Edited by Ryan Pierson

IN FOCUS

Drawing on the Margins: Animation in Film and Media

Ryan Pierson, editor

Introduction

Animation no longer sits at the margins of moving image practice. For most of the history of moving images, frame-by-frame manipulation had been relegated to slivers of play within a largely photographic arena: segments of instructionals, special sequences in fantasy or science fiction films, advertisements, and, of course, split-reel cartoons. Now animation is so pervasive as to be practically impossible to separate from recorded motion.[1] Animation's characteristic techniques of manipulating motion frame by frame and manipulating space layer by layer are essential components of cinema, television, video games, smartphone apps, and internet videos. In the United States alone, there are more than two hundred postsecondary animation programs, not to mention additional programs that include animation instruction, such as graphic design and game design.[2] Major animation festivals are held in Annecy, Ottawa, Zagreb, and Hiroshima, with scores of smaller-scale festivals worldwide. Disney, the studio that has long served as the synecdoche for animation, took in almost a third of all box office revenue in 2019, more than twice as much as any other studio.[3] What had once sat on the periphery of media culture has moved to the center.

A move from the margins to the center has also characterized animation's place in the *study* of moving images. As digital imagery and computer-generated graphics became more pervasive throughout the 1990s and into the early twenty-first century, it became easier for scholars to define the moving image itself by its plasticity rather than by its attach-

1   Suzanne Buchan, introduction to *Pervasive Animation,* ed. Suzanne Buchan (New York: Routledge, 2013), 1.
2   See, for example, "Background Info and Criteria for College Rankings," Animation Career Review, accessed January 16, 2021, https://www.animationcareerreview .com/background-info-and-criteria-college-rankings.
3   Adam B. Vary, "Disney Explodes Box Office Records with $11.1 Billion Worldwide for 2019," *Variety*, January 2, 2020, https://variety.com/2020/film/box-office /disney-global-box-office-2019-1203453364/.

ment to reality.[4] In addition, the theatrical feature-film experience began to lose its importance during this time, in comparison to the broader media ecology of sound and image.[5] Animation's very dependence on "minor" forms was a boon here. Whereas cinema exists in a theater, animation exists wherever motion can be technologically rendered. The growth of animation scholarship was thus representative of the shift from cinema studies to cinema *and media* studies.

This shift is not surprising, as critical interest in animation has often followed developments in animation practice. Early trick films such as *Le garde-meubles automatique* (*Automatic Moving Company*, Romeo Bosetti, 1912) inspired poet Vachel Lindsay to postulate "The Motion Picture of Fairy Splendor" in 1915.[6] After cartoon production became industrialized in the mid-1910s, Viktor Shklovsky and Élie Faure posited a future for cinema in the refinement of cartoon techniques.[7] And in the 1930s, Disney's elastic creatures and inventive use of sync sound were celebrated by Sergei Eisenstein, Lewis Jacobs, and many others.[8]

The mid-century saw a change in the way single-frame filmmaking was conceived; taking after art cinema and visual education, the notion of "animation" emerged as an alternative to the cartoon, which inspired further study of the art form. This notion was boosted within postwar film culture by periodicals, film societies, and festivals.[9] By 1960, there was an international organization specifically devoted to the promotion of animation, the Association internationale du film d'animation (ASIFA).

Our current era of theorization of animation is largely a product of three

4   For examples, see Lev Manovich, *The Language of New Media* (Cambridge, MA: MIT Press, 2001); Tom Gunning, "Moving Away from the Index: Cinema and the Impression of Reality," *differences* 18, no. 1 (2007): 29–52; and Dudley Andrew, *What Cinema Is! Bazin's "Quest" and Its Charge* (Malden, MA: Wiley-Blackwell, 2010).

5   For responses to this development, see Anne Friedberg, "The End of Cinema: Multimedia and Technological Change," in *Reinventing Film Studies*, ed. Christine Gledhill and Linda Williams (New York: Oxford University Press, 2000), 438–452; Laura Mulvey, *Death 24x a Second: Stillness and the Moving Image* (London: Reaktion Books, 2006); and Francesco Casetti, *The Lumière Galaxy: The Seven Key Words for the Cinema to Come* (New York: Columbia University Press, 2015).

6   Vachel Lindsay, "The Motion Picture of Fairy Splendor," in *The Art of the Moving Picture* (New York: Macmillan, 1915), 30–38.

7   Viktor Shklovsky, *Literature and Cinematography*, trans. Irina Masinovsky (Champaign, IL: Dalkey Archive Press, 2008), 69–70; and Élie Faure, "The Art of Cineplastics," trans. Walter Pach, reprinted in *Screen Monographs* (New York: Arno Press and New York Times, 1970), 1:9–45.

