
A Tenth of a Second: A History by Jimena Canales

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‘Modernity’ is a grand and difficult word—and one all too easily conjuring up, arguably, the somewhat one-dimensional imagery of urbane *flaneurs*, bustling trams, and the arc-lights flickering above them. And yet, there no doubt is a lot to be said about all those narratives of modernity which center on the ever-intensifying, material interminglings of men and machines—of subjectivities and artificial, machine-infused spaces—that indisputably defined this so-called modern age; or which center, if you will, on the ensuing, gradual exposure of that very figure ‘human nature’ through his (or her) own creations: ‘technologically produced stimuli...as the civilizing agents of the psyche’, as Schivelbusch’s history of *The Railway Journey* once had it [1977, 150–151 (my trans.)]. Indeed, the last three decades or so have seen no small amount of activity in the direction of such civilizing agents on the part, not least, of historians of science, who began charting the various ways in which the devices of modernity impinged on, transformed, made problematic, and helped fabricate conceptions of human physiology, perception, subjectivity, epistemology, and so on. A project which had considerable resonances and correspondences in the history of art, culture. and ‘media’, the machines of the 19th and early 20th century—from trains, telegraphs, and precision instruments to (more notoriously) gramophones, films, and typewriters—on these accounts produced, exposed, and effected many features of what began to take shape as human nature, *naturalized*.

The bigger picture that has here emerged is one that very productively illuminates the ways in which, say, the physiology of the ‘human motor’ was deeply enmeshed in the rise of factories, balloons, airplanes, industrializing cities, and alpine mountaineering; and much

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the same holds true for a variety of analogous constellations which have come under the purview of historians: the mutual entanglements of laboratory instruments, street-lighting, vision, and attention; of color-blindness, seafaring, and railway safety; of language, voice, radio, and telephony; of wartime cripples, prostheses, and the (nascent) 'cyborg', and a great deal more.¹ The book under review, Jimena Canales' *A Tenth of a Second*, squarely fits into that mold, advancing as it does, an ambitious and complex story of techno-physiological modernity as told through the lens of one such modern man/machine-effect: reaction time. Or, in more dramatic terms, the story it tells revolves around that epistemologically worrisome exposure of the non-instantaneity of cognition, its ineluctable 'temporality' (9). This rather elusive temporality—the 'lag', crudely, between stimulus and response—was something hovering in the range of a 10th of a second; or so it turned out, rather consistently, as the psycho-physiological limitations of the human observer were thrown into relief thanks, largely, to the ever more exacting, intricate, and faster workings of machines. What is more, Canales is making good use of it, somewhat reminiscent of the biography-of-a-scientific-object literature, in order to bring together a range of indisputably crucial scenes and figures in matters of Modernity—some of them familiar, others less so. Covering a period roughly from 1800 into the 1920s, in its six highly readable chapters, *A Tenth of a Second* thus moves elegantly across pertinent developments in the realms of physics, psychology and physiology, weaving, along the way, a number of narrative threads between them—not to mention the multitude of cross-references to the history of photography, cinema, and the philosophy of science; precision instruments (or metrology) naturally loom large in this story of 'micro-temporality', as do such all-time favorites as Hermann von Helmholtz, Étienne-Jules Marey, and Henri Bergson.

Though Canales very well might have capitalized more systematically, and profitably, on the historiographical proximities of her subject matter to the vast range of modern body/machine effects gestured at in the above—her preferences, as we shall see, rest more assuredly on the intellectual history end of things—this is not a 'disciplined' history, then. And it is along these lines that chapter 2

¹ See, among others, [Crary 1990](#), [Dierig 2006](#), [Hoffmann 2006](#), [Lenoir 1994](#), [Mills 2011](#), [Otter 2008](#), and [Rabinbach 1992](#).

(chapter 1 serving as the introduction) sets in with a rereading of the origins of reaction time in the first half of the 19th century. Offered as a revision of the ‘standard account’—an account promulgated, we are told, notably by the fledgling science of experimental psychology (which merely treated itself to a story of progress)—the story as painted by Canales emphasizes the rather more practical dimensions of precision measurement in the birth of reaction time; and hence, in such useful sciences as astronomy, which was then quite heavily involved in the business of time and longitude determination. The psycho-physical limitations and idiosyncrasies of human observers—soon circulating as ‘personal equations’, ‘individual differences’, or ‘observer errors’—first turned problematic within such contexts; and much effort, accordingly, was directed to controlling, effacing, and bypassing them. The very scale of the issues raised is relevant to Canales’ retelling of the standard story; the immense spill-over, in other words, of these troublesome revelations beyond the laboratories and into the various ‘cultures of reaction’ which had been coalescing around the bountiful stimuli delivered by the modern age. By the early 20th century, as Canales recounts, notions of ‘reaction time’ and its variations were pondered by Taylorist efficiency experts and a new breed of (so-called) psycho-technicians as much as by armchair anthropologists and psychoanalysts, all of whom had some stake in the matter.

