

concerned, only those beyond all suspicion should be granted clearance, regardless of the rights of suspects. Lillienthal, beleaguered, flawed, but understanding the stakes better than most, wrote in his diary that he would be “God damned if I would start lynching these poor devils just because Hickenlooper or anyone else didn’t have the backbone to insist on decency in these things”.

The FAS intervened on behalf of individual scientists facing clearance difficulties. It also lobbied the AEC to establish fair rules and procedures for dealing with security cases, holding that in practice the agency’s security operations were often subversive of individuals’ rights. Wang notes that, while the procedures improved, suspect scientists remained disadvantaged by having to deal with hearsay evidence about, for example, their associations, relatives and reading matter. The American Association for the Advancement of Science, the National Academy of Sciences and the FAS each attempted to forge a position on the threat posed by loyalty and security procedures to civil liberties. But in the end, Wang shows, each did little more than advance tepid recommendations for procedural reforms.

Using the records of the National Academy of Sciences and other documentary sources, Wang gives a remarkable account of the academy’s refusal to take a strong public stand in defending Condon against the defamatory methods of the HUAC. She also

illuminates the controversy that arose when, in 1949, the AEC wanted all its fellowship holders to sign a loyalty oath and a non-communist affidavit. The academy, whose National Research Council selected the fellows for the AEC, accepted the ruling; but when, in the summer, the Senate mandated that all recipients of AEC fellowships undergo FBI investigations, the academy drew the line, forcing the AEC to compromise.

According to Wang, the loyalty and security procedures established by the Truman administration helped prepare the way for McCarthyism in science. This included applying political criteria in decisions on research grants, requiring loyalty oaths for members of university faculties, and denying passports to suspect Americans such as Linus Pauling and visas to suspect foreigners such as Paul Dirac.

Wang seems at times to push her case too far. She claims, for example, that, together with its anticommunist justifications, Truman’s loyalty programme even “validated the more extreme actions of HUAC and, later on, Senator McCarthy”. Nevertheless, her overall thesis is convincing: with their increasing focus on loyalty procedures, groups ranging from the FAS to the National Academy of Sciences avoided public or even internal discussion of the ‘real questions’ of what constituted loyalty in a democratic state. They thus permitted clouds of disloyalty to hang over politically progressive dis-

senters and contributed to the discrediting not only of them but also of their ideas. □

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Beware the diseases of the will, my child

Advice for a Young Investigator

by Santiago Ramón y Cajal, translated by Neely Swanson and Larry W. Swanson
MIT Press: 1999. 176 pp. \$22.50, £15.50

Pere Puigdomènech

Science as a career has never been an easy choice for a young person. For centuries it was the domain of philosophers and the enlightened rich; it only became a job at the turn of this century. Now, when unemployment and underemployment have become commonplace for young postdocs, how is it possible to envisage science as a choice? It may seem surprising to seek the advice of someone who wrote about this question a century ago, but the author is Santiago Ramón y Cajal, in many respects a unique personality in science.

The son of a country doctor, Cajal (1852–1932) was born in a little village in the north of Spain. He trained as a doctor himself and saw military service as a medical officer in the Cuban War of Independence before becoming professor of histology at several Spanish universities and developing a deep interest in the study of nerve cells. A critical and passionate writer, Cajal was so precise in his work that his drawings are still used in present-day publications and he remains one of the most cited authors of the life sciences. He was awarded the Nobel prize for medicine in 1906, and to this day is the only Spanish scientist to receive the prize for work done in his own country. He was active in promoting science, serving for more than 20 years as president of the Junta de Ampliación de Estudios, one of the first European institutions designed to promote the education of young scientists by helping students to travel and carry out experiments.

Cajal’s *Advice for a Young Investigator* includes chapters on the qualities needed to become a scientist, the problems the young investigator may encounter and the way to write scientific papers. The book’s curious subtitle in Spanish — *The Tonics of Will* — is very typical of this author’s ideas. The will is, according to Cajal, the main feature that the young scientist has to cultivate.

One hundred years after this book was written, it evokes mixed feelings.