8   See Esther Leslie, *Hollywood Flatlands: Animation, Critical Theory and the Avant-Garde* (London: Verso Books, 2002); and Gregory A. Waller, "Mickey, Walt, and Film Criticism from Steamboat Willie to Bambi," in *The American Animated Cartoon: A Critical Anthology*, ed. Danny Peary and Gerald Peary (New York: E. P. Dutton, 1980), 49–57.

9   For examples, see John Hubley and Zachary Schwartz, "Animation Learns a New Language," *Hollywood Quarterly* 1, no. 4 (1946): 360–363; and André Martin, "Animated Cinema: The Way Forward," *Sight and Sound* 28, no. 2 (Spring 1959): 80–85. For accounts of the transition from cartoons to animation, see Hervé Joubert-Laurencin, "André Martin, Inventor of Animation Cinema: Prolegomena for a History of Terms," trans. Lucy Swanson, in *Animating Film Theory*, ed. Karen Beckman (Durham, NC: Duke University Press, 2014), 85–97; Ryan Pierson, "On Styles of Theorizing Animation Styles: Stanley Cavell at the Cartoon's Demise," *Velvet Light Trap* 69 (Spring 2012): 17–26; and Ryan Pierson, "Postwar Animation and Modernist Criticism: The Case of Annette Michelson," *Journal of Cinema and Media Studies* (forthcoming).

scholarly developments in the late 1980s: the release of the English translation of Eisenstein's notes on Disney, the Illusion of Life conference in Sydney (the proceedings of which were later published as an edited collection), and the founding of the Society for Animation Studies.[10] Save for the Eisenstein publication, these developments were responses to the encroachment of animation into visual culture that was already taking place and would become unavoidable by the twenty-first century.

This dossier has two purposes. The first is to expose nonspecialists to a sample of the range of developments currently happening in animation scholarship. The second is to bring marginal phenomena to the center again—this time, phenomena *within* animation studies itself.

Since becoming a subfield, animation studies has been able to pursue a number of topics, including non-Western industries (especially Japanese), animation and race, animated documentary, and commissioned (or "useful") animation.[11] Despite this variety, however, animation studies has still had a difficult time expanding beyond the American studio cartoon. Those qualities that were first noted in American cartoons—their apparent negation of photography and real-world physics as well as their oft-repeated themes of objects coming to life—are sometimes hypostatized into a universal essence of animation.[12] This tendency has kept the American cartoon at the center of animation studies, as the default assumption of what animation "is."

The essays in this dossier propose a series of alternatives to that assumption. Taken together, they suggest that the most enabling way for animation studies to go forward is to assume that animation has no essence. What happens if, instead of focusing on animation's potential for rendering fantasy worlds, we take as primary its capacity for the graphic reduction of information—if we take animation as a medium for conveying concepts? What happens if we take animation's aesthetic possibilities primarily as technical matters of visual experimentation rather than as diegetic matters of impossible physics? If we shift our focus to animation industries that are almost entirely unfamiliar to Western audiences? If we don't assume a principled separation between the animated world and the photographed world? The following essays demonstrate that those phenomena that appear to lie at the

10 See Alan Cholodenko, ed., *The Illusion of Life: Essays on Animation* (Sydney: Power Publications, 1991).

11 For examples, see Marc Steinberg, *Anime's Media Mix: Franchising Toys and Characters in Japan* (Minneapolis: University of Minnesota Press, 2012); Masao Yokota and Tze-yue G. Hu, eds., *Japanese Animation: East Asian Perspectives* (Jackson: University Press of Mississippi, 2013); Nicholas Sammond, *Birth of an Industry: Blackface Minstrelsy and the Rise of American Animation* (Durham, NC: Duke University Press, 2015); Annabelle Honess Roe, *Animated Documentary* (London: Palgrave Macmillan, 2013); and Malcolm Cook and Kirsten Moana Thompson, eds., *Animation and Advertising* (London: Palgrave Macmillan, 2019). For an expansive list of sources on non-Western animation and issues of race in animation, see Mihaela Mihailova, "An Anti-Racist Animation Syllabus," *Fantasy/Animation*, accessed January 18, 2021, https://www.fantasy-animation.org/current-posts/2020/6/19/antiracist-animation-syllabus.

12 For an assessment of this tendency, see Donald Crafton, "The Veiled Genealogies of Animation and Cinema," *Animation: An Interdisciplinary Journal* 6, no. 2 (2011): 93–110.

margins—of animation studies and film and media studies more broadly—turn out to be vital for understanding the center.

