

But who was Alice Stewart, and how did she come to be in Oxford in the first place, choosing between clinical medicine and epidemiology? Gayle Greene provides us with an extended account of the events leading to this juncture in her life. She starts with the story of Stewart’s mother, who in 1897 came to London from Scarborough in Yorkshire to study medicine, married a pioneering paediatrician and moved to Harrogate with the intention of practising medicine together with her husband. There is a touching account of them putting their professional name-plates up together, and incurring the wrath of a senior member of their Harrogate practice who did not wish his practice to be tainted by the presence of a female physician. Stewart’s parents later bought their own practice in Sheffield, had eight children, and became deeply involved in welfare and the general reform of medical practice.

Eventually, the couple’s career paths diverged, as Stewart’s father qualified as a consultant physician, which by law prevented her mother from engaging in general practice. Instead, she took a position as a doctor in an armament factory and as ‘Lady Tutor in Anatomy’ at Sheffield Medical School.

Greene effectively links the early events in Stewart’s life — growing up in these particular circumstances — to her indefatigable quest for intellectual stimulation and the terms of her independence in her life and work. From early days, she had been attuned to the trade-off between fighting her corner and finding fulfilment within the boundaries of compromise. In the 30 years of her life spent in Oxford, rather than seeking to further her status within the university, Stewart chose to accommodate herself within a “crack in the system” and get on with her work. Hers is the story of a proud woman, but one clever enough to place her pride outside the boundaries of institution, so that the repression she encountered did nothing to diminish her enthusiasm for life. Part of her extraordinary self-confidence appears to derive from her outstanding record in clinical medicine. “Now, I must tell you as a physician I was a tremendous snob,” she tells Greene. Success in a different discipline, it appears, gave her the strength and courage to negotiate her position in a new field.

Greene is careful to point out the privileges of Stewart’s background as well as the difficult experiences that equipped her for a life in science. She was educated at a

progressive public school, and came to Cambridge already integrated into a “charmed inner circle ... of beautiful well groomed young women”. She married a fellow student at Cambridge who became a French master at Harrow School, and for a while she played the role of wife and mother. In the meantime, she hoisted herself out of a low-key research job at the London School of Tropical Medicine and Hygiene into full-time clinical medicine. She sat for her membership of the Royal College of Physicians and succeeded in her first attempt, and in 1939 was appointed to a consultant post.

Juggling a successful career, children and the demands of being a staff wife might have been the entire shape of Stewart’s life had it not been for the Second World War. Stewart was asked to replace a senior assistant at the Nuffield Hospital in Oxford who had been called up for service. “It was the sort of job that was normally never open to women,” says Stewart.

The quality of her life before the war and during her years in Oxford does little to substantiate the suggestion of persecution in the title of the book. It is only in the latter part of the book that we begin to identify with the sinister ring of the title, when Greene lays bare the extraordinary history of resistance by the US government to the progress of research on the hazards of radiation. Stewart’s place in this scenario was as a proponent of the notion that sustained exposure to low-level radiation carries an increased risk of cancer. She became vocal in this post-retirement period of her life in supporting the various researchers who had been isolated by this process of “governmental interference”. She began to serve regularly as an expert witness in compensation cases, and engaged at an international level in the public debate about nuclear safety.

In Britain, she participated in the Wind-scale, Sizewell and Dounreay inquiries and acted as an expert witness in the trial of the 44 women who had danced on the missile silo at Greenham Common. While not entirely comfortable with her position as a hero among activists, Stewart declares that she has “a responsibility as a scientist and physician to support them”. Suddenly, she is no longer content with being invisible.

Greene attempts to comment on this

change from the perspectives of gender and marginalization, and ends up with a rather diffuse amalgam of quotations and impressions. However, one clear message emerges: it can work for a time to plough on quietly, engirdled and protected by your self-esteem, but it is hard to make the same choice when your silence quite obviously affects the lives of others.

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Of science and men

The Genius of Science: A Portrait Gallery of 20th Century Physicists

by Abraham Pais

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£25, \$30

Giovanni F. Bignami

Having paid compulsory tribute to the Medicis, the Grand Dukes of Tuscany, Giorgio Vasari dedicates his monumental opus, *Lives of the Most Excellent Painters, Sculptors and Architects* (Giunti, Florence, 1568), to his fellow artists. Vasari was a great biographer of the artists of the Italian Renaissance. In 1,012 quarto pages, with illustrations, he turned their life stories into gripping tales. He could do this because he was one of them, a famous artist in his own right, for whom Michelangelo drew fresco cartoons. He was also a magnificent writer.

Not all biographers had such a style. Plutarch and Tacitus, who wrote biographies of the great men of the first century, were not emperors themselves, although they obviously moved in the right circles — Tacitus, for example, was the son-in-law of Emperor Agricola. We read (or are forced to study) their works, admire their heroes, and learn. In the case of Vasari, however, there’s much more. We are transported into the minds and hands of great artists, and sit transfixed as we watch the unfolding of both history and genius — an apt comparison, I think, for the newly published work of Abraham ‘Bram’ Pais, albeit one he himself would not make.

Pais is a scientist of world class, and he has obviously been moving in the right circles for quite a few years now. He, too, has Vasari’s capacity for making his biographees jump out of the page, both in his more extended works (like his famous ones on Albert Einstein and Niels Bohr) and within the ‘microbiography’ genre which he himself, I submit, invented.

Pais is the man who can say that he knows “so well” the article that Bohr wrote for Einstein’s seventieth birthday (1949), because “I helped him prepare it”; or the personal recollection of Paul Dirac (Nobel prizewinner at