On the one hand, most of the advice and comments on the practice of science are perfectly valid

Rainbow reptiles

All the colours of the rainbow are to be found among the world’s reptiles and amphibians, judging by a stunning portfolio of pictures of 91 species by the Japanese photographer Ryu Uchiyama (*Reptiles and Amphibians*, Chronicle,

\$12.95, £8.99). The New Caledonian giant crested gecko, *Rhacodactylus ciliatus* (below), can vary in colour from brown and yellow to blue. It lives in trees and was thought to be extinct for more than 100 years, until it was rediscovered in 1994.





After Aesop

The Illusion of Orderly Progress (Knopf, \$20) is a collection of entomological compositions by the artist Barbara Norfleet. In the foreword, E. O. Wilson describes Norfleet's work as part of the tradition of animal fables which allows human nature to be scrutinized dispassionately. In the piece "My tribe is better than your tribe" (above), shining leaf chafer beetles (*Chrysina macropus*) confront metallic wood-boring beetles (*Euchroma gigantea gigantea*). In "The myth of coupling" (right), the two metallic wood-boring beetles (centre) are otherwise engaged while the single shining leaf chafer beetle straddles the stone alone. Norfleet is director and curator of the photography collection at the Carpenter Center for the Visual Arts at Harvard.



today. His description of the scientific method and the necessary attitude towards experiments and theories, for instance, are enriching for any present-day scientist. Anyone would recognize colleagues in his amusing descriptions of the different "diseases of the will" — sufferers include contemplators, bibliophiles, megalomaniacs and instrument addicts. His insistence that a young scholar should not be put off by the view that in science "the most important problems are solved" is also interesting. After what has happened during the past century in biology, one wonders what Cajal would think about present-day discussions on the 'end' of science.

On the other hand, the book is sometimes deliciously anachronistic. It strongly recommends studying foreign languages, especially German, "because it must be admitted that Germany alone produces more new data than all other nations combined when it comes to biology". And he is completely politically incorrect when he recommends as the ideal wife for a scientist one who "belongs

to him, whose best dowry will be a sensitive compliance with his wishes, and a warm and full-hearted acceptance of her husband's view of life". This advice is out of place in our labs full of young women but, from a historical point of view, the whole chapter deserves consideration.

The same is true when he praises patriotism as a source of motivation for the young scholar. Maybe some of these aspects are lost in the translation that converts nineteenth-century Spanish into modern English, and by the deletion of the last chapters, containing his analysis of the reasons for Spain's lack of standing in world science. Many of his comments in these chapters are, unfortunately, perfectly valid today.

The book was written by a person who had to work very hard to achieve an international standing in science, and who came from a country that was struggling to get away from its decadent imperialist tradition. He succeeded in building an easy relationship with the international scientific com-

munity and, following a rigorous methodology, he became influential as few other scientists have been.

Bearing in mind the distance in time and culture, you are left with the feeling that a high proportion of his advice is valid. It is written in the candid style of a person devoted to science and willing to help young people on the verge of making a decision that was as difficult a century ago as it is today. □

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Also new in translation

Of Flies, Mice & Men: On the Revolution in Modern Biology, By One of the Scientists Who Helped Make It

François Jacob, translated by Giselle Weiss
Harvard University Press, \$24

"It is just wonderful to read about genetics and to be reminded of details from the classics one has almost forgotten. If there were more books like this, genetics might not be under such an attack as it is now. It would be part of European culture".
Benno Müller-Hill, *Nature* 386, 668–669 (1997)

And some contemporary advice for graduate students

A Student's Guide to Graduate School in the Sciences

by Dale F. Bloom, Jonathan D. Karp & Nicholas Cohen

Oxford University Press, \$16.95, £11.99 (pbk)

German science admits to fraud

Der Sündenfall: Betrug und Fälschung in der deutschen Wissenschaft [The Fall of Man: Fraud and Falsification in German Science]

by Marco Finetti and Armin Himmelrath
Raabe: 1999, 261 pp. DM34

Alison Abbott

German science lost its innocence two years ago with the exposure of what is probably Europe's worst case of scientific fraud: the now infamous Friedhelm Herrmann and Marion Brach stand accused of brazen fabrication of data in scores of peer-reviewed publications over many years.

Thirty-something Brach has admitted guilt, but says she was taught to cheat by Herrmann, who had been her mentor, scientific collaborator and lover. The "web of sex, violence and intrigue" that bound her to Herrmann was the breeding ground for the deceit, she claims. Herrmann, 11 years her senior, says Brach had not told him that she was making up results.

The case seemed to release pressure in a fermenting barrel, for German newspapers