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Essay review

Plasmids, patents and the historian

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Genentech: The beginnings of biotech, Sally Smith Hughes. The University of Chicago Press, Chicago & London (2013). pp. 232, Price \$16:00 paper, ISBN 9780226045511

Gene jockeys: Life science and the rise of biotech enterprise, Nicolas Rasmussen. Johns Hopkins University Press, Baltimore (2014). pp. 264, Price \$35.00 hardback, ISBN 9781421413402

The recombinant university: Genetic engineering and the emergence of Stanford biotechnology, Doogab Yi. The University of Chicago Press, Chicago & London (2015). pp. 304, Price \$40.00 cloth, ISBN: 9780226143835

On New Year's Eve 1978, two biotechnology researchers, Peter Seeberg and Axel Ullrich, took a batch of bacterial clones of human growth hormone from a laboratory at University of California, San Francisco (henceforth UCSF). The pair drove the clones across town to their soon-to-be home-lab at Genentech. As junior scholars Seeberg and Ullrich had struck-out from an academic context at UCSF to work for Genentech, one of the Bay Area's first biotech firms. The event has become a loaded origin myth for the biotech revolution, and an emblem of a new cut-throat and corporate world.

Like all such myths this tale is revealing of the context from which it emerged. In biotechnology, the canon includes many other myth-like stories such as the Honolulu delicatessen-date between Stanley Cohen and Herb Boyer in 1972 when plasmids met clones. Yet Seeberg and Ullrich's late-night freezer raid is particularly interesting because it showcases tensions between university and commercial contexts, issues of ownership, junior scholars creating new paths for their careers, the possessiveness of senior scholars, a new role for new types of businesses – biotech firms – in producing therapeutic artificial human hormones, and the safety of new biomaterials circulating through a changing economy of access and exchange; one that Seeberg and Ullrich neatly short-circuited. Their act of breaking-in might just as easily be read as one of breaking-out, crossing lines and boundaries. It is also worth noting that these breaks were not total in nature, the pairs' credentials were sufficient to allow them to pass at both ends of their journey

from UCSF to Genentech. And both have, in fact, passed back into the academic world, Ullrich to the Max Planck Institute of Biochemistry in Munich, and Seeberg to the Max Planck Institute for Medical Research in Heidelberg.

Do these sorts of emblematic moments really punctuate change? How much emphasis should historians place on individuals or institutions? How should we work with subjects that are still very much alive? And, indeed, still litigious; the suit that UCSF filed against Genentech in respect of the removal of its lab materials was only resolved in 1999 when Genentech paid \$200 million to settle. One of the features of the biotech revolution is the infiltration of capital into university research. While the speed and extent of that process is still up for historical interpretation, some money has undoubtedly slid in and that cannot but change the role of the historian of academic research as much as it has changed the work and careers of academic researchers. Indeed, historians of science and technology have been drawn into the very policy debates that have formed the subject of their work, being called upon as expert witnesses or in explicit references.¹ These problems have troubled social scientists for some time, and still do.² However, they are a new challenge for those trained in the history of science, which is currently moving into ever more contemporary historical territory.³

Seeberg and Ullrich's story of derring-do features in three new histories of 1970s Bay Area biotechnology. Transformation links these three books' attempts to contextualise and explain the so-called biotech revolution. Were the roles of the research university and the purpose of molecular biology reconfigured by the arrival of a handful of biotech start-ups in the 1970s? In addressing these changes the books cover some of the same ground but there is an interesting division of labour. Nicholas Rasmussen's *Gene Jockeys* is a book about molecules, science and law. Sally Smith Hughes's *Genentech* focuses on institutions, characters and business. Doogab Yi's *Recombinant University* focuses on people, institutions, legislation and the reconfiguration of academic research

¹ See Charnley (2013), pp. 120–121, for two examples of historians of science and technology interacting directly with legal proceedings.

² See Webster (2007, 2016).

³ For one view on the role of the historian of science in the age of genetic engineering see Palladino (2003), more generally and recently see the June 2016 special issue of *Isis*: Viewpoint: The History Manifesto and The History of Science.

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culture around the Stanford University Medical School's biochemistry department and the scientific practices developed there.

The early 2010s mark a career's distance away from "The beginnings of biotech", the subtitle of Hughes's book. Perhaps the timing is coincidental, but in any case, a history-grab is now ongoing. These three books, along with several other elements, are strands in a nascent biotech industry-industry; one that is somewhat similar to the Darwin industry, but with a key difference. The firms originally involved in 1970s and 80s biotechnology, notably Genentech (which sponsored the oral history project behind *Genentech*, freely available and searchable here: <http://bancroft.berkeley.edu/ROHO/projects/biosci/>), Amgen, and Eli Lilly have become increasingly active in producing histories. These companies have made substantial donations to the Life Sciences Foundation in San Francisco which has recently amalgamated with the Philadelphia-based Chemical Heritage Foundation under a new widened remit, including the history of biotechnology. Hughes and Yi's books appear in Chicago University Press's Synthesis Series, produced in partnership with the Chemical Heritage Foundation. Government has also moved into this space; in the form of projects such as the NHGRI History of Genomics Program. Academic institutions have done likewise, creating archives such as The Bioethics Research Library at Georgetown University. A British equivalent of this activity has been the Wellcome Library's Codebreakers: Makers of Modern Genetics archival resources, and more generally the Wellcome (Burroughs Wellcome & Co.) and Leverhulme (Unilever) Trusts' roles in sponsoring and shaping historical research. The University of Leicester has long cherished the work of Alan Jeffrey's on DNA fingerprinting on its campus and King's College London displays a hording of Rosalind Franklin at its Strand campus.