The first two essays, by Scott Curtis and Michelle Kelley, explore useful animation. Scott Curtis argues that animation is a crucial visualization technique for scientists, in research as well as communication. He notes that animation belongs in a "figural" tradition of visualization tools such as charts and diagrams and that its additional component of motion places its own formal demands on scientific work (in biology, for example). Because these formal demands impact the ways scientists imagine their own objects of study, they impact the ways we conceive of the world. Michelle Kelley examines one use of educational animation, the *Fun and Facts about America* series of the late 1940s and early 1950s. Funded by the Alfred P. Sloan Foundation, this series was made for the ostensible purpose of educating children on economics; its actual purpose, however, was to promote free market ideals and corporate liberalism. These less-visible uses of animation by private interests make clear how deeply intertwined the projects of "education" and "persuasion" are, in any example of media.

One of the most notable features of animated films, especially independent shorts, is the bewildering variety of visual styles one encounters from film to film. In the next essay, Alla Gadassik sketches a theoretical account of this feature, putting forth a new conception of "apparatuses" in animated work. She offers as a test case the multiplane stand: a layered structure underneath a camera with empty spaces between the layers. For animators working in two-dimensional forms, the camera is pointed down at a flat surface—or, in the case of the multiplane stand, at a stack of surfaces. This makes the perspective of the camera's lens less important than the arrangement of the layers below it, which opens up new possibilities for depicting space. Rather than capturing a spectator in a preexisting set of optical (and social) relations, as apparatus theory has traditionally asserted, the apparatus here becomes an occasion for the animator to offer strange and unforeseen relations—a partner in creation.[13]

While Gadassik's essay is concerned mainly with independent animation, Mihaela Mihailova's essay focuses on the Russian animation industry. More specifically, Mihailova illustrates the need for the Russian animation industry to navigate global trends and domestic audience assumptions and expectations. The *bogatyr* (epic hero) franchise of the early twenty-first century found a way to distinguish itself from dominant CGI realism and successfully compete for box office returns by embracing a flatter visual style and relying on well-known folk stories. Such case studies are crucial for obtaining a more complete picture of animation industries and avoiding Anglocentric conceptions of animation.

The final two essays, by Jordan Schonig and Thomas Lamarre, question the oft-presumed separation between the animated world and our own world. Film studies' conventional vocabulary of visual analysis—such as mise-en-

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13 See Jean-Louis Baudry, "Ideological Effects of the Basic Cinematographic Apparatus," in *Narrative, Apparatus, Ideology: A Film Theory Reader*, ed. Philip Rosen (New York: Columbia University Press, 1986), 286–298.

scène, cinematography, and editing—makes it extremely difficult to describe onscreen movements. Schonig argues that animation studies can teach film scholars to describe movements in live-action film with greater precision. Examining the fall of a bowling pin in *Scarface* (Howard Hawks, 1932), Schonig demonstrates that concepts from animation theory can do for even the most basic tools of film scholarship. Lamarre, by contrast, takes issue with how animation scholars tend to think about movement. For most of animation studies, *movement* means the motions of individual figures. Lamarre argues that nonlocalized movement and change—dust in swirling wind or the response of materials to pressure and heat—offer other possibilities for philosophical speculation. Nonlocalized movements encourage us to arrive at what he calls an ecological image of thought: a picture of ourselves as embedded within, rather than divided from, our world.

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Scott Curtis

Animated Images in a Media History of Science

Animation has been used in science and medicine since the 1910s and is ubiquitous today, when nearly every scientific discipline uses animation to test and/or communicate results. Animation is only one of many representational technologies used in these fields, a range that includes everything from pencils to electron microscopes. If we were to focus on animation's unique place in that ensemble, however, a number of questions emerge: Why animation? What value does it hold for researchers? How is that value expressed in practice? How did these practices and values develop over time?

 Scholars in the philosophy, sociology, and history of science explore similar questions and themes in scientific practice. Philosophers of science ponder questions of epistemic value: What role do diagrams play in biological reasoning, for example? How do they contribute to scientific knowledge?[1] Sociologists of science observe the ways that researchers use their tools in the laboratory: How do they employ computer modeling, for example, in their routine representations of proteins?[2] Historians of science are interested in the development of these visualization practices: How can we trace the emergence of a visual culture in science, such as the use of drawings and notations in astronomers' notebooks of the nineteenth century?[3]

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1 See Laura Perini, "Explanation in Two Dimensions: Diagrams and Biological Explanation," *Biology and Philosophy* 20 (2005): 257–269; and Nicola Mößner, *Visual Representations in Science: Concept and Epistemology* (London: Routledge, 2018).

