

BOOK REVIEW

The Squares: US Physical and Engineering Scientists in the Long 1970s Cyrus C. M. Mody (2022) xii + 401pp., US\$65 paperback, MIT Press, Cambridge MA, ISBN 9782543613

Cyrus C. M. Mody argues, as perhaps no others have, that many of those driving the microelectronics industry in the 1960s and 1970s were ‘square’. This is an odd term, best defined, perhaps, as outstandingly ordinary. The cover of his new book, *The Squares*, carries a sepia photograph of half a dozen squares of the period, each in anonymous jacket and tie, and all rather more hirsute than they will be now. Your reviewer squirms in recollection of the dundrearies he himself sported in those days. But the cover photo is promoting an IBM 7030 computer and these men, as befits squares, are incidental. This may be the point that Mody is making: the squares are overshadowed by their accomplishments in the development of microelectronics.

Mody introduces the notion of square scientists in a journal paper of 2017 within a collection of what he calls ‘storylines’:

Which brings me to my fourth storyline: the role of – literally – button-down scientists and engineers in an era of turmoil and experimentation. My label for these people is ‘square scientists’, a term encompassing people who were not part of the youth counterculture or New Left, but who also were not part of the backlash ... we need storylines about these people to place the other storylines in context. (Mody, 2017, p.64)

Do we? Just how useful is the classification of anything in terms of what it is not? Are we the richer for knowing that squares were neither part of a counterculture nor of a backlash (presumably against the counterculture)? Elsewhere, Mody refers to the ‘excluded middle’, defined as ‘square scientists ... in the middle of American science in the 1970s ... These people have been excluded in the historiography thus far, in favor of more colorful characters on the left and right’ (Mody, 2017, p.68). ‘There is already a literature on square scientists’ Mody proclaims (2017, p.64), ‘but it is invisible *as a literature*’ [original emphasis]. There is something nicely appropriate about a scarcely visible literature about scarcely visible scientists, but *The Squares*, it would seem, is intended as a visible version of square literature.

I posit a category of actor – ‘square scientists’ – that is neglected in the dominant post-1970 storylines. I outline what little the historiography says about square scientists and sketch what a full-fledged narrative about them might say (Mody, 2017, p.59)

The Squares is Mody’s ‘full-fledged narrative’.

Chapter 1 of *The Squares* introduces the concept of ‘square’ and Chapter 7 (the last) matches evidence to concept. In between, Chapters 2 to 6 give details of some prominent individuals in the development of microelectronics and reflect on just how square they were in the 1970s. First up is David Phillips from the University of California at Santa Barbara. Phillips was into extrasensory perception, out of body experience and parapsychology, surely a colourful character. Phillips, declares Mody, was ‘doing the kinds of things that lead to the formation of regional industrial clusters’ (pp.66–7). The literature linking regional industrial clusters to extrasensory perception is also invisible. ‘At this point’, says Mody, ‘some readers may ask why I would categorize Philips as a square scientist’ (p.64). Yes, why would you? The answer is that Philips ‘identified with the squarest wing of the parapsychology community’ (p.65) and was less ‘groovy’ than many. ‘Square’, it turns out, is very much a relative concept.

Chapter 3 we will get to in a moment. Chapter 4 is about going to the moon. Mody is merciless in his use of abbreviation; a full title is given on first adoption of an abbreviation or acronym and never again. So, finding the meaning of, say, ‘JSC’s USPO, JPL’s Four Cities Program’ (p.168) requires a search over the 30 or 40 previous pages. Not beyond the dedicated scholar, but the academic spirit is fading fast.

Chapter 5 stars Jack Kilby, who worked for and with Texas Instruments (TI) and is considered square because of his “small-c” conservative presentation of self and ... publicly ambivalent or reticent stance towards the politics of the day’ (p.179). Odd to think of someone who spent the latter part of his career in Washington writing monthly – and extremely frank – reports to Fred Bucy, one of the most politically influential industrialists in the country, as politically reticent. But it is because Jack Kilby considered leftie environmentalists to be incompetent engineers that he is condemned as a square, an ultra square even. In a section headed ‘Squarest of squares’, Mody quotes Kilby’s biographer, who gushes forth that the evening meal of the young Kilby, future square, ‘was a sit-down affair with a white tablecloth and napkins and food brought in from the kitchen’ (p.180). Oh, and Mody grew up in the same state as Kilby:

Kilby was of roughly the same generation as my parents, and [this] picture of Kilby’s childhood dinners doesn’t deviate much from my mother’s recollection of meals among the small-town midwestern bourgeoisie in the 1940s. (p.180)

When Jack Kilby went to work for Texas Instruments, he ‘settled into ... as [*sic*] unexceptional white Texan suburbia, ... immersed in photography and woodworking in his spare time and [his wife] becoming an accomplished ceramic artist’ (p.181). Be still my beating heart. Later (bear with it) we find that:

Kilby’s departure from TI left him in limbo. He continued to be that squarest of squares: a white, straight, suburban, Midwestern-turned-Texan, fairly conservative (but publicly politically reticent) decidedly patriotic, military veteran and family man... Kilby had already done the thing that he would always be most famous for – and now he had to find something else to do. (p.183)

By page 183, the reader will also be looking for something else to do.

