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Introduction: Surface Histories

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The first section of this issue brings together four essays on "surfaces" – a subject matter which might seem conspicuous or, indeed, palpable enough. Just think of the sheets of paper, window panes, and haptic interfaces surrounding you: the world, evidently, is diffused with surfaces, membranes, and boundaries of all sorts. Some of these things have been salient, for obvious reasons in fields such as media studies, or implicit in notions such as "boundary object"[1]: the retina, photographic plates, basilar membranes, the skin, or various forms of "displays" immediately come to mind.[2] Not even mentioning their immense metaphoricity, surfaces are the entities that make things visible, inscribable, or knowable. But not all of them have been so salient. In fact, most surface-phenomena arguably – and, typically, for similarly obvious reasons – haven't received much scholarly notice at all: plastic wraps, lacquers, lubricants, coatings, silicon wavers, cell membranes, glass, plant leaves, the ozone layer.

By no means is the subject – surfaces – exhausted by the usual, media-inflected considerations. On second thought, the subject points toward a more heterogeneous, mundane set of materialities, typically less glittering than the sleek *interfaces* that surround us (First-Worlders) in particular, but no less important. Surfaces, after all, are the entities that connect, separate, and delineate things as well as places and people. It makes them, or so this special issue contends, a worthwhile pursuit for historians of science. What we have in mind here is no metaphysical endeavor (say, a philosophy

[1] Examples would include Ward 2001; Von Arburg 2008; Galloway 2012; and Harwood 2012. Closer to home, Laura Otis has ventured into the realm of "membranes," and the interplay of inclusion and exclusion in nineteenth-century literature and science, with an eye on topics such as the self or infection (see Otis 1999). On "boundary objects," see the classic paper Star and Griesemer 1989, 387–420.

[2] Arguably the most prominent case is provided by the entanglements of visual physiology and imaging technology, leading to the late nineteenth-century optogram craze. See the pioneering essays by Richard Kremer and Christoph Hoffmann (Kremer 1997; Hoffmann 2001).

of surfaces, which might cover all these various cases and bind them into a common conceptual framework); nor do we suggest that what we really should be doing is producing histories of such things as lubricants or industrial filters. What we do suggest – and what our four essays, dealing with skin, glass, the retina, and organic coatings, respectively, demonstrate – is that "surfaces" provide a productive prism or, indeed, an historiographical interface of sorts: surfaces, by virtue of their conceptual and/or material porosity, thus can attune us to the synchronicity and multiplicity of events, places, and bodies of knowledge that go into the making of any one idea, theoretical edifice or set of practices. Heeding surfaces, in this view, can be historiographically productive precisely because they serve, by reflecting, transducing, absorbing, separating, or figuring as a substrate of one sort or another, as both agents of exchange as well as sites of precipitation.

The multiple entanglements of film – on celluloid – and films – those coating biological cells – provide a vivid example, familiar notably thanks to Hannah Landecker's work on the intersections of early twentieth-century media theory and cell biology (Landecker 2005). And there seems to be no need to stop here: such material resonances – the quasi-life of surfaces – could be traced further into the copious, material cultures of the filmic, exposing ways of knowing as fluid and useful as they were central to triangulating the "life" of the cell: photochemistry, the theory of emulsions, the sciences of food, and so on. In fact, film – in defiance of common expectations – was a topic rarely concerned with "the cinema" only, as the versatile British physiologist-cum-colloid-chemist William Bate Hardy noted at the time. Rather, it was concerned with the exceedingly complex "films spread over the surface of each living cell" and "those thin films of matter, familiar to all in the form of soap bubbles or lubricating films of oil" (Hardy [1926] 1970, 109).

Chitra Ramalingam's essay in this special issue, titled "Dust plate, retina, photograph," offers an exemplary analysis of such convertible surface-elements. She explores the early to mid-nineteenth-century fascination with "transient" phenomena – electric "sparks," among others – and the coming together therein of metal plates covered in fine dust, human eyes, and surfaces covered with light-sensitive, chemical emulsions. A related problematic is pursued by Henning Schmidgen, in his account of Hermann von Helmholtz's famous experiments on nervous excitation in the 1850s: supplementing the equally famous history of the "graphic method" with that of a nondescript, gluelike nineteenth-century commodity called "isinglass," Schmidgen's case neatly demonstrates how histories of "inscriptions" – qua surface/screen/display – carry in their trail a veritable rhizome of historical materialities onto which the various pencils of nature might then leave their more or less appealing traces. What is more, such "surficial" trails easily lead off into the lesser-known territories, as both Kijan Espahangizi's and Alexander von Schwerin's essays show. Taking his cues from a largely taken-for-granted piece of scientific equipment, glass, Espahangizi argues for the significance of "separating" as an epistemic regime, quite on par with the historiographically more familiar scientific preoccupation of "fixating" or "inscribing"

phenomena on paper, collodion, cathode ray tubes, etc. Schwerin, for his part, is concerned with a more bodily kind of boundary – the skin – and a different aspect of surface activity – protection, or to be precise: DNA repair mechanisms. "Skin," it turns out, is a suitable vehicle allowing to fold the narrative of the life sciences' "molecularization" back into broader histories of the twentieth century, from cold-war radiation hazards to late-modern beauty-products, or from protection to regeneration.