2 See Natasha Myers, *Rendering Life Molecular: Models, Modelers, and Excitable Matter* (Durham, NC: Duke University Press, 2015). For a fine sampling of current work in this area, see Catelijne Coopmans, Janet Vertesi, Michael Lynch, and Steve Woolgar, eds., *Representation in Scientific Practice Revisited* (Cambridge, MA: MIT Press, 2014).

3 See Omar W. Nasim, *Observing by Hand: Sketching the Nebulae in the Nineteenth*

Each discipline speaks to the others, as their questions and approaches overlap, but these questions are also important to anyone interested in what we might call a *media history of science*: a history that focuses on the role of media in scientific knowledge production and dissemination. Such a focus implies a mutually constitutive relationship between medium and discipline and challenges us to describe that relationship historiographically. I have argued elsewhere that, to understand the use of any given medium for any given discipline, we must find points of contact between the material limits and possibilities of the medium—its *form*—and the agendas and practices of the discipline.[4] Cinema and media scholars are especially adept at articulating a medium's formal properties, but we should draw on the established literature in the philosophy, sociology, and history of science—often, but not always, aligned with the field known as science and technology studies (STS)—to understand disciplinary agendas and practices.

Recognizing that *animation* and *science* are umbrella terms that cover a wide range of practices and agendas—the specificities of which any historical case study would need to address—I nevertheless think it would be helpful to outline how these broad questions about value, practice, and history can help us articulate the role animation might play in this media history of science. In what follows, I will look at the philosophical and historiographical questions specifically: What epistemic value does animation hold for science? How do we explore the twentieth-century emergence of animation in scientific visual culture? Finally, I will address the question of why cinema and media scholars should consider science a vital area of inquiry.

What is animation's role in the process of knowledge production? Philosophers of science have not asked this question of animation directly, but they have asked it of figures, diagrams, graphs, and models, all of which bear a family resemblance to animation. Understanding the value of images (as opposed to text) in science can help us begin to understand the epistemic value of animation, even if it adds dimensions that diagrams and such do not.

Generally speaking, the philosophy of science divides the epistemic work of scientific representations into two tasks: explaining and exploring.[5] When scientists explain ideas or results, visual representations perform valuable work by offering more than the written word can: most diagrams, for example, provide information about the spatial arrangement of the object under study that sentences cannot easily replicate.[6] Even tables and graphs arrange their data spatially to deliver their information more efficiently than written explanations. Yet while they may depict the arrangement of objects in space,

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    Century (Chicago: University of Chicago Press, 2013). On the emergence of visual cultures in science, see Klaus Hentschel, *Visual Cultures in Science and Technology: A Comparative History* (Oxford: Oxford University Press, 2014).

4   Scott Curtis, *The Shape of Spectatorship: Art, Science, and Early Cinema in Germany* (New York: Columbia University Press, 2015), especially the introduction and conclusion.

5   See Mößner, *Visual Representations*, 7.

6   See Laura Perini, "Scientific Representation and the Semiotics of Pictures," in *New Waves in Philosophy of Science*, ed. P. D. Magnus and Jacob Busch (Basingstoke, UK: Palgrave Macmillan, 2010), 131–154; and Laura Perini, "Diagrams in Biology," *Knowledge Engineering Review* 28, no. 3 (2013): 273–286.
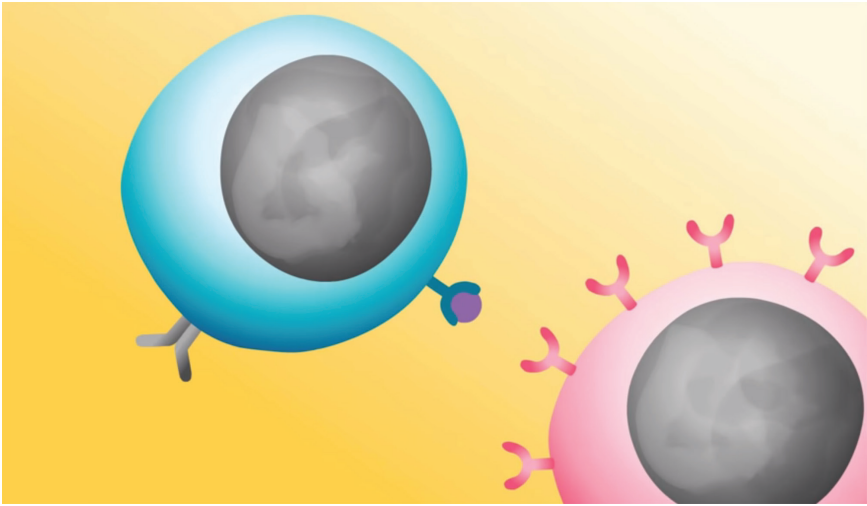
Figure 1. A helper T cell (lower right) seeks to bind with the antigen (small circle in the center) on a B cell (upper left) (Wellcome Trust, 2015).

