

Beny Wagner

Plasmaticness and the Boundaries of Human Perception

In recent years, I have observed a prevalence of artistic practices that explicitly aim to reach beyond the limitations of human perception in order to formalize expressions of a continuum between human and nonhuman entities. The motivations driving this expansion of human subjectivity into previously imperceptible realms might include, but are not limited to: wide scale recognition of the destructive impact of human behaviors towards other life forms manifested in perpetual ecological crises, the discoveries in recent decades of a deep material continuity between the human body and the environment on a microbiological scale, a historical decentralization of human subjectivity made tangible through networked technologies. Contemporary artistic practices have grappled with such issues through a wide range of expressions by attempting to make scientific knowledge approachable through the senses. The central challenges of this task involve developing new aesthetic frameworks capable of mediating processes that are either too big or too small, too slow or too fast; in other words, too widely distributed through space and time to be absorbed by the unmediated human perceptual apparatus. What do long term changes in an ecosystem look or feel like for the human perceiver? How might we consciously experience the decentralized functions of the microbiome? How do we grasp the ways in which

agency is exchanged between different life forms? As an artist and filmmaker, I am particularly invested in exploring how moving image media, in their relationship to indexicality and time, confront such questions. Throughout their history, moving image technologies have been crucial mediators between human perception and processes that unfold in otherwise imperceptible spatiotemporal dimensions. The historical emergence of cinema was predicated on the realization that a sequence of images set in movement at a rate of twelve or more frames per second, allows the human eye to perceive a continuous duration. This newfound ability to reproduce duration was simultaneous with the realization that such a constructed duration is malleable; it can be slowed down to create slow motion or accelerated to create time-lapse. These techniques, central to the use of moving images in science as in art, demonstrate the tension manifest in the human drive to transcend its perceptual limitations. On the one hand, moving image technologies allow us to perceive—and crucially, to acknowledge—the many nonhuman processes among which human life unfolds and upon which humans depend. On the other hand, moving images absorb the many heterogeneous dimensions of different life forms or distributed processes into the specifically determined logic of cinematographic motion, actively transforming the objects of inquiry in the process. Can moving image technologies de-center human subjectivity to the extent that it would be possible to escape the limitations of human perception, or do we, in the process of trying to make nonhuman entities and processes comprehensible to us, alter the nonhuman to fit into our limitations? Is it possible to recognize the broader implications and potential pitfalls of the human drive to reach beyond itself?

In the following text, I situate these concerns in two specific historical objects that I have found illuminating with regards to the central tensions and contradictions

in the cinematographic extension of human subjectivity into nonhuman life forms and processes. The first half of my inquiry concerns Sergei Eisenstein's concept of "plasmaticness," a theory of continuum between human and nonhuman processes that the cinema, according to Eisenstein, allowed humans to experience directly. Originally formulated in the early 1940s in response to Eisenstein's admiration of Walt Disney's animated films, the concept of plasmaticness emerged from a broader discussion among early filmmakers and commentators about the perceived privileged access that cinema had to "life." The relationship of cinema to a particular conception of life in the first half of the twentieth century was not simply metaphorical or poetic. In order to underline this, I will also deal with the scientific application of cinematography to microscopic observation—microcinematography—which produced unprecedented views of organic processes. Films of cellular generation and transformation testified not only to fundamental building blocks of life but to a fluid exchange between the human and nonhuman. Cinematography was the means by which interdependencies between entities and scales were made visible. But in fusing organic movement to cinematographic movement, it became difficult if not impossible to determine where agency was situated, whether in the otherwise imperceptible organisms or in the technology itself.

The second half of the text contrasts the idealism with which Eisenstein conceived of plasmaticness with the short educational film *The Enemy Bacteria*, produced by the US Navy in 1945. Made in exactly the same period as Eisenstein was elaborating the qualities of plasmaticness in relation to Disney animations, *The Enemy Bacteria*, produced by several Disney animators, combined animated cartoons, microcinematography, and live action to construct a narrative of microorganisms as dangerous and unruly forces of nature. For Eisenstein, the plasmatic fluidity that eradicated the boundaries between

human and nonhuman beings was a revolutionary force of liberation from the shackles of a cultural logic of regulation, but for the creators of *The Enemy Bacteria*, the same ability of organisms to fluidly transform, made visible through the same techniques of animation, represented a grave threat to humans, one that needed to be dominated.

