Stalin or Khrushchev and to intrigues at their court. Intermittently Soyfer declares that "the system" was to blame for Lysenkoism, but he does not get beyond the empty declaration. He does not analyse 'the system' in the process of historical development, or confront the difference between analysis of cause and effect and assignment of blame or credit. Soviet histories were written this way before *glasnost*, in reverence instead of rage. Now pluses and minuses have been reversed, but the crude algorithm persists.

Official Soviet histories credited the Communists with modernizing a backward country; Soyfer blames them for ruining "a once bountiful land, with the world's largest sown area and pasturage", for destroying "the well-organized system that Lisitsyn, Vavilov and others had established to maintain pure seed production" and wrecking "the leading position that Russia once held in genetics". It is painful to see fantasy still projected upon Russia's agricultural realities — in retrospection now instead of anticipation — and embarrassing to read Soyfer's boasts of Russian priorities in genetics, which recall claims that provoked worldwide laughter not long ago. I am not doubting that genetic science made remarkable progress in Russia during the 1920s. I am merely noting that it did so under a Communist regime, while applied science in agriculture did not make such progress. Both the official histories of the Soviet period and the simplistic inversions of *glasnost* historiography ignore the hard question: why did revolutionary commissars repeat the forceful top-down pattern of modernization that began with Peter the Great in the early eighteenth century, intensifying servile relationships and the frightful inefficiencies that accompany them?

Soyfer's book is nevertheless a useful addition to the scholarly literature. He has done some digging in archives and summarizes a good deal of what others have uncovered. More significant are the materials he collected over many years from some of the major participants, although he is sometimes naive in repeating their stories as gospel. For example, the tale of Stalin's final interview with Vavilov, which reached Soyfer at fourth hand almost 50 years after the event, has the style and substance of Soviet folklore.

Soyfer's most striking achievement is his portrait of Lysenko, whom he observed and interviewed at length over a considerable period of time. Semiliterate, charismatic, fanatic, wilfully contemptuous of careful reasoning with hard evidence — all that has been said of Lysenko in previous works, but never with the persuasive detail and intimate evidence that Soyfer provides. He even sympathizes with the brute in his fall from power, since the "personal drama had nothing to do with the fate of Lysenkoism as a social phenomenon". This simplistic disjunction is unwittingly revealing of the extreme separation of power from responsibility that has plagued the Russian system for a very long time, even in the minds of those who rebel against it. □

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Abamp to zyometry by way of mingel

Walter Gratzer

The Dent Dictionary of Measurement. By Mike Darton and John Clark. *Dent: 1994. Pp. 538. £30.*

"ALL knowledge", Dr Johnson declared, "is of some value. There is nothing so minute or inconsiderable, that I would not rather know it than not." I wonder though whether even he might not have drawn the line this side of being instructed that the Danes measured dry volumes by the *tønde*, one of which was the equivalent of 144 pots, 8 *skaeppe* or 4 *fjerdings*; or that in ancient Russia there were 40 *funte* to a *pud* and 30 *pudi* to a *packen*. Consider furthermore that in the Iberian peninsula — I have of course only Messrs Darton and Clark's word for it — an *almude* (that is to say 16 *octavillos*) is one-twelfth part of a *fanega*, but whereas the Spanish *fanega* makes up 55.50 litres (or, as Darton and Clark helpfully add, 12.21 UK gallons or 14.66 US gallons), the Portuguese *fanega* is no more than 55.364 litres and so forth.

Darton and Clark have given us more than 500 pages, overflowing with such revelations. There is masses on sport: you can satisfy yourself as to the dimensions of tennis courts, of tennis rackets or of cabers, and you will discover, if you persist, the significance of the lag line in the ancient sport of marbles. There are some 130 collective nouns — a *smuck* of jellyfish but a *doult* of pigs (wild), and as for snipe they come in *walks* when on the ground but in *wisps* when in flight. ("Over there, Mellors, a wisp! Quick, the twelve-bore (0.729 – 0.740 inches)" .) If, incidentally, you bag a brace, you are actually securing a *bras* — one to be held out in each arm. (The next entry is the Bragg angle: but we know all about that.)