diagrams present only the information necessary at the moment, thereby abstracting important details from the wealth of data found in, say, a photograph.[7] A diagram therefore *visualizes* objects or processes in a way that matches them structurally, *emphasizes* elements deemed most important for comprehending those objects or processes, and *abstracts* or generalizes those elements such that they depict not the particular elements but the researcher's theoretical understanding of them.

An animation depicting, for example, how antibodies bind to antigens works similarly (see Figure 1). Even if the figures are abstracted to very simple shapes, such as Y shapes for antibodies and O shapes for antigens, their structure and the spatial relations between the two illustrate the scientific understanding of the objects and process.[8] The way the elements are drawn—such as the isomorphic match between the antigen as "ball" and the antibody as "cup"—emphasizes binding as the key feature of the process. But the details of that binding process are left out. The animation is not (nor is it meant to be) a 100 percent accurate rendering of what we would *see* if we could view such things; instead, the animation is a 100 percent accurate rendering of what we presently *theorize* about how such mechanisms work.

Yet the animation also moves, providing epistemic value beyond what a diagram can offer. Specifically, the animation depicts how the process works and how the elements move in relation to one another; it offers the spectator an understanding of the process in time and space. It therefore provides, sim-

7   Perini, "Diagrams in Biology," 275–276.
8   Wellcome Trust, "Animation: Developing Immunological Memory," January 8, 2015, YouTube video, https://youtu.be/SSYOVbEQj_4.

ilarly to a model, an *experiential* understanding of the objects and processes.[9] Like a model, an animation presents a theoretical space, akin to a fictional world, for the researcher or the viewer to explore.[10] While scientific models and animations may or may not come with narratives, they, like fictional worlds, come with conventions—specifically, conventions of drawing, design, and movement to help depict the objects and processes in time and space. Indeed, some animations, such as XVIVO and BioVision's *The Inner Life of the Cell* (2006), adopt conventions of commercial animation to convey their ideas about natural phenomena.[11] Likewise, studio animation and special effects houses adopt conventions or techniques from scientific animation for their fictional worlds.[12]

Researchers use models (and animations) to test the limits of their experiential understanding of these processes; if they can manipulate the environment by changing variables, then this understanding becomes *experimental* as well. Recently, advances in computer memory storage, processing power, fluorescence microscopy, and gene-mapping techniques have allowed scientists to mark and track cells; they can now capture these cells digitally, rebuild a cell population in a computer animation program, and apply algorithms to make that population "grow" according to the scientists' design.[13] The Allen Institute for Cell Science in Seattle, for example, uses these techniques and others to develop predictive computer-animated models that give answers to "What if?" questions any researcher might pose of the cell environment.[14] These simulations allow researchers to explore cell morphologies and locations in ways that only animation allows, giving scientists both experiential and experimental insight into cell function.

The Allen Institute for Cell Science is unusual in that team science— science practiced by interdisciplinary scholars working under one roof on a common project—is so integral to its mission.[15] Unlike interdisciplinary collaboration, which is common but sporadic, team science is steady in its exchange of expertise. In addition to the variety of scientific disciplines represented on the team, the sophistication and amount of animation

9   See Oliver Gaycken, "'A Living, Developing Egg Is Present before You': Animation, Scientific Visualization, Modeling," in *Animating Film Theory*, ed. Karen Beckman (Durham, NC: Duke University Press, 2014), 68–81.

10 See Gabriele Contessa, ed., "The Ontology of Scientific Models," special issue, *Synthese* 172, no. 2 (January 2010), especially the contributions by Contessa, Roman Frigg, and Adam Toon.

11 See Scott Curtis and Robert Lue, "Bridging Science, Art, and the History of Visualization: A Dialogue between Scott Curtis and Robert Lue," *Discourse* 37, no. 3 (Fall 2015): 193–206.

12 See Christopher Kelty and Hannah Landecker, "A Theory of Animation: Cells, L-systems, and Film," *Grey Room* 17 (Fall 2004): 30–63.

