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BOOK REVIEW

Rigor Mortis—How Sloppy Science Creates Worthless Cures, Crushes Hope, and Wastes Billions by Richard Harris. New York: Basic Books, 2017. 222 pp. $28 (hardcover), $18 (paperback), $12 (ebook). ISBN: 978-1541644144.

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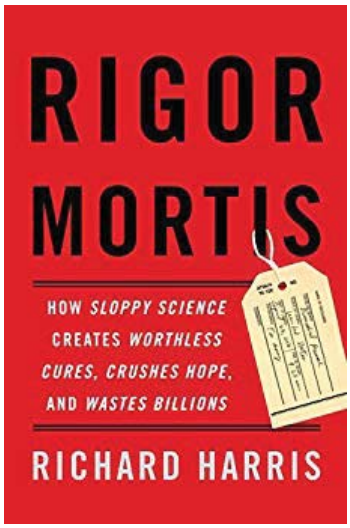
The subtitle of this book is accurately descriptive. The "science" underlying much of modern medical practice, particularly that associated with prescription drugs, is largely incompetent owing largely to faulty statistical approaches; and even when mistakes are pointed out, that does not ensure that practices change.

The fundamental trouble is that the research enterprise has become far too big and far too competitive and is corrupted by commercial and political agendas and influences. One indication of the competition-induced hype and spin is the inflated self-lauding language in articles in medical journals; the frequency of such words as "novel," "unprecedented," and the like increased by factors as great as 150 between 1974 and 2014 (pp. 190–191). The book mentions these fundamental issues but does not sufficiently emphasize them, indeed obscures them by suggesting remedies that do not get at the fundamental trouble: That researchers take more responsibility for good practices, for instance, is just whistling in the wind when the problem is systemic—as the book acknowledges in a few places: "The much harder challenge is changing the culture and the structure of biomedicine so that scientists don't have to choose between doing it right and keeping their labs and careers afloat" (p. 4); "Biomedicine's entire culture is in need of serious repair" (p. 167)—the prevalence of sloppiness, haste, corner-cutting, is amplified by the human penchant to "do what everyone is doing" (p. 187) because under present circumstances that seems effective in bringing visibility and prestige (p. 188).

In reality, official regulation must become competently evidence-based, the influence of Big Pharma needs to be brought under control, and only governmental actions could begin to do the job, including initiatives to make the research enterprise smaller rather than larger.

For people who have already delved into the pervasive errors and commercial deceits prevalent in modern-day medical research and practice



(Bauer no date), there is little new here. But the illustrations are well-chosen and powerful, and a few tidbits deserve mention:

- Surprising as it may seem, pre-clinical animal studies have often been less competently done than clinical trials with human beings, and moreover "animal models" of a human disease may not be valid models or analogues (p. 55 ff.). That matters enormously because it is the pre-clinical studies that determine what lines are followed and which are not. One common failing of animal studies had been that researchers used only male mice and not females, for reasons of convenience (p. 41); it was only in 2014 that the National Institutes of Health announced a policy to ensure that sex was recognized to be an important variable (Clayton & Collins 2014).
- Mice are used very widely as convenient animals, but the results can be entirely misleading (Chapter 4, p. 71 ff.). What happens with mice does not always jibe even with what happens in rats! The drive for reproducible results entails that researchers use carefully selected strains of animals; but the results may then be misleading because the tested subjects are too homogeneous to illustrate what happens in the real world.
- A cash incentive showed more apparent improvement than any tested drug with patients suffering from muscular dystrophy (pp. 43–44), more than suggesting that there is something wrong with how improvement is measured.
- Routine lab procedures may have unrecognized effects: cleaning glassware with acid rather than detergent can make a difference (p. 45). The mechanical means used to stir solutions can make a difference (p. 47).
- "Between 18 and 6 percent of all cell experiments use misidentified cell lines"! (p. 96) even after the mistake has been pointed out!! (p. 99). More than 1,000 published articles claiming to be about breast cancer were actually done with skin-cancer cells (p. 102). Needed precautions against using bogus cell lines are far from universally employed (p. 111).

- The problems with cell lines are mirrored by problems with antibodies. Monoclonal antibodies are supposed to be highly specific but they are not (p. 112 ff.).
- There may be about 12,000 papers based on bogus cell lines, each paper cited an average of 30 times (p. 103). The literature is highly unreliable, in other words; mistakes are not eliminated, they live on. "Years after two of the largest and most expensive medical studies ever undertaken had debunked the claim that vitamin E reduced heart attacks, half of all articles on the subject still cited the original [mistaken] study favorably" (p. 219).
- The searches for genes that influence particular conditions—obesity, schizophrenia, blood pressure, etc., etc.—have been going on for many years. A careful analysis by Ioannidis of publications in this genre identified as reliable only 1.2% of tens of thousands of articles.
- Many journals make it difficult to publish corrections to earlier-published articles (p. 182).
- The flood of publication is exacerbated by official incentives by some nations to gain prestige. Chinese scientists gain cash bonuses for publishing in *Science*, *Nature*, or *Cell*; and the authors multiply their awards by selling co-authorships (p. 178).

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