► the exception of the Morrill Land-Grant Act of 1862 — which gave land to states, enabling them to finance public agricultural and technical colleges — the US government was relatively uninvolved in research universities until after the Second World War. Public universities have dominated in the US Midwest, West and South, although these regions also have exceptional private research universities. Public universities have been more democratic about admissions, have had more students (graduate and undergraduate) and have been more vocationally oriented. To a greater extent than in Germany, many US professors have become academic entrepreneurs — teaching what they wish, developing their own research programmes, moving from discipline to discipline, obtaining large research grants that permit establishment of small firms and securing patents.

After the Second World War, the US federal government became a major source of research funding, through the National Institutes of Health, the National Science Foundation and the departments of defence, energy, agriculture and education. This influenced the research agendas of universities — facilitating both basic and applied research — and the number of researchers. US universities have also long had more funding from private foundations than have German institutions.

By the end of the twentieth century, many US public research universities had, unlike Germany's, become huge, bureaucratic, self-organizing and vastly complex. Some have numerous vice-chancellors, provosts and vice-provosts; more than half a dozen colleges (each with deans, associate deans and assistant deans); colleges with multiple departments (some with as many as 90 highly specialized faculty members); sprawling hospitals; and huge athletic programmes. Some have also managed large federal laboratories. And today, US universities seem to be in existential flux, questioning their size, function, structure, nature, philosophical bases and monumental student fees.

The Rise of the Research University charts how unpredictable and unstable university systems have been on both sides of the Atlantic Ocean. It reveals that academic soul-searching about the role of research universities is as prevalent now as it was 150 years ago. But it also shows how important these bodies remain, in both the United States and Europe, in advancing understanding of the world. ■

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BIOETHICS

Democracy *in vitro*

Insoo Hyun weighs up a treatise exploring the ethical deliberations surrounding embryo research.

One of the most celebrated paintings in Ohio's Cleveland Museum of Art is *Twilight in the Wilderness*. Frederic Edwin Church's panorama depicts a blazing sunset over shadowy mountains and a crimson lake. It signals a reverence for nature, but the blood reds hint at something darker. Church completed his landscape in 1860, on the eve of the American Civil War, and many believe that the fiery sky symbolizes the nation's expected conflagration.

Experiments in Democracy reminds me of this painting, in both its ambitious scope and its sense of unease. Science historian Benjamin Hurlbut offers a wide-angle history of US attempts at democratic deliberation on the ethics of human-embryo research. Pains-takingly researched and spanning more than four decades — from the advent of *in vitro* fertilization in the 1970s to contemporary developments such as germline editing — the book draws attention to an intricate interplay between science and democracy.

Mediating this interplay are government-sponsored bioethics bodies such as the Ethics Advisory Board of the US Department of Health, Education, and Welfare in the 1970s and the National Institutes of Health Human Embryo Research Panel in the 1990s. These serve as “experiments in democracy” wherein social imaginings of science, democracy, and the correct relationship between them are ‘co-produced’. Building on the terminology and work of other scholars at the nexus of science, technology and society, notably Sheila Jasanoff, Hurlbut laments that ethical deliberation around embryo research has always been too focused on the moral status of the embryo, with science supplying ‘facts’ and bioethics bodies providing ‘correct’ reasoning.

Standing in for the public, these bioethics bodies uncritically accepted science as an extra-political authority and used it to delimit the range of appropriate public reasons. That crowded out other legitimate perspectives, such as social-justice

More than 40 years of controversy surrounds research on human-embryo cells such as these.

considerations. Although these institutions helped to pave the way for human embryonic stem-cell research and widespread acceptance of *in vitro* fertilization, Hurlbut argues that they also narrowed the “repertoire of democratic imagination” necessary to guide our march towards a shared technological future.

Regret and lost opportunities are a leitmotif in the book. Yet, like Church's hidden brushstrokes — which lessen the painter's presence in his luminist landscape — Hurlbut's repeated use of the passive voice at key moments makes it difficult to discern who the agents were for these historical developments. In writing about scientific knowledge, for example, Hurlbut says that scientists' claims are privileged because they “are treated as *de facto* reasonable”. But, he notes, “those views that are marked as depending upon moral pictures of the world that are not accessible to others are *de facto* excluded as nonpublic reasons” — that is, as too doctrinaire and subjective to ground public policy. But who is doing this treating, marking, excluding and privileging? Is it the secular members of bioethics bodies? Is it the government sponsors who draft committee agendas and statements of task? Hurlbut obscures responsibility for these outcomes and offers no clear alternative account of how the social imaginings of science and

Experiments in Democracy: Human Embryo Research and the Politics of Bioethics
J. BENJAMIN HURLBUT
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YORGOS NIKAS/BOL. REPROD./SPL

democracy should have been co-produced.