13 See, for example, Khaled Khairy and Philipp J. Keller, "Reconstructing Embryonic Development," *Genesis* 49, no. 7 (2011): 488–513; and Janina Wellmann, "Animating Embryos: The *in toto* Representation of Life," *British Journal for the History of Science* 50, no. 3 (September 2017): 521–535.

14 Allen Institute for Cell Science, "3D Probabilistic Modeling," Allen Cell Explorer, accessed December 20, 2020, https://www.allencell.org/3d-probabilistic-modeling.html.

15 See Rachel Tompa, Susanne M. Rafelski, and Graham Johnson, "'Not Just a Cog': A Q&A on Team Science in Cell Biology," *ASCB Science News*, May 7, 2020, https://www.ascb.org/science-news/not-just-a-cog-a-qa-on-team-science-in-cell-biology/.

hardware and software at the Allen Institute also imply a craft component; certain members of the team, whether animation specialists or scientists now expert in animation, must be very good at computer animation. In fact, the history of animation in science demonstrates that teamwork has always been common; in most cases, researchers sought out animators to help visualize their findings and ideas. Historiographically speaking, then, we should favor a *prosopographical* approach to animation and science by focusing on the teams formed around specific projects.[16] The collaboration of animators and scientists leads us to three areas of historiographical emphasis: *iconography*, *infrastructure*, and *influence*.[17]

The conventions adopted by the team are sometimes extremely common—the use of shading to signal depth, for example—but others can be traced to *iconography* in scientific illustration, animation, or other graphic traditions, including poster design, print cartoons, and informational graphics. For example, the use of a skeleton as a symbol of tuberculosis in the public health animations supervised by Jean Comandon in France after World War I drew upon a trope that had spread throughout France and Europe in posters, editorials, and public health literature about the disease. More recently, the use of animated "fly-throughs" in 3D CGI animations such as *The Inner Life of the Cell* recalls similar techniques in Hollywood productions such as *Fight Club* (David Fincher, 1999), which in turn echo scientific visualizations such as the Visible Human Project (1994). Examining these conventions is not about finding the origins of a trope, however; it is about uncovering the life of an image, how an image is made from a web of intermedial relationships. The use of conventions reveals scientific and artistic presumptions about the object of study and how those presumptions depend on a chain of images. Tracing this chain involves stylistic and serial analysis of those images.[18]

This chain of images extends not just backward in time but also across media in what Bruno Latour has called a "cascade" of successive images generated in the process of arriving at the final—or at least most recent—visualization.[19] Sketches, storyboards, and pencil tests in animation correspond to the rough work that researchers also carry out to visualize their data. To understand how any given visualization articulates an understanding of the phenomenon, we need to look at all stages of image production (or at least as many as we can access). This requires an understanding of the material and conceptual *infrastructure* of the production, from the space of the lab or studio to the technology and software to the disciplinary way of

16 Hentschel, *Visual Cultures*, provides a book-length discussion of what this approach would mean for histories of images in science.

17 This trilogy is the focus of a collaboration on "useful animation" between Malcolm Cook, Michael Cowan, and Scott Curtis. See "Useful Animation in Early Cinema," Domitor 2020, November 18, 2020, https://domitor2020.org/en-ca /roundtable-no-1-useful-animation-in-early-cinema/.

18 A good example is Kirsten Ostherr, "Animating Informatics: Scientific Discovery through Documentary Film," in *A Companion to Contemporary Documentary Film*, ed. Alexandra Juhasz and Alisa Lebow (West Sussex, UK: Wiley-Blackwell, 2015), 280–297.

19 Bruno Latour, "Drawing Things Together," in *Representation in Scientific Practice*, ed. Michael Lynch and Steve Woolgar (Cambridge, MA: MIT Press, 1990), 40.

seeing that each expert brings. The history of animation and science demonstrates that there is often a productive friction between these two ways of seeing as members of the team learn from one another. This transmission of knowledge is the most obvious evidence of mutual *influence* as the animator learns about the scientific data and theory while the researcher learns about the material limits and possibilities of the medium. The result is a collaborative vision of the phenomenon that expresses this collective understanding, which is eventually distributed to larger publics through journals, textbooks, science journalism, and other sources, all of which help to shape our everyday understanding of elements of the natural world.

Animation, therefore, has distinct advantages for scientific inquiry, as it uniquely combines functions and iconography from a variety of traditions, including modeling, illustration, simulation, and even cartoon history. This range of practices and conventions presents a daunting set of challenges for media historians. We must unravel the knotty entanglement of iconographic and production traditions, research agendas and laboratory protocols, disciplinary ways of seeing, and the specific formal features of the animated image. The investigation of animation in scientific fields provides an excellent opportunity to uncover the mutual influence of medium, discipline, and craft, which is the goal of this media history of science.