Our lexicographers are also strong on music and are generous with facts about modal scales, key signatures, standards of pitch and the like, not to mention the ranges of instruments — including the B-flat alto flugelhorn ($2^{1}/_{2}$ octaves from E below middle C, whereas a psaltery will comfortably manage 4 octaves).

There is of course plenty to bemuse the scientist, such as instruments for every imaginable measurement, and especially units — units current, units defunct and units that never caught on in the first place; so while the *slug* survives amongst the pounds and the feet, the *glug* was stillborn as the metric unit of mass, nor did the *inferno* find favour as a measure of the temperature of stars. The dollar is not only a dollar (etym.: *thaler*, from *Joachimsthaler*, a coin minted from silver, mined in Sankt Joachimsthal, now Jachymov in the Czech Republic, first issued in 1519), but also a unit of reactivity, equal to that contributed by delayed neutrons. Pain, it seems is measured by the *dol* (in a dolorimeter) and herrings by the *cran*.

The standard of accuracy of the definitions is, so far as I am able to judge, high, though the odd mistake does crop up: the Bohr magneton, for instance, does not come in joules per kelvin, the rate constant of a reaction is misdefined, there is a wholly inscrutable entity called a *biomolecule*, and surely nobody now believes that the direction that water swirls down the plug-hole changes at the equator in accordance with the Coreolis force? Tested for comprehensiveness the dictionary came through triumphantly; I looked up first the Scoville scale, which measures the hotness of chilli peppers, and was rewarded with the information that a standard chilli registers about 5,000°, and the incandescent kind 8,000°. Among the few units I failed to find was the hardness scale for pencils, and neither was there any entry under *degrees Twaddle*, which (if memory serves) measure alkali titre. There is, on the other hand, a great deal of repetition: the seven sizes of wine bottles from the magnum to the nebuchadnezzar are all tabulated under each, there is the half-mile ("see half a mile"), as well as the mile with all its constituent parts, and units tend to recur under milli, micro, centi and the rest — but oddly, the smallest is atto, as in attomole, and zetto does not appear (though it is true that it is very small). I cannot remember which physicist it was who suggested that zetto may have originated as a misprint for zeppo, after the forgotten Marx brother, and that the zettomole should therefore be followed by the chicomole, the harpomole and the grouchomole. (As the last corresponds to less than one molecule, it could also perhaps be termed the benveniste.)

So, then, if you are not stirred by the discovery that 1 *schtoff* contains 10 *charki*, while 10 *schtoffs* make a *vedro*, and more, that the *schtoff* (of which there are 0.9259 in two UK pints, though only 0.7722 in two US pints) is identical to the old Dutch

mingel (whether by coincidence or design no one knows) then I would not urge you to buy this book. But Flann O'Brien, who spent his literary life pushing satire to its outermost limits, would undoubtedly have drawn much inspiration from its pages. And one final consideration: it was said that when Aldous Huxley was passing through his phase of reading the *Encyclopaedia Britannica*, so ravenous was he for knowledge, his conversation would for one excruciating month be confined to topics ranging from *Brassica* to *Caernarvon* and the next to anything from *Caesar* (*Gaius Julius*) to *Cement*. The *Dent Dictionary* could be put to the same use and so might help ensure that one's dinner guests do not linger too long over the port and cigars. □

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Wrangling in Washington

Harvey Brooks

The President's Scientists: Reminiscences of a White House Science Advisor. By D. Allan Bromley. *Yale University Press: 1994. Pp. 232. $28.50, £20.*

IN 1988 Allan Bromley was appointed to the two-hatted position of Special Assistant for Science and Technology to President George Bush and Director of the Office of Science and Technology Policy (OSTP). Most members of the presidential staff were already in place. The status and influence of the presidential science apparatus was then at an all-time low, having shrunk from a staff of 50 and an annual budget of $4 million at the end of the Carter years to a staff of 11 and a budget of $1.5 million under Reagan. Even when the President's Science Advisory Committee and the position of science adviser were abolished by Nixon in 1973, and the responsibilities of the Office of Science and Technology (OST) were returned to the director of the National Science Foundation (NSF), staff support available within the NSF for roles previously assigned to the OST exceeded that available to the director of OSTP in 1988. Moreover, relations between OSTP and Congress were grimmer than ever. Yet by end of the Bush administration in 1992, the OSTP staff had grown to 65 and its budget to $6.2 million, and it had become the largest agency within the Executive Office, with excellent congressional relations and good collaboration with the Office of Management and Budget. The result? Many presidential initiatives and a programme and capability that turned out to be the foundation for most of the policies and programmes selected for rapid expansion by the incoming Clinton administration.