The stark, even polar, contrast between these two approaches to the cinematographic mediation of non-human life, is, I believe, not simply a matter of ideological perspective, but is in fact constitutive of the material conditions of moving image technologies in themselves. The tension between perpetual transformation and regulation, fluidity and stasis, freedom and domination, is present at the base level of cinematography, before any decision has been made as to what kind of images should be made and to which purpose they should be applied. By reading the concept of plasmaticness in relation to *The Enemy Bacteria*, I aim to probe the ways in which technological mediation extends human subjectivity and the conclusions such extension affords about the nonhuman processes within which human lives emerge.

Plasmaticness

Sergei Eisenstein wrote the sketches for his essay *On Disney* between 1941 and 1945. In these writings, he formulated the concept of plasmaticness, a term that combined a range of ideas about movement, change, plasticity, fluidity and rhythm that pervaded the ideas of many filmmakers and commentators of the early cinema. In trying to define plasmaticness, Eisenstein repeatedly appealed to a primal power of ceaseless transformation exhibited by organisms, but also by fire or water, a quality of things that “behaves like the primal protoplasm, not yet possessing a stable form, but capable of

assuming any form.”² Eisenstein understood this primal protoplasm to be pulsing through the moving image. Cinema, in his conception, was not a passive receptacle of plasmaticness but its very catalyst; it had managed to break through the layers of cultural convention that had buried the primal force of metamorphosis under its logic, and tap into the flow of life itself. Plasmaticness emerged from the union of a prototypically modern technology—cinematography—and the boundless energy of organic transformation unbound to cultural logic or history. Plasmaticness didn’t simply impart organicism to the apparatus, or mechanism to living things,³ but as Esther Leslie elaborates, it usurped the very idea of nature, so that: “nature becomes non-nature, anti-nature, something in movement.”⁴ The power of plasmaticness was its *integration* of elements—human, organism, mechanism—that have been conceptually separated by a culture that Eisenstein viewed as “shackled by logic, reason, or experience.”⁵ Walt Disney’s animations, particularly from the *Silly Symphonies* series (1929–1939) pulsed and vibrated with plasmaticness (fig. 1). The seemingly inexhaustible plasticity of the figures that stretched, contorted and metamorphosed on screen was, in Eisenstein’s eyes, the manifestation of an elemental force: “Disney’s art [is] the purest model of *inviolably natural* elements, characteristic of any art and here presented in a chemically pure form.”⁶ Eisenstein depicted Disney as a sort of modern magician who had learned to conjure the otherwise invisible rhythm of life itself and transform it into the vibrant beings

2 Sergei Eisenstein, *On Disney*, ed. Jay Leyda, trans. Alan Upchurch (London, New York, and Calcutta: Seagull Books, 2017), p. 32.

3 Thomas Lamarre, “Coming To Life: Cartoon Animals and Natural Philosophy,” in *Pervasive Animation (AFI Film Readers)*, ed. Suzanne Buchan (New York: Routledge, 2013), pp. 117–141.

4 Esther Leslie, *Hollywood Flatlands: Animation, Critical Theory and the Avant-Garde* (London and New York: Verso, 2002), p. 230.

5 Eisenstein, *On Disney*, p. 6.

6 *Ibid.*, p. 20.



Fig. 1: Film still from *Merbabies* (dir. Walt Disney, USA 1938).

on screen. The experience of freedom that came from watching the process of perpetual transformation had far reaching implications for Eisenstein, who initially saw in Disney a force of liberation “for the suffering and unfortunate, the oppressed and deprived. For those who are shackled by hours of work and regulated moments of rest, by a mathematical precision of time, whose lives are graphed by the cent and dollar.”⁷ Plasmatic cinema had the power to fuse the elemental power of organic change with individual experience and in the process, awaken a primal force latent within each person as the desire for freedom as transformation.⁸

⁷ Ibid., p. 8.