The question for historians of the various life sciences is how to involve themselves, or not, in this biotech industry-industry. Historians of science might also wonder if this is a new model for industry involved research. Charting the birth of an area of entrepreneurialism, 40 years on, means doing business with the commercial entities and academic empires that emerged from that activity, with their own agendas and reasons for turning to history. Whether historians of science, or their audiences, would be best served by working with those efforts – perhaps as a corrective – or working against them, remains to be seen.⁴ The works offered by Hughes, Rasmussen and Yi suggest that maybe a little of each approach is useful.

Going back to the freezer-incident. Rasmussen here, as elsewhere when his and Hughes's books cover the same ground, gives us some more detail than Hughes. Yi, for reasons we return to shortly gives the incident only passing mention. It seems the director of the lab at UCSF, Howard Goodman, had treated Seeburg unfairly – or this is how Seeburg felt anyway – and Ullrich was not happy with his relations to senior UCSF staff either. As young academics, they saw this as a generational issue as much as one to do with ownership across academic and commercial contexts. The two issues are, of course, related. It was precisely because Seeburg and Ullrich's generation – aping the recent moves made by senior scientists like Genentech's founder Herb Boyer – was attempting to form careers in new contexts, that the scientific social mores over ownership of biomaterials had not yet crystalized (if they ever will). As Rasmussen puts it neatly, "this event marks a battle line drawn in the conflict between the professors and the junior scientists over

control of both the knowledge and the materials being produced at UCSF" (p.85).

Gene Jockeys makes several unique and welcome contributions to the history of biotechnology. The book is, of course, infused with the racing metaphor suggested by its title and this inevitably leads to a focus on winners and losers, though not just the players themselves. Rasmussen is explicit on the point. Did we all win or lose, as a society, in the 1970s and 80s gene races? This question leads to a second metaphor, that of low hanging fruit. An initial chapter on hormone research and genetics earlier in the century couched in a discussion of Kuhn and normal science sets up the context and previous work on known molecules while successive chapters chronicle the plucking of individual fruit: i.e. molecules such as insulin, human growth hormone, interferon, EPO and tPA. The same molecules appeared on everybody's lists of what to clone because these were the ripest and most well-known. This is the sort of scientific realism that is productive. I suspect it is what leads to Rasmussen's concern with over-proscription of the therapeutics that emerged from the cloning races.

Then there is Rasmussen's use of and focus on patent law. The story *Gene Jockeys* tells about the intersection of patent law, science, and scientific culture and the changing developments in each area is compelling in itself, but there is also the use of documents generated by patent litigation as an evidential base (p.8). This move, also used in Rasmussen's previous work, has its own merits, but it's hard to escape the clear message that historians of science see most when acting somewhat like private investigators in a noir thriller. While it might be the case that Rasmussen is so good at inhabiting the positions of his historical subjects in academia and bringing them to life because he was a biology graduate at Stanford in the early '80s himself, this approach also implies that given the choice, and despite the hours of interviews Rasmussen captured, on an insider's view, there is always a need to recourse to other evidence than that willingly shared by those involved.

The book ends on a look to the future and in it there is a hint of nostalgia for a moment when scientists operated with unprecedented freedom to shape research practices and agendas. Of course, to attain this freedom, they also had to commercialise their work, dominate boards and play at being directors, with far from spectacular results. *Gene Jockey's* makes clear in closing something which was well known by the end of the 1990s. The average investor, "would probably be better off betting on the 3.30 at Chepstow".⁵ Government policy for universities on both sides of the Atlantic has instead taken that bet.

Hughes has also spent endless hours in interviews. The character Hughes has derived from these contacts, adds, well, character to this institutional history of Genentech. However, the sameness of this all male cast is sometimes striking and often makes for a 'seminal' history of the most infuriating kind (p.xi). The relationship between Bob Swanson – venture capitalist, Genentech's fixer and all round lynchpin – and the company's scientists is one of the more enjoyable contrasts of character precisely because such comparisons are made but rarely. However, the psychological explanations this type of study entails are always perilous; other minds never being entirely available and self-reporting never being entirely reliable. The temptation with such an approach is to place too much emphasis on individual actions and motivations to the exclusion of historical slings and arrows. Hard-working charismatic foreigners provide the motivational force in this story on several occasions. No doubt the arrival of talented young biochemists such as Axel Ulrich or Peter Seeburg did much to spur work at Genentech

⁴ See for example the recent activist science and technology studies work by Conway and Oreskes (2010), screened in full at the History of Science Society's 2015 meeting.

⁵ Harold Baum quoted in Norman (1998) p.16.

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