Which brings us to Chapter 6, a case study of Signetics, a Silicon Valley company that had little sympathy for the trendy and became notorious for its flagrant disregard of employee and environmental concerns. Here, but rarely elsewhere, Mody describes change in terms of company strategy rather than the characteristics of individuals. Mody talks of company men, giving Jack Kilby as an example of someone who was, and Robert Noyce as an example of someone who was not. Noyce did not simply eschew company values, the minimal walls of his open plan office allowed him both to mix with Intel’s troops and still have room to hang pictures of the aeroplanes he owned. And while TI might have treated Jack Kilby well, Bell Labs did not shirk from its corporate responsibility to expunge John Bardeen, then on his second Nobel Prize, from promotional photographs of the three inventors of the transistor. Insufficiently square perhaps and yet Bardeen would not have been out of place alongside the squares on the cover of *The Squares*.

If Mody is trying to say that those who did exceptional things in microelectronics were really quite ordinary folk, a simply assertion would have sufficed and would have spared his reader many pages of detailed description of ordinariness. Mody stops short – but not by much – of telling his readers that his squares got out of bed of a morning, put their trousers on one leg at time and went to the lavatory. Often it would seem that Mody is trying to squeeze exceptionality from men he has targeted because they seem so unexceptional: Would they have voted for Reagan? What did they feel about the war in Vietnam? Which leg goes into the trousers first? Who knows, but then who cares?

Perhaps by emphasizing the very ordinariness of Silicon Valley’s high technology pioneers Mody is challenging the many authors – including your reviewer, I suppose – who have made much

of Silicon Valley as being well out of the ordinary. To be sure, Silicon Valley has provided a model of high technology innovation that has been exploited by scoundrels all over the world. There are now multitudes of Silicon Meadows and Silicon Mountains, Silicon Forests and Silicon Bogs, Silicon Roundabouts and Silicon Paddy Fields, all seeking easy emulation of what happened in California of the 1970s. Few have succeeded in any sense, in all probability because their political progenitors accepted myth to explain what drove innovation in Silicon Valley. But Mody would seem to be just as susceptible to convenient myth. Is Mody's mission not to dispel myth by revealing that the Valley's gods actually had feet of clay?

Garages are a good example of a Silicon Valley myth: some Silicon Valley firms certainly did begin in garages. Unchecked, though, the association readily became causal, a cargo cult whose followers believe that more garages yield more high technology firms. To this day, visitors to Silicon Valley are offered tours of garages, some marked with plaques to honour the role of the garage in the nation's innovation. No stretch of the imagination is required to picture Mody's square as Silicon Shedman. Mody depicts garages as a retreat for square scientists from the excluded middle. He includes 'garage' in his brief but eccentric index and directs the reader to no fewer than seven separate pages on the subject:

One standard explanation for Silicon Valley's success is that it has long been a place with low barriers to entrepreneurship, where people want to, and can easily, form their own tech companies. There are a number of factors that *supposedly* encourage that culture, from the role of Stanford to the prevalence of garages ... but one that both actors and academic analysts agree on is the presence of a single company where dozens of entrepreneurs gained technical skills, became disenchanted and left to found businesses ... [reviewer's emphasis] (pp.224–5)

That 'supposedly' just about saves Mody's credibility, especially as he applies it equally to yet another Silicon Valley myth – that Stanford University was the cradle of innovation in Silicon Valley. Stanford was embarrassingly out of both step and tune with the Valley's entrepreneurs, and the links between it and the Valley's scientists and engineers have been largely imagined, a distortion of reality encouraged by Stanford's Dean of Engineering and Provost, Fred Terman, and welcomed as a role model by unscrupulous universities round the world. Mody cites, apparently with approval, one of the most egregious cultivations of this particular myth, *Fred Terman at Stanford: Building a Discipline, a University, and Silicon Valley* by C. Stewart Gillmor (Stanford University Press, Stanford, 2004) as if this promotion is to be taken at face value. Rebecca Lowen's (2005) review of Gillmor's book is far from complimentary: an encomium to two famous garage men, William Hewlett and David Packard, whose foundations paid Gillmor for his efforts, and a paean to Terman, who was 'not a particularly interesting person'. Terman the square, then?