⁸ Plasmaticness emerged from a range of ideas and concepts about life, movement and change that drove both practitioners and theorists of early cinema, including Germaine Dulac, Jean Epstein and Jean Painlevé, to point to a few of the best-known thinkers who sought to understand cinema as a set of relations intertwined in the transformation of living things. Recent scholarship in film and media studies has sought to recontextualize these figures and their perspective on cinema, as film scholarship departs from the psychoanalytic and semantic approach of mid and late twentieth century film theory, to views of cinema as an evolving set of material, ecological, energetic

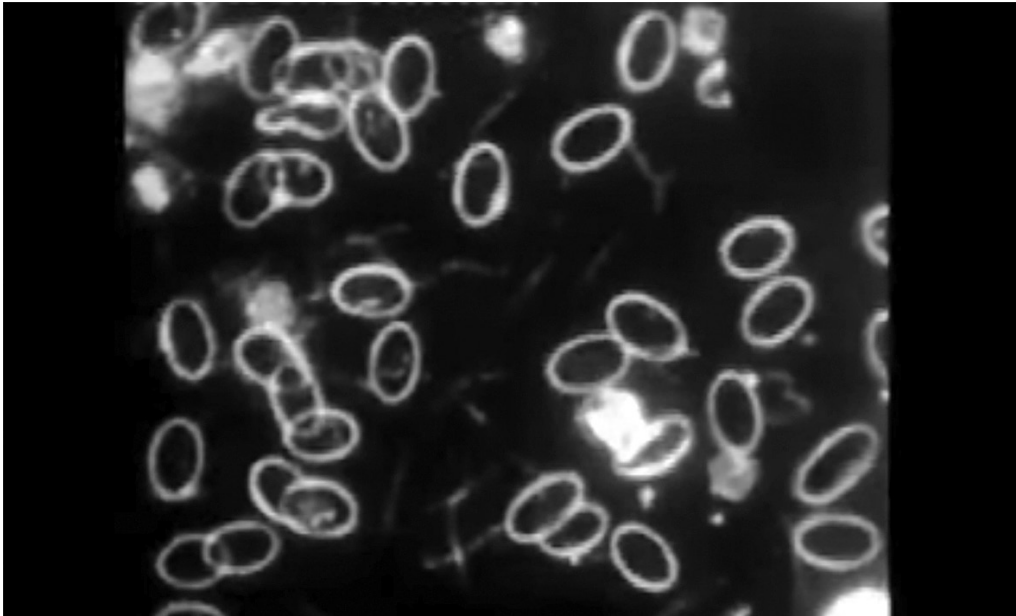


Fig. 2: Film still from *Spirochaeta Pallida (Agent de la Syphilis)* (dir. Jean Comandon, France 1909).

If life is that which moves itself, and cinema produces motion, is cinema life? In his work on the history of animation, Thomas Lamarre refers to the “movement-as-life”⁹ paradigm, so central to the scientific and philosophical investment in early moving images, and which invokes the dual meaning of the word animation: at

and affective relations. The preoccupation of early cinema with notions of life, movement and change therefore presents a rich reservoir of ideas for recent scholarship to recontextualize the moving image in those relations. Examples of recent scholarship in this area include but are not limited to: Inga Pollmann, *Cinematic Vitalism: Moving Images and the Question of Life* (Amsterdam: Amsterdam University Press, 2018); Teresa Castro, “An Animistic History of the Camera: Filmic Forms and Machinic Subjectivity,” in *A History of Cinema Without Names*, ed. Diego Cavalotti, Federico Giordano, and Leonardo Quaresima (Milan and Udine: Mimesis, 2016), pp. 247–255; John Mackay, “Film Energy: Process and Metanarrative in Dziga Vertov’s *The Eleventh Year* (1928),” *October* 121 (2007), pp. 47–78; Katherine Loew, “The Spirit of Technology: Early German Thinking about Film,” *New German Critique* 122 (2014), pp. 87–116; Shane Denson, *Postnaturalism: Frankenstein, Film, and the Anthropotechnical Interface* (Bielefeld: transcript, 2014); Jesse Olszynko-Gryn and Patrick Ellis, eds., *The British Journal for the History of Science* (Special Issue: *Reproduction on Film*) 50, no. 186 (2017).