Yet the most compelling reason for cinema and media scholars to invest in this conjunction—besides the fact that our media landscape is simply rife with scientific images—is the impact animation has on scientific ways of seeing and thinking. Just as a researcher's pencil sketches dialectically inform and expand their understanding of the process under study, so animation has catalyzed how researchers conceptualize their object, especially in that computer animation provides ways of thinking beyond static two-dimensional models. Philosophical, sociological, and historiographical approaches to the use of animation in science can therefore help us demonstrate the influence animation has on their—and our—understanding of the natural world. The stakes could not be higher.

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Michelle Kelley

Fun and Facts about America: Postwar Corporate Liberalism and the Animated Economic Educational Film

Business leaders were worried. Labor insurgency in the wake of World War II indicated a new militancy among American workers. Even more troubling, opinion polls revealed that many distrusted both their employers and the American economic system. For many in the business community, workers' growing demands and their antagonism toward management suggested unions had bested private industry in the fight for workers' ideological allegiance.[1] At the same time, conflict was brewing within the business community between corporate executives and small business owners. During the war, large-scale manufacturers signed wartime production contracts with the US government and secured federal funds to build new facilities, giving them an edge over smaller competitors. As big businesses grew, they forced small businesses out of both industrial and consumer markets.[2] When government

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1   For a history of this effort, see Elizabeth A. Fones-Wolf, *Selling Free Enterprise: The Business Assault on Labor and Liberalism, 1945–1960* (Urbana: University of Illinois Press, 1994).

2   George Lipsitz, *Rainbow at Midnight: Labor and Culture in the 1940s* (Urbana: University of Illinois Press, 1994), 57.

measures had allowed large corporations to dominate markets in the past, both workers and small business owners had fought back.[3] If big business leaders hoped to preserve the gains they had made during World War II, they would need to persuade both American laborers and small business owners to accept the growing power of large corporations.

In this essay, I discuss an animated economic educational film series from the post–World War II era, Fun and Facts about America (John Sutherland Productions, 1948–1952).[4] During this period, economic education was one of several methods business leaders used to promote the American financial system. The purveyors of economic education claimed their goal was to advance the public's understanding of how the US economy works. In fact, as Caroline Jack has shown, economic education was little more than a propaganda campaign on behalf of industrial capitalism.[5] Historian Elizabeth A. Fones-Wolfe has described how business leaders used various strategies, including economic education, to sell Americans on the merits of US capitalism after World War II.[6] While Fones-Wolfe's work focuses on how the business community addressed workers and the public, corporate leaders also used economic education to speak specifically to small business owners' concerns. Building on Jack's work on the series, I argue that Fun and Facts about America aimed to persuade both small business owners and American laborers that big business was on their side.

Fun and Facts about America was a product of the National Education Program (NEP) of Harding College in Searcy, Arkansas. At the time, Harding was a small Christian college, but it later became one of the largest universities in the state.[7] Working through the NEP, John Sutherland Productions produced the series with funding from the Alfred P. Sloan Foundation. The series included ten-minute animated Technicolor shorts such as Make Mine Freedom (1948), in which an industrialist, laborer, farmer, and politician encounter a huckster peddling a bottle of snake oil called "ISM," and Fresh Laid Plans (George Gordon, 1950), which portrays the dire consequences of economic planning among a community of chickens.[8] All celebrate the virtues of the American economic system.[9] Metro-Goldwyn-Mayer exhibited several of the films in theaters. After the theatrical runs, the NEP provided

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3 Lipsitz, 60.

4 The second film in the series, Going Places (1948), refers to the series title as Fun and Facts about American Business; however, later films, such as Why Play Leap Frog? (1949), identify it as Fun and Facts about America.

5 Caroline Jack discusses the economic education movement in "Fun and Facts about American Business: Economic Education and Business Propaganda in an Early Cold War Cartoon Series," Enterprise and Society 16, no. 3 (September 2015): 491–520.

6 Fones-Wolfe, Selling Free Enterprise.

7 Harding College, "Financial Aid," accessed July 22, 2021, https://www.harding.edu/finaid.

8 Copyright records and archival documents do not identify the directors of most of the Fun and Facts films, including Make Mine Freedom, Going Places, Why Play Leap Frog?, and Meet King Joe. However, some sources attribute Make Mine Freedom to directors William Hanna and Joseph Barbera. For example, see Evan R. Ash, "Forgotten Toons: Hanna-Barbera, Anticommunism, and 'Make Mine Freedom' (1948)," The Vault of Culture, September 6, 2019, https://www.vaultofculture.com/vault/feature/ash/makeminefreedom.