This book is a highly personal and candid account of how all this came about. It provides a fascinating new chapter in the rocky history of science and technology in the White House, a history that began in 1951 under President Truman. Bromley gives valuable insights into the institutions and inner workings, formal and informal, of government at the level of the White House; it should be compulsory reading for anybody wanting to really understand how science policy is made: a good deal of the material here cannot be found in the official documentary sources usually used by policy scholars. This is particularly true of the chapters on budgetary process and the interactions between Congress and the Executive. The book is full of surprisingly frank anecdotes and comments on people active in debates about science policy and especially technology policy in the upper reaches of the executive branch of the Bush administration. The picture of national policymaking that emerges is not always very flattering, replete as it is with turf battles and oversensitive egos, although negative and positive comments are fairly evenly balanced. The heroes and villains are not always the same as those identified by the contemporary press.

The inherent problem of science and technology in the policy process arises from the fact that they are crucial inputs to policy debates that are primarily non-technical in character. At the same time, when budgetary issues are involved, it is difficult for the OSTP to avoid the appearance of representing the special interests of the scientific community that is uniquely dependent on federal financial support in competition with other political and economic constituencies, especially since the discretionary part of the federal budget has shrunk from 70 per cent of the total in 1960 to 37 per cent in 1993. Also, the credibility of the OSTP in all other aspects of the policy process depends on its reputation for impartiality and freedom from the suspicion of being beholden to any external constituency — a difficult balancing act that Bromley seems to have carried out with unusual skill.

Bromley is at his best when dealing with issues in which he was directly involved. For example, there is a brief discussion of the controversy over the Supersonic Transport Program in the early 1970s and of early controversies about automobile emissions. While I happen to agree with Bromley's policy conclusions on these subjects, his discussion of the underlying science is oversimplified and partly wrong. Similarly, his explanation of the reasons for Truman's veto of the original NSF legislation is a serious oversimplification of a much more subtle and complex controversy.

Indeed, the book often disappoints when it deals with the scientific basis of policy issues. For example, there was much (in my opinion unfair) criticism of the Bush administration before the United Nations Conference on Environment and Development in Rio de Janeiro in 1992 because of the administration's refusal to agree to specific targets and deadlines for the reduction of greenhouse-gas emissions. I believe that this position was absolutely scientifically defensible, but the justification that Bromley gives is vague and unconvincing.

Comparisons of US science policy with those of Europe and Japan also seem unduly simplistic and in some cases wrong. Support for science and technology in these countries, Bromley says, is centred on a single agency, in contrast to US pluralism. In fact, defence, space and atomic energy tend to be administered separately in virtually all major countries. He also states that "essentially all" research and development (R&D) goes into this creation of "new knowledge" except in the United States, where 54 per cent funds the development of large public technological systems, mainly relating to defence, space and nuclear energy. Although there is a grain of truth here, these observations are so oversimplified as to be quite misleading.

Moreover, statistics on international comparisons are presented almost entirely in terms of ratios of total R&D investment to gross domestic product, which virtually ignores the fact that US R&D investment in absolute terms exceeds that of any of the five other major countries. No credit is given to the potential advantages of economies of scale in R&D in the United States and the greater diversity and competition of ideas made possible by the sheer size of the country. No mention is made of the fact that in Germany and Japan a much higher fraction of total national R&D (65 per cent and 83 per cent respectively) is financed by private companies with their own funds than is the case in the United States (50 per cent). This may possibly explain the outstanding economic performance of the first two countries. □

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■ *The Fifth Branch: Science Advisors as Policymakers* by Sheila Jasanoff has just been published in paperback by Harvard University Press ($20.25, £13.50). "A provocative and original work...Jasanoff has pioneered the exploring of the workings of the gears and sprockets of the Fifth Branch [of government]," wrote Daniel S. Greenberg in *Nature* **349**, 116 (1991).