And Mody briefly mentions William Shockley, co-inventor of the transistor and Silicon Valley entrepreneur. Mody does not quite appreciate the naivety of Stanford University in giving Shockley a part-time academic post. Shockley was such an unpleasant and unskilled manager of men that they fled to other companies in droves. Mody notes that Stanford students protested about Shockley's eugenic convictions. Mody might have mentioned Shockley's sperm bank, his own solution to the problem of the excluded middle. Superior genes would ensure that bog ordinary squares would be succeeded by extraordinary scientists and engineers, many of them little Shockleys. It is in this surreal context that we might flash back to Chapter 3, on interdisciplinarity at Stanford University. 'If *interdisciplinarity* is a ubiquitous keyword of American academia today', declares Mody, 'so is *Stanford*. Often they are uttered in the same breath' (p.95). Are they indeed? Chapter 7 tries to explain why this is significant. The argument appears to be that squares would follow the thinking of established disciplines and would be inclined to reject interdisciplinarity (p.273).

This is a book of about 400 pages, a quarter of them Notes at the end. Each of its seven chapters has 100 or so citations directing readers to these Notes, which contain the cited references and a farrago of other information that would have been more useful in footnotes. While the rest of the book has running heads throughout, Notes has no running heads at all. Only a single number at

the beginning of each section of the Notes tells the reader to which chapter the references refer. Worse; references are given in full just once in each section. So, for example, the book by Martin Kenney, *Biotechnology: The University-Industrial Complex* (Yale University Press, New Haven, 1986), is reference 72 on p.322. It crops up next as reference 6 on p.329, though this Kenney book of the same title was published in 1988. A later edition? Kenny appears next as another reference 6 on p.341, but just as ‘Kenny, *Biotechnology*’. Saving paper, saving ink?

Not to worry, the bibliography will reveal all. But there is no bibliography! How can this be? There is only an index, apparently random in its selection of subjects. (What is the reader to make of the entry ‘Counterculture ... in contrast to square’?), an index in which no authors figure, not even Kenney. Mody has probably had this format imposed on him by MIT Press, which has published this and dozens of other books in its Inside Technology series, including two more by the very same Cyrus C. M. Mody. Whatever its origins, the format makes *The Squares* just about unusable for the serious scholar. And for this reviewer, who ran short of the fingers required to go back a dozen pages and then forward three dozen, and then ran out of patience.

Your reviewer tires of this book. Reaching the conclusion is a delight, but the author is no nearer there to showing a benefit from his adoption of the square concept than he was at the beginning. Square, like nerd or wet, is a tempting construct, but one that should have been abandoned when it failed to add value. Instead, Mody maintains the square as a straw man, continuing to hit the wretched thing when there is no longer anything of substance left to hit. Squares were flexible and accommodating (p.207), except when they resisted cooperation, when they were not flexible and accommodating (p.293). And when it came to changing with the times, squares were just like anybody else:

Curiously, personal politics or lifestyle didn’t seem to matter that much in determining whether someone moved toward or away from socially responsible R&D; whether square or groovy, almost everyone moved toward such projects in the 1970s and away from them in the 1980s. (p.302)

What is the point of trying to distinguish those who are just like anybody else from anybody else? Mody concludes that squares took an interest in the concerns of the appropriate technology movement, but did not join in:

... none of the archival collections that I have examined contain [sic] sufficient examples of practicing scientists and engineers who collaborated with grassroots AT organizations. (p.293)

Those who rely on the absence of evidence to support their theory should tread carefully.

In his defence, Mody has been limited by his sources, basically secondary tomes and organizational archives, neither of which is likely to have had much to say about squareness, however defined. In his search of the archives for ordinariness, Mody has failed to notice a commonality in those at the cutting edge of microelectronics in the California of the 1970s, square or any other shape. This was an excitement, a thrill arising from personal involvement in something that mattered. Mody, champion of the storyline, considers those who remark on this extraordinary excitement to be second-rate scribblers of ‘popular histories [which] in particular, cast academic entrepreneurs and high-tech pioneers as norm-defying mavericks’ (Mody, 2017, p.63). But they were ‘norm-defying mavericks’ – in as much as that term captures whatever is the opposite of a jobsworth.

It is hardly surprising that this excitement has been missed in Mody’s mining of the archives to find something ordinary to supplement the existing literature. *The Squares* lacks any trace of the intensity of feeling that interviews of these men, even second-hand interviews, make undeniable – unmissable, in fact. Mody has overlooked the reality that even the most ordinary of these men were once almost beside themselves with excitement, with the exhilaration of personal involvement in something they had never anticipated. Your reviewer was privileged to interview many of those active in the American microelectronics industry of the 1970s, including a good few of those who figure in Mody’s book. Were they squares? They might have been, I suppose. I never thought to ask.

References

Lowen, R. (2005) 'Review of *Fred Terman at Stanford: Building a Discipline, a University, and Silicon Valley*', *Technology and Culture*, 46, 4, pp.854–5.

Mody, C. (2017) 'Square scientists and the excluded middle', *Centaurus*, 59, pp.58–71.

Stuart Macdonald
School of Business, University of Leicester
s.macdonald@sheffield.ac.uk