Without any alternative positive account, one may wonder at the end of *Experiments in Democracy* what the prospects are for future deliberations on human-embryo research. With fortuitous timing, the book arrives just as the administration of Donald Trump enters Washington DC, with two ideological opponents of embryonic stem-cell research in tow: vice-president Mike Pence and Tom Price, nominee for health secretary. Many fear a revival of the 'embryo wars' of President George W. Bush's tenure, and the restrictive federal research policies introduced in 2001 (or worse). Both stunted progress in US stem-cell research, introduced great uncertainty among early-career scientists and biotechnology investors, and upended state funding priorities. How might we apply Hurlbut's insights to the battles to come?

To be fair, it is not Hurlbut's intent to issue ethical prescriptions for the future. His only normative commitment in this book is to the question of how we should understand democratic science, not what we should do politically. He wants us to interrogate the idea of "right public reason" and widen the field of potential participants. In my view, however, our greatest collective challenge is not constructing a more inclusive ideal of public reasoning. Rather, it lies in finding cause to believe that, given human nature, divisive social inequities and the current political climate, US citizens are capable of realizing such an ideal. Sadly, social media and the Internet, once embraced as tools for broadening democratic discourse, are now serving mainly to narrow and harden people's views.

At the opposite end of the Cleveland Museum hangs the enormous 'pixelated' portrait *Paul III* (1996) by the artist (and supporter of stem-cell research) Chuck Close. Close created the work by superimposing a grid over a photograph of the sitter and painting abstract forms approximating the details and colours in each square. The result is a face 'mapped' in cells — at arm's length impossible to parse, but at a distance coalescing into a man's cool stare. Close has described the effect of his portraits as the democratization of life experience. Yet there is also something unsettling about this piecemeal portraiture. It could be an apt metaphor for the coming embryo-research controversy in the United States: citizens inhabiting isolated bubbles of (mis)information who, through the aggregation of their votes, coalesce into a picture of democratic agency that one might find unappealing. ■

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Books in brief

Why Time Flies: A Mostly Scientific Investigation

Alan Burdick SIMON & SCHUSTER (2017)

Few concepts are as slippery as time, but science writer Alan Burdick takes on that wrestling match with verve. On his journey through the concept's science and psychology, he interfuses multiple storylines, from the intricate synchronization of Coordinated Universal Time to the stretch and snap of time as felt by infants and the elderly. He does a free fall for neuroscientist David Eagleman's research, delves into geologist Michel Siffre's underground studies on circadian rhythms and explores freshwater biology in the perpetual daylight of an Arctic summer. Wonderfully rich and utterly beguiling.

Amazing Stories of the Space Age

Rod Pyle PROMETHEUS (2017)

Seasoned space writer Rod Pyle returns to orbit with this cavalcade of oddball missions, many only recently declassified. We learn how the Nazis planned to reduce Manhattan to radioactive rubble with Silbervogel — a huge rocket bomber that never materialized, yet spawned key spaceflight technologies. And in 1952, rocket scientist Wernher von Braun devised an inflatable solar-powered space station. There is plenty more, from analyses of near-failures such as NASA's Apollo 8 mission to a capsule history of a late, lamented 'thrill ride': the US X-15 hypersonic rocketplane, which last flew in 1968.

Arthur and Sherlock: Conan Doyle and the Creation of Holmes

Michael Sims BLOOMSBURY (2017)

How did Scottish physician Arthur Conan Doyle conceive of Sherlock Holmes — hyper-logician, forensic genius, maverick? Michael Sims reveals a complicated birth. Holmes's real-life model was Doyle's professor, hawk-eyed diagnostician Joseph Bell; writers from Émile Gaboriau to Edgar Allan Poe offered fictional prototypes. Holmes's mastery of chemistry and occasional impetuosity stem from Doyle's own training and personality. Sims even ferrets out the influence of Robert Louis Stevenson (who also knew Bell) in Doyle's *A Study in Scarlet*. A delightful piece of detective work.

The Upstarts

Brad Stone LITTLE, BROWN (2017)

So ubiquitous are Airbnb and Uber in the world of online services that many forget how outlandish they seemed a few years ago. Technology writer Brad Stone chronicles their swift rise to the corporate stratosphere, juxtaposing visionary zeal with the often deep impacts they've left in their wakes. As he shows, "regulatory rancor" has dogged the companies in some cities, leaving Uber drivers at odds with traditional taxi services and Airbnb's hosts up against hoteliers. The book is a timely reminder that pushing the digital realm into the physical can disrupt communities as well as the competition.

Override

Caroline Williams SCRIBE (2017)

Science journalist Caroline Williams does the rounds of top neuroscience laboratories for this immersive investigation of neuroplasticity — changes in the brain induced by training. Eager to work on issues such as attention span, Williams turns guinea pig, submitting to magnetic brain stimulation to achieve better focus, geeing up creativity by means of electrodes over her prefrontal cortex, and more. The human brain, she concludes, is "an amazing thing to play with" that can do more than you might imagine. [Barbara Kiser](#)