⁹ Lamarre, “Coming To Life,” p. 118.

once a humble gesture of making something move, and at the same time, the mighty act of bringing something into being. The slipperiness between these two meanings is nowhere more apparent than in the emergence of microcinematography, which can be traced to as early as 1891, in Étienne-Jules Marey's application of chronophotography to microscopes.¹⁰ Much more than a tool of representation, microcinematography was, as Jimena Canales writes, "a metaphysical machine";¹¹ in providing unprecedented access to the movements of organic transformation, microcinematography was a central foundation of cinema's ontology. Working at the intersection of science and film, figures such as Jean Comandon, F. Martin Duncan, Frank Percy Smith and Jean Painlevé introduced views of moving and transforming microorganisms into the public sphere such as Comandon's hugely popular early films showing the bacteria that caused syphilis (fig. 2). While early microcinematographic films were often viewed in the context of entertainment, Hannah Landecker outlines the profound implications such films had in the cultural and scientific imagination: "For both biologists and cultural observers, these [microcinematographic] films were experiments in seeing and perceiving life, not just living things, but that which was understood and narrated as the fundament of life."¹² Eisenstein's concept of "plasmaticness" emerged from a close engagement with the vibrant exchange between the cinema and the life sciences. Marie Rebecchi has pointed to Eisenstein's close friendship with Jean Painlevé, as evidence of how closely Eisenstein's own ideas grew from his encounters

10 Oliver Gaycken, "'The Swarming of Life': Moving Images, Education, and Views Through the Microscope," *Science in Context* 24, no. 3 (2011), pp. 361–380, here pp. 361–366.

11 Jimena Canales, "Dead and Alive: Micro-Cinematography between Physics and Biology," *Configurations* 23, no. 2 (2015), pp. 235–251, here p. 237.

12 Hannah Landecker, "Cellular Features: Microcinematography and Film Theory," *Critical Inquiry* 31, no. 4 (2005), pp. 903–937, here p. 905.

with scientific films, such as Painlevé's *Mouvement du protoplasme d'Élodea canadensis* from 1927, which must have influenced his theory of a primal protoplasm.¹³ It is clear, when Eisenstein refers to Disney's cartoons as "the purest model of *inviolably natural elements*,"¹⁴ he is drawing on an idea of life as essence. Microcinematographic films, which presented what Oliver Gaycken calls the "swarming of life"¹⁵ everywhere in our midst, seemed to validate the idea that *life* was a unifying flow that permeated but was separate from specific *lives*.

Yet the movements of life forms glimpsed through microcinematography were inseparably fused with cinematographic movement, presenting a perspective of organic movement that exists nowhere outside of the moving image. Microcinematography combined the microscope's spatial magnification with the "temporal magnification" afforded by time lapse techniques. By recording a cell, for example, at regular intervals, and recombining each image into an animated sequence, it became possible to observe microbiological processes that are otherwise too slow or too fast to be observed by the human eye and microscope alone. In this way, the spatial and temporal dimensions intrinsic to microorganisms are converted into what Marie Rebecchi calls the "hetero-temporality of the vegetal world."¹⁶ Organic phenomena are contorted to perform an altered version of their own transformation, shaped by the standards of cinematography, which themselves derived from the study of the human physiology of perception.¹⁷ In early

13 Marie Rebecchi, "'The Beginning of Life'. The Birth of the Cinema, the Birth of a Flower," *La Furia Umana* 39, <http://www.lafuriaumana.it/index.php/73-archive/lfu-39/947-marie-rebecchi-the-beginning-of-life-the-birth-of-the-cinema-the-birth-of-a-flower> (accessed October 29, 2021).

14 Eisenstein, *On Disney*, p. 20.

15 Gaycken, "The Swarming of Life."

16 Rebecchi, "The Beginning of Life."

17 See Jonathan Crary, *Suspensions of Perception: Attention, Spectacle and Modern Culture* (Cambridge, Mass.: MIT Press, 2001); Pasi Väliäho, *Mapping the Moving Image: Gesture, Thought and Cinema*

microcinematography, what appeared to observers as unprecedented access to the miracle of life in its primordial form, was, in fact, the technological regulation of organic movements necessary for their conversion into spatial and temporal scales that could be perceived by humans.