Readers hoping to learn more about these broader ‘cultures of reaction’ will, however, largely be disappointed: the phenomenon in place, chapter 3 shifts gear again, exploring the crystallization of the value $\frac{1}{10}$ —and the controversies surrounding it—within the nascent science of experimental psychology. The elaborations of the phenomenon during the decades around 1870, so the story unfolds, involved only few doses of unanimity: a matter of technique, legitimate or no; of what one was inclined to read into the products of one’s inscription devices (devices, predictably, not liked by everyone); of accounting for so many sources of contamination—the apparent influence of state of attention, exercise, age, fatigue, sex, and race; and it was, to be sure, an uncomfortable question, smacking of materialism: Is the speed of thought, or of volition, measurable? Adolphe-Moïse Bloch, based at the Muséum d’Histoire Naturelle, here emerges as the principal bad sport, wasting many years and a great deal of energy on finding

defective the many attempts to prove that, in fact, there existed a meaningful and measurable entity.

Even so, the opponents of reaction time eventually lost out—no easy victory, as silencing the Blochs required the victors to alter, Canales suggests, the very meaning of experiment: the legitimization of ‘experimental systems where the subject under experimentation was an accepted component within a system composed of keys, wires, and automatic inscription devices’ [86]. If the consolidation of reaction time thus provided a central moment in the formation of experimental psychology, chapters 4 and 5 return to astronomy, and more specifically, to the run up to, and the events surrounding, the transit of Venus in 1874. Expectations were that this would be an especially delicate and fleeting event, and it made acute once more the problem of ‘individual differences’ (unless, that was, that rare occurrence be lost to science). The French, we learn, took it seriously enough to come up with an official Transit of Venus Commission. The Commission, geared towards improving the pertinent techniques of measurement and observation, promptly launched a series of pedagogical initiatives devised to come to terms with those vexing individual differences and personal errors. In this connection, it soon transpired that the production of disciplined observers only went so far, however, and the proffered solution increasingly involved getting rid of the human observer altogether. Under the heading ‘cinematographic turn’, Canales here traces the instrumental role played by the Commission in the sanctioning of the nascent (and contested) enterprise of scientific photography; and most notably in this regard, the role it played in furthering the pivotal doings of the astronomer—and pioneer of chronophotography—Jules Janssen, whose photographic ‘revolver’ was naturally poised, or so the rhetoric went, to capture objectively that elusive moment of Venus’ transit.

We are firmly on the terrain of ‘mechanical objectivity’, then, or the constructions thereof, Canales pressing the point that, all told, this was a victory by no means uncontested and total.² Canales’ narrative throughout tends to emphasize, more so than other writings on the subject matter, the observer who was implicated in all this mechanical displacing of natural by artificial eyes, rather than the instruments *per se*. Indeed, the 10th of a second, that essential

² On the notion ‘mechanical objectivity’, see esp. [Daston and Galison 1992](#).

limitation of the human observer, it transpires, turned into a salient entity wherever rapid sequences and elusive, microtemporal events were to be captured (lightnings and electric sparks, for example); whenever the requisite, chronophotographic and similar such pro-cinematic technologies of moving, animated images were deployed (zoetropes, phenakistoscopes, and so on); and wherever, as chapter 6 narrates, precision and exacting standards emerged as matters of concern. Anxiety about individual differences thus spread still further as the laboratories of that youngish science called experimental physics mushroomed toward the end of the century. Dedicated to rigorous, metrological ideals, the deplorable existence of a physiological unit of time threatened to sabotage even its grandest and most useful endeavors in precision measurement—then launched at places such as the German Physikalisch-Technische Reichsanstalt or its US pendant, the Bureau of Standards. But it had its loftier effects too: as Canales is keen to show, by now, the 10th of a second had long turned into an intellectual specter of sorts, traceable into the influential musings of a Ernst Mach or Pierre Duhem. The final chapter accordingly is devoted to the fundamental divergences which erupted in the early 1920s between two grand thinkers of time indeed: Henri Bergson (no friend, famously, of sliced up time *à la* cinematograph) and Albert Einstein (someone not so inhibited).

If their talking past each other hinged on the smallest moments of time—and their (non)perceptibility—so did, as Canales argues in her conclusion, a great deal of what is called modernity. And sure enough, the story of reaction time, exemplary for that disturbing revelation that ‘bodily differences affected knowledge’ [10], may very plausibly be read as one crucial ferment in this narrative, forever frustrating those modern dreams of progress, exactitude, and universality (with intellectual repercussions, as Canales suggests, well into the 20th century). Exploring the realms of micro-temporality, as should have become clear, also allows her to draw up an unusually wide and synthetical picture, one which has much to offer to historians of science, photography, and philosophy. Indeed, even as many of the cast are familiar, if not canonized, by zeroing in on the 10th of second Canales still manages to draw together a great many only apparently disparate things in a refreshing and very accessible account.