"Surfaces" then, as they are conceived here work as a device for multiplying historical entanglements, a device for generating historical narratives alert to the material substrates of knowing. Not least, they have the virtue of steering narratives into seemingly off-beat directions: skin/molecules, isinglass, practices of separation. In this regard, our four case studies barely have scratched the surface, as it were. The history of science, technology, and media is tremendously rich in surface things, from the glitzy to the banal.

As the allegedly first text book on industrial filtration from 1923 exemplifies, many sciences have coalesced around such surface things: "from the phenomenon of plant osmosis to the ordinary straining of breakfast coffee." Surfaces are surrounding us "constantly on every side, although [they are] seldom noticed or appreciated as such" (Bryden and Dickey 1923, see "Preface"). In the generally surface-conscious interwar period, this was something of a truism: "It was a surface world." And unsurprisingly so, perhaps, given the preponderance of pertinent things to think with. At the time, photographic mass (re)production, urban centers impregnated with billboards, and illuminated display windows, sciences such as colloid chemistry, solid state physics, cell physiology and biophysics were all celebrating their heydays, or at least beginning to emerge.[3] As cultural pessimists complained about the overabundance of modern, superficial distractions, chemists awed at "molecular sieves" or the wondrous semi-permeability of biological membranes: items driving home the point that surfaces were all important, constituting nothing less than a "fourth state of matter."[4]

While the acute forms of surface-awareness exhibited in the 1920s and 1930s may have been peculiar, such surface worlds weren't a fascination exclusive to the interwar period. Surface phenomena had perplexed (not least) scientists for generations and would continue to do so – Simon Schaffer's 2004 essay on "Soap Bubbles as Commodities in Classical Physics" is a case in point, treating on the career of the subject in the Victorian era (Schaffer 2004; also see Mendelsohn 2003; and Tanford 2004). Nor did "surfaces" (or the entire meso- and macrocosm of matter) simply vanish, as science proceeded to uncover and take command of the remoter microworlds: molecules, nano-structures, and so on. Whereas the post-World War II life sciences, for example, are primarily associated with things molecular – proteins and DNA – the

[3] On surfaces in interwar culture, see, for example, Ward 2001. The prominence of surface sciences at the time, most notably at the examples of colloid chemistry and cell biology, is shown e.g. by Ede 2007 and Landecker 2007.

[4] Cited is the British colloid chemist, Sir Frederic Donnan (see his "Preface" in Rideal 1926).

preoccupation with more or less organic surfaces never entirely withered either. Images of membrane and surface ultrastructure proliferated with the electron microscope, and in the late 1960s, Max Delbrück, of all, enthused: "I am now very much in the business of learning about electron transport and related membrane phenomena that might be special two-dimensional solid state physics gimmicks." By then, Delbrück, as were other so-called molecular biologists, was after a "transducer physiology"; that is, an understanding of how cells, excitable tissues and sensory membranes transformed stimuli into bodily "signals."[5] In the even more recent past, "liposomes," membrane-enclosed simulacra of cells, became not only research tools but literal vehicles of the cosmetic industry and medicine, in what were described as "guided missiles" to deliver drugs specifically in the body (Bangham, Hill, and Miller 1974; Schmeck 1979).

In short, there probably never has been a lack of interest in surface phenomena. And yet, as the above examples intend to convey, they seem to have largely eluded historical attention – notwithstanding the fact that these phenomena presumably were, or are, "familiar to all." In part, this may have to do with the grand, and one could say "corpuscular" narratives of science, such as the story of the atom, the nuclear, or the "molecularization" of the life sciences. Objects of the macroscale, their uses and their sciences frequently seem to have no systematic place, let alone historical agency, in these narratives. And in part, this may have to do with the fact that, on the face of it, many surfaces lack the kind of sex-appeal that tends to make scholars listen up immediately (think "industrial filtration," rather than, say, "video"). Membranes, surfaces, and boundaries, separating and connecting both literally and in a metaphorical sense, thus add an elusive and less explored dimension to an historiography of science focused on objects and materiality. In spite of, or rather, because of their often unimposing nature, surface phenomena, as this special issue demonstrates, prompt historians of science to tell stories significantly rearranging narratives and priorities – surfaces, after all, are always subtly at work, encircling us "constantly on every side."

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[5] Letter Max Delbrück to Efraim Racker 25.1.1966, Delbrück Papers, California Institute of Technology Box 18, Folder 8; see also Delbrück 1969. On electron microscopy of cell membranes and surfaces, see Rasmussen 1999.

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