Animation, whether applied to indexical images, such as photographs taken through a microscope, or line drawings requires highly complex technical regulation of motion in order for it to be perceived as fluid. As Phillip Thurtle writes:

In animation, the immediate task is not, how does one put this world into motion [...], but, rather, how does one best create stability in a world prone to constant change? [...] The need to create stability in animation images is so important that a student of animation can fruitfully think about the history of animation as the development of techniques for regulating how images change over time.¹⁸

Thurtle's insight has meaningful implications for how to consider the tension between the perception of fluidity encapsulated in plasmaticness and the technical regulation that is ingrained in cinematography. How do we reconcile the tremendously compelling notion that animation can summon a plasmatic force of primordial life with the material conditions of regulation necessary to produce the perception of fluid movement?

circa 1900 (Amsterdam: Amsterdam University Press, 2010); Henning Schmidgen, *The Helmholtz Curves: Tracing Lost Time*, trans. N. F. Schott (New York: Fordham University Press, 2014); Ute Holl, *Cinema, Trance and Cybernetics* (Amsterdam: Amsterdam University Press, 2017).

18 Phillip Thurtle, *Biology in the Grid: Graphic Design and the Envisioning of Life* (Minneapolis and London: University of Minnesota Press, 2018), p. 184.

The Enemy Bacteria

The tension between fluidity and regulation underlay every aspect of production in the Disney animation studios. While part of the “magic” of early Disney animations was the apparent ease and flexibility with which the animations moved, this perceived fluidity was enabled by a vast workshop of laborers whose job it was to create the technical conditions of stability within which the perception of fluidity could take place. Given that the actual design and animation of all the Disney characters were done by other animators, Disney’s true innovation was in creating the conditions in which the labor of movement regulation could become industrialized.¹⁹

In 1945, exactly as Eisenstein was working on his essay on Disney’s plasmaticness, a number of the key animators from the Disney workshop (Dick Lundy, who animated many of the *Silly Symphonies* as well as *Snow White* [1937], Grim Natwick, who likewise worked on *Snow White* and early Mickey Mouse films, and Art Heinemann, one of the main animators on Disney’s *Fantasia* [1940]) worked on the animated sections of a short educational film titled *The Enemy Bacteria*, produced by the US Navy.²⁰ The film integrates live action, microcinematography and cel animation to depict a scenario in which bacteria, invisible to the naked eye, infiltrate a hospital patient undergoing surgery and cause him permanent disability. Despite being labelled as educational, the film, somewhat bizarrely, doesn’t impart any lesson, such as how to better avoid infections. Instead, an almost comically misanthropic voiceover leads viewers

¹⁹ See Leslie, *Hollywood Flatlands*; Sean Cubitt, “Ecocritique and the Materialities of Animation,” in *Pervasive Animation (AFI Film Readers)*, ed. Suzanne Buchan (New York: Routledge, 2013), pp. 94–114.

²⁰ Jerry Beck, “The Enemy Bacteria (1945),” *Cartoon Research*, June 19, 2013, <https://cartoonresearch.com/index.php/the-enemy-bacteria-1945-2/> (accessed October 22, 2021).

towards a view of bacteria as an invisible enemy against which any feeble human attempts to protect themselves are rendered hopeless.