That said, synthesis tends to come at a price; and most curious perhaps in this regard, the 10th of a second, ostensibly the book's subject matter, remains a strangely unproblematized and under theorized object. As other reviewers have noted, its ontological status is never quite explicated. In itself, this would not be much of a problem, of course—for historians at any rate (who may remain agnostic)—were it not the case that Canales' narrative at times borders on imbuing that elusive fraction of a second with a quasi-causal, historical agency. While one certainly need not worry that *A Tenth of Second* aspires to deal in psycho-history or some such naturalistic sin, it would take little imaginative effort to read it as such (were one so inclined); and even so, the somewhat ill-specified status of Canales' semi-physiological protagonist tends to slightly diminish the force of her overall argument. It is not, for example, always clear what the exact stakes were and who were the various parties involved in the numerous controversies that she examines in the course of her book, nor what ultimately connected them, their convergence on the temporal nature of cognition apart. Similarly, despite the obvious emphasis on instrumentation in her account, the detailed workings and the technological background of the production of such minuscule, exacting intervals of time—'time microscopy', in the words of the great Helmholtz—will largely have to be inferred. (Readers familiar with, say, Rebecca Solnit's story of chronophotography in the 'Technological Wild West' [2003] will find perhaps too much credit given in this regard to the European metropolises). Or again, whence the cutoff, or 'closure', of the story around 1920 is an issue likewise given somewhat short shrift; it certainly is one that may have deserved better justification, however, assuming that human, cognitive 'reactions' and perceptual competences became more rather than less significant as the world gradually turned post-industrial.

The result is the occasional feel of montage. Indeed, no fully consistent, historical explanation emerges as to why 'reaction time' popped up in so many places, whence it seemed so significant to so many actors. There are, to be sure, pointers enough. Above mentioned 'cultures of reaction', for one, may have provided one such line of historical argument, illuminating the import of 'reaction time' from a wider, cultural rather than primarily intellectual perspective. There is mention, for instance, in this connection of the significance of the Franco-Prussian war, and of the less academic dimensions of reacting (quickly), but little is made of it. The same may be said

for its appropriations and elaborations by psycho-technicians and other folk taking an interest in the optimal, visual performance not merely of scientists but a much vaster population of laboring men and women. On a related note, one might complain that psycho-optical phenomena such as ‘flicker’ and ‘fusion’ meant food for thought not only to aspiring cinematographers but also to those, say, who were engaged in the more mundane (and emphatically modern) tasks of street lighting and factory illumination.

‘Reaction time’, in other words, may have been a thing with more, and more profound, connections to the real world than what Canales’ at times slightly science-centered narrative would seem to suggest. Or a stronger, and even richer, case may have been made by embracing a wider and less aesthetic notion of the modern; by embracing a world, that is, increasingly, and quite generally, infused with signals, symbols, and messages emitted from all manner of machines.

The fact remains that conveying the intricate genealogy of a thing such as ‘reaction time’ is no trivial task, and these criticisms should not distract from Canales’ considerable achievement in this direction. Indeed, in the days of Google-based research, we would all seem to be facing the challenge of narrating a somewhat rhizomatic, sprawling, and non-linear kind of material; and here, when it comes to writing the correspondingly complicated histories, one could do a great deal worse than taking Canales’ story as a model case (something still rather hard to come by, certainly as regards the history of science). Whether or not, then, the realms of the microtemporal in fact do allow us ‘to rethink ‘modernity’’, as Canales claims, ‘both as a chronologically delimited period and as a conceptually defined category’, is a quite secondary matter from this perspective [219]; at the very least, *A Tenth of a Second* is an unusually well crafted and intelligent complication of a *certain* story of modernity: one in which scientists and philosophers set the tone, and one that prominently features that classical *topos*—a profound crisis of perception induced by the irresistible progress of technology.

BIBLIOGRAPHY

Crary, J. 1990. *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century*. Cambridge/MA.

- Daston, L. and Galison, P. 1992. 'The Image of Objectivity'. *Representations* 40:81–128.
- Dierig, S. 2006. *Wissenschaft in Der Maschinenstadt*. Göttingen.
- Hoffmann, C. 2006. *Unter Beobachtung. Naturforschung in Der Zeit Der Sinnesapparate*. Göttingen.
- Lenoir, T. 1994. 'Helmholtz and the Materialities of Communication'. *Osiris* 9:184–207.
- Mills, M. 2011. 'Deafening: Noise and the Engineering of Communication in the Telephone System'. *Grey Room* 43:118–143.
- Otter, C. 2008. *The Victorian Eye: A Political History of Light and Vision in Britain, 1800–1910*. Chicago.
- Rabinbach, A. 1992. *The Human Motor: Energy, Fatigue, and the Origins of Modernity*. New York.
- Schivelbusch, W. 1977. *Geschichte Der Eisenbahnreise. Zur Industrialisierung Von Raum Und Zeit Im 19. Jahrhundert*. Munich.
- Solnit, R. 2003. *River of Shadows: Eadweard Muybridge and the Technological Wild West*. New York.