nuclear resonance is described quite fully, but medical historians will not find much detail on the initial applications of the modality to human subjects. What there is, however, is fascinating. The earliest devices were so small that it was impossible to image objects larger than the little finger of a small hand. While due consideration was certainly given to safety issues, in the form of brave self-experimentation by Mansfield himself, it is noteworthy that the reason why some of the first whole-body images were of paediatric patients was that only children could fit into the scanning space.

Some readers may find the structure of this book unhelpful, alternating as it often does between personal and family minutiae and fairly heavy-duty physics. Certainly scholars will want to triangulate Mansfield's account against other sources. But I enjoyed an entertaining and engaging account of a remarkable life and career. And, as I say, anything that sheds light on history of MRI is to be warmly welcomed.

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Peter Keating and **Alberto Cambrosio**, *Cancer on Trial: Oncology as a New Style of Practice* (Chicago, IL: University of Chicago Press, 2012), pp. 424, $40.00, hardback, ISBN: 9780226428918.

In the past decade the scholarship many of historians, sociologists and anthropologists has converged on the study of 'biomedicine'. The duo of historian Peter Keating and sociologist Alberto Cambrosio have been prolific contributors to this area, including a previous monograph, *Biomedical Platforms*. In their most recent work, they turn their attention to an exemplar of biomedical research: cancer chemotherapy clinical trials. Most historians of medicine assume that laboratory experiment and clinical observation are two different ways of developing knowledge about health and disease. Biomedicine, as these accounts define it, is characterised by the experimental study of these phenomena. In this view, clinical trials are a matter of routine testing. Historians of the randomised clinical trial (RCT), most notably the late Harry Marks, have emphasised the sociopolitical stakes in the promotion of statistics as an 'objective' means of testing drugs while accepting that trials were essentially concerned with the generation of facts.

Contrary to this view, Keating and Cambrosio argue that chemotherapy clinical trials should be understood as a new style of *biomedical practice* (p. 10). Clinical trials 'have become full-fledged experiments' capable of generating hypothesis (and answers) about cancer. In particular, the sheer scale of multicentre oncology clinical trials placed the biostatistical criteria of the RCT at the centre of not only fact generation but knowledge production. Keating and Cambrosio emphasise that this method of knowledge production is a hybrid characteristic of biomedicine: biological knowledge based upon statistical reasoning (pp. 20–32). In this new set of practices, statistics and protocols are as vital to knowledge production as laboratory techniques.

Keating and Cambrosio follow the development of chemotherapy clinical trial practices across institutional, professional and national borders. The development of oncology clinical trials began in 1945 and has passed through three major phases to reach the present. Following the first use of mustard-gas derivatives by pharmacologists at Yale, cooperative clinical trial groups emerged at many institutions for testing cancer chemotherapies, especially those against leukaemia. Under the patronage of the National

Cancer Institute's Cancer Chemotherapy National Service Center, the growth of these groups accelerated. These trials moved beyond serving merely as a means of 'testing' compounds according to operations-research-derived statistical criteria to become a means of generating hypotheses about the natural history of cancer. For example, the landmark success of the multidrug VAMP protocol for the treatment of acute leukaemia in 1962 not only demonstrated the efficacy of a new treatment but substantiated a theory advanced by clinical oncologists that the biological development of leukaemia passed through distinct phases, each treatable by a different drug.

From the 1960s through the 1980s, the second phase, clinical oncology, emerged as a distinct professional sub-discipline in the United States. Cooperative groups undertook multicentre and multinational clinical trials designed to evaluate not only chemotherapy by arrangements of therapy, the new generation of trials envisioned by these oncologists required enrolling thousands of patients for many years. However, the rapid expansion of clinical trials created two problems: first, the coordination and standardisation of treatment regimens over dozens of clinical sites; and, second, processing the 'tsunami' of data associated with monitoring trial enrollment and outcomes. Biostatistics became an important force not only in designing trials but in *managing* them: the unit of trials became not particular drugs but particular *protocols*. Assisted by the computerisation of the increasingly complex statistical calculations associated with RCT design, the preeminence of protocols in trials consolidated central control over individual clinicians (pp. 211–245). However, this control was tenuous: trial designs still needed patients. The clinicians who enrolled their patients in these trials often balked at continuing their involvement if interim results suggested that a new treatment was significantly better (or worse) than the control. The 'end' of these large trials became a matter of 'oncopolitics': a complex negotiation among clinicians, oncologists, statisticians and, starting in the 1980s, patient advocacy groups.

The logistical and ethical difficulties of large-scale trials and the fragmentation of cancer as a disease entity form the backdrop for the final phase of Keating and Cambrosio's work: the 'molecularization' of chemotherapy starting in the 1990s. Knowledge of the molecular mechanisms underlying cancer promised to realise the dream of designing 'rational' chemotherapies targeting specific biochemical events. The testing of Gleevec, the first targeted therapy, exemplifies these new features of clinical trials. Its first trial was not initiated by a clinical cooperative but by a pharmaceutical company: Novartis. Novartis pushed Gleevec not as a supplement in a treatment protocol in a wide market, but as a 'niche buster' drug targeting a specific molecular mechanism for a small number of patients. Its testing had to negotiate not only patient and clinical concerns but those of intellectual property (p. 319). As a successful single-molecule targeted therapy, Gleevec is likely to be an exception. However, its other features, pharmaceutical industry sponsorship, patient involvement as subjects/advocates and wide-ranging global development process, mark the present state of chemotherapy clinical trials.

Keating and Cambrosio's claim that cancer clinical trials represent a novel kind of biomedical practice is entirely convincing. In addition, the interludes they provide on the history of biostatistics or the molecularisation of cancer are among the best short histories of these developments anywhere. However, having chosen to focus so intently on the practice of clinical trials, they risk obscuring how conclusions regarding the organisational and regulatory forms of biomedical knowledge production might relate to other themes in the study of biomedicine. For example, the relationship between these new forms of biomedical practice and the expansion of state patronage for heath research after 1945 is given short shrift. This seems remarkable given the close entanglement of the National Institutes of Health with the creation of a corps of biostatistical experts and

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its later promotion of computers. Moreover, unlike Steven Epstein's study of AIDS, the presence of patients is muted. This is an inevitable consequence if one's informants are largely oncologists. Keating and Cambrosio suggest, tantalisingly, that palliative care has something to do with the continued prominence of oncologists in cancer clinical trials, but the point is not pursued.

However, these are less criticisms than indicators of the fact that the history of biomedicine has emerged as a vibrant area of inquiry. Keating and Cambrosio have made a major contribution to this area and scholars of any stripe working on cancer or biomedicine, and even the further-flung fields of statistics and molecular biology, will benefit from reckoning with its insights.

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