The film is remarkable in the context of this study, because of the way in which the bacteria are depicted using the very same animation techniques that were cultivated in the Disney studios and which Sergei Eisenstein hailed as plasmatic. If the Disney animations in which Eisenstein identified plasmaticness behaved like the primal protoplasm whose incessant metamorphosis was the very force of *resistance* to control, *The Enemy Bacteria* adopted the same animation techniques to depict bacteria as a rogue force of nature whose resistance to control must be dominated at any cost. The bacteria are first introduced via microscopic images, framing them within a context of nonnegotiable scientific authority. But their real plasmaticness is represented figuratively, by means of cel animations. Midway through the film, a doctor visits the patient who has undergone surgery to check up on his recovery. While everything seems fine on the live action surface appearance, another crash zoom into the patient's plastered leg transports the viewer into the body's interior. At the end of several animated crossfades depicting the various layers of the body, we encounter a plump and slightly sinister looking cartoon microbe, taking a nap in the middle of a blood clot, which is depicted in the style of ominous lairs familiar from many early cartoons. Suddenly a tremor passes through the microbe, whose humanoid features jolt into the expression of surprise. The tremor becomes increasingly violent until the microbe's elastic body splits in the middle to become two identical, fully formed versions of the first (plate 8). What is particularly striking about the logic of this sequence is that the humanoid character of the bacteria is depicted as shocked by the plasmatic force that overrides its anthropomorphized identity. The untameable force is not bound to the figures themselves but merely

occupies them in the service of its ceaseless reproduction and transformation, which the viewer is being taught to understand as dangerous and threatening. Even though cel animation has been very explicitly applied in this case in order to depict physiological processes that otherwise elude visibility, the logic of this scene leads to the conclusion that the animations themselves are ultimately driven by a force that remains obscure behind or in between the characters to which it momentarily bestows form. As we identify, to some extent, with the anthropomorphized bacteria, we also come to understand our own bodies to be inhabited by some greater, unruly force.

In her comprehensive study of the turning point in Disney's history, marked by *Snow White* (1937), the first animated feature film ever, and the outbreak of the second World War, Esther Leslie addresses Eisenstein's disenchantment with the post-*Snow White* Disney. It seemed that Disney's focus had turned towards disciplining viewers, whether in the romantic nostalgia for a lost innocence personified by *Snow White* and shortly after by *Bambi* (1942), or in the ideological propaganda of animations made for the US military by the Disney studios. Had Eisenstein seen *The Enemy Bacteria*, he would have surely despised it for compromising his idea of the plasmaticness that had appeared so revolutionary in Disney's early work. Yet in the tension between the ideal of plasmaticness, and the multiple processes of regulation necessary to produce the perception of fluidity in cel animations and microcinematographic films, we can observe a particularly poignant intersection between scientific observation, technological mediation and cultural narratives. *The Enemy Bacteria* incorporates every aspect—scientific, technological, rhetorical, aesthetic—of the biopolitical absorption of organic fluidity into the logic of technoscientific regulation. In merging live action, microcinematography and cel animation, the film shows how the material con-

figuration of animation techniques establishes certain underlying possibilities of observation and how these in turn shape the cultural narratives that influence how humans come to perceive the boundaries of self, somewhere between the machine and the organism, the concrete form and the invisible plasmatic force.

Conclusion

In this text I have sought to explore Eisenstein's plasmaticness as a powerful concept of continuity between life forms and processes, central to the medium of moving image. In doing so, my aim was also to problematize any straightforward readings of the concept, in order to draw out its latent contradictions. I find that the nuances of these contradictions illuminate tensions that continue to reverberate through contemporary artistic and scientific practices engaging with fundamentally unknown nonhuman agencies through technological means. The medium of moving image, in particular, demonstrates that the challenges of stretching beyond human subjectivity are not only about intention or narrative, but are ingrained in the material conditions of mediation and that these create the foundation upon which perception is possible.

As I see it, the central challenge in reaching out towards the nonhuman lies in how we might engage with a multiplicity of spatial and temporal dimensions within which heterogeneous entities and processes unfold, without in the process forcing these to transform into altered and therefore partial versions of themselves in order to be perceivable by humans. In my own practice, this involves acknowledging that the embodied human position, even when extended through technological means, cannot understand everything, and that the drive to create a comprehensive whole is itself an inherent quality of structural violence. An operative

“plasmaticness” would therefore have to account for multiple orders of being, situating what we can experience directly in relation to everything we can’t. While technologies enable us to extend our senses, it is equally important to develop a means of engaging with absence as a form of recognition and perhaps celebration of the inevitable limits of human subjectivity. Cinematography does this, even if indirectly, since its operations are predicated on our inability to perceive the gaps between frames. A concept that includes absence not as something to overcome, but as a plasmatic force in itself, would then also allow for the recognition of heterogeneity that is essential to life processes.

