as a youth, he valued theory above all else in his early career. But eventually, influenced by the small circle of rocket enthusiasts centred on Frank Malina, together with the exigencies of war in the 1940s, Tsien engaged practical issues as part of von Kármán's Scientific Advisory Group for the US Army Air Force, and evidently came to like the activity. Tsien's professional life in the United States before the McCarthy period provides a useful glimpse of international fertilization in science and engineering. One can draw parallels between his experiences and those of contemporary European refugee scientists who, despite xenophobia, made enormous contributions to US culture. But the real questions about Tsien's life reside in China.

Chang points out that Tsien's reputation helped to convince authorities that China could build missiles, but what other

factors were involved, and how did Tsien and his colleagues play them? For instance, unlike the United States, where advocates for ballistic missile systems had to compete with a dominant strategic bomber command, China possessed no long-range air force at the close of the Second World War, and so it seems that missile-building started there under very different circumstances. One would like to know how much Tsien played on, and helped to shape, China's Cold War policy for long-range missiles, and whether he relied more on political rather than technical arguments. Chang has left such questions for future study. Her work should act as a stimulus and guide. □

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Geratology comes of age

J. Grimley Evans

Crossing Frontiers: Gerontology Emerges as a Science. By W. Andrew Achenbaum. *Cambridge University Press: 1995. Pp. 278. £35, \$59.95 (hbk); £12.95, \$18.95 (pbk).*

THE history of science is only partly the history of ideas. Ideas have their own dynamic, but social factors, economics and the personality and commitment of individuals can influence their fate. Countries may learn from each other's efforts to develop a social environment in which good ideas can flourish. In its admirable exposition of the history of gerontology in the United States, this scholarly and lucid book will stimulate readers to reflect on the development of the subject, and of science in general, in their own countries.

It is not clear whether the original coining of 'gerontology' (the study of old men) as a malapropism for 'geratology' (the study of old age) was due to illiteracy or latent sexism. Most old people are women, but, although they outlive men, their extra years are mostly years of dependency. The reasons are to be found in evolutionary pressures on cellular and sub-cellular processes in organisms living in the particular social organizations adopted by human and prehuman species. Geratology therefore has firm roots in biology and social science but must justify its existence in the practical world of modern medicine. Nations are ageing; the numbers and proportions of older people in populations throughout the world are rising. The essence and challenge of ageing lie in the loss of adaptability of individual organisms as time passes. This leads in the human species to an exponential increase with age in the risk of death and the prevalence of

disability. Ageing is the product of interactions between extrinsic factors in lifestyle and environment with intrinsic propensities determined by genes and early development. Preventing and alleviating age-associated disability will require collaboration between medical, biological and social sciences.

In Britain, as in several other countries, these three streams in geratology have run in separate channels. As the book's title implies, there have been efforts in the United States to create a unified science of ageing rather than seeing it as a field that several sciences need to cultivate. In Britain, interest in old age was stimulated by the doctors who created the medical speciality of geriatric medicine in the 1950s. They were dealing with the horrors of the old workhouse hospitals, which post-war Britain regarded as no longer acceptable, and their activities were determinedly pragmatic.

Faced with the desperate realities of human suffering, they had little time or leisure to brood on the aetiology and pathogenesis of senescence. Peter Medawar raised the standard of scientific geratology in a 1952 lecture by drawing attention to ageing as a fundamental biological puzzle as well as a social challenge. Sadly, biological geratology in Britain was crippled in the 1960s by retrenchments in Medical Research Council funding. Neglect of older people by a social-work establishment preoccupied with children inhibited the development of a scientific basis for the design and deployment of social services for an ageing population. Political awareness of the sufferings of older people and the economic challenges of an ageing population has been late and remains half-hearted.

In the United States, a scientific approach to the medical aspects of ageing was imported directly from nineteenth-century continental Europe. 'Geriatrics' was a term invented in 1909 by Ignaz Nascher, an Austrian immigrant to the United States. Significantly, Nascher called attention to the poverty of older people and their neglect by social workers as well as to the clinical features of later life. Public concern for the (Unionist) veterans of the Civil War inaugurated a tradition of high-quality medical care for old soldiers that matured into the innovative Veterans Administration programmes — now international pace-setters in health-services research for older people. Needless to say, the path of the Veterans Administration has not always been smooth, as a noisy faction of Americans see in it the unacceptable face of socialized medicine. From the 1920s onward, gerontology was stimulated and supported by private and corporate donors, and this makes for fascinating reading. Some of them may have had bees in their bonnets, but in sparking off powder trails of ideas they had the edge on the anxious jobsworths of public funding. Some of my American friends suggest that Britain owes its lack of similar sparkle from private funding of science to the honours system. Potentially charitable 'fat cats' spend their (or other people's) money on buying knighthoods instead of endowing fellowships or equipping laboratories.

Most striking has been the direct involvement of older people themselves in demanding a better deal from American society. Public lobbying by the Gray Panthers of senators and congressmen was a truly terrifying sight. Letters to the *London Times* have an old-world dignity but are no substitute for the threat of personal violence in encouraging politicians to do the right thing. Tactical voting power of older Americans gave Bob Butler's superb book *Why Survive?* the clout that led to the creation of the US National Institute on Ageing and its multi-million-dollar research budget. Older people elsewhere in the democratic world need to take note.

Despite these enviable achievements, US gerontology is seen in Andrew Achenbaum's final chapter as probably remaining "at the borders of disciplinary enclaves and professional cultures" and as still embodying "too little science". Most readers will join him in seeing a pragmatic and multidisciplinary future for the study of human ageing in the systematic dissection of the genesis of disabilities. This ought to make sense to politicians and the public as well as to scientists. □

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