9 The title Make Mine Freedom is a play on Disney's animated anthology Make Mine Music (Robert Cormack, 1946).

the films free of charge to schools, community groups, and industrial firms to screen for audiences of students and workers.[10]

Fun and Facts about America is informed by what George Lipsitz describes as monopoly capitalist corporate liberalism.[11] Here, monopoly refers not to the existence of legal monopolies but to the market dominance of a handful of firms, preventing genuine competition.[12] Lipsitz defines corporate liberalism as a "philosophy of using state power energetically to balance the power of major interest groups."[13] More specifically, it refers to cooperation between big business, organized labor, and the state to ensure economic stability and growth. Corporate liberalism predates the 1940s. However, during and after World War II, it flourished.[14] During this era, big businesses were the beneficiaries of what Lipsitz describes as "one of the largest welfare projects in history—wartime industrial expansion."[15] Large corporations, such as Alfred P. Sloan's General Motors, signed lucrative wartime production contracts with the US government and received government subsidies that small businesses did not. Although these contracts helped the war effort, they devastated the small business sector. Unable to compete, more than half a million small retail, service, and construction companies went out of business.[16] Economic centralization—or the concentration of economic power in the hands of a few large firms—changed the calculus of big business owners. Rather than fight both unions and government intervention in the economy, many large corporations recognized the legitimacy of organized labor and supported limited economic interventionist policies.[17] In public relations missives, institutional advertisements, and economic educational films such as those in the Fun and Facts about America series, corporate liberals characterized their business practices as reflecting a new accord between business, labor, and the state.

Corporate liberalism defied many of the tenets of laissez-faire economics. But many monopoly capitalist corporate liberals, including Sloan, remained free market ideologues, praising free enterprise while their firms benefited from government subsidies. Similarly, the Fun and Facts about America series celebrates the principles of laissez-faire capitalism: open markets, individual autonomy, and limited government. But it also promotes a decidedly corporate liberal vision of cooperation between industry, workers, and the state. Hence, Going Places (1948), a film about the importance of the profit motive in American industry, acknowledges government's role in preventing the abuses of power that can occur in an unregulated market. Make Mine Freedom, meanwhile, argues that conflict between American laborers,

10 For more details on the distribution and screening of Fun and Facts about America films, see Jack, "Fun and Facts," 508–512.

11 Lipsitz, Rainbow at Midnight, 59–61.

12 Lipsitz, 67, f46.

13 Lipsitz, 59.

14 Most work on corporate liberalism identifies it as a reform effort that emerged during the Progressive Era. Lipsitz cites William Appleman Williams's The Contours of American History (Cleveland, OH: World Publishing Co., 1961) as the basis of his and many other scholars' understanding of corporate liberalism.

15 Lipsitz, Rainbow at Midnight, 57.

16 Lipsitz, 61.

17 Fones-Wolfe, Selling Free Enterprise, 3.

management, agricultural workers, and politicians plays into the hands of communist infiltrators. At the end of *Meet King Joe* (1949), Joe, an American laborer and "king of the workers of the world," sits atop a throne flanked by representatives of management and capital. Together, they constitute "the greatest production team in the history of mankind."

Fun and Facts about America is an amalgam of corporate liberal rhetoric and free market ideology. However, the series is not as contradictory as it may seem. For indeed, corporate liberalism was more than a set of policies and practices emerging from the newly cooperative relationship between business, labor, and government; it was also a strategy used by politicians and big business leaders to prevent those disenfranchised by monopoly capitalism from fighting back. The growth of monopoly capitalism decimated the small business sector.[18] Yet, Lipsitz argues, rather than resist economic centralization, small business owners aligned themselves with big business leaders, supporting legislation that advanced monopoly capitalists' interests at the small business sector's expense. They did so, Lipsitz contends, because small business owners blamed the growing power of unions for their downturn rather than the rise of monopoly capitalism. Feeling besieged by organized labor, small business conservatives struck a bargain with monopoly capitalists. They supported corporate liberal policies and legislation such as the Taft-Hartley Act of 1947, a labor law that primarily served the interests of large corporations and the state. In return, they looked to big business leaders and corporate liberal legislators to put a check on labor militancy. Yet the Taft-Hartley Act not only contradicted conservatives' economic principles but, by aiding the growth of the monopoly sector, also contributed to the small business sector's decline.[19]

Monopoly capitalists primarily courted small business conservatives' support by promising to restrain labor. However, they also appealed to them ideologically. One way they did so was by producing economic educational films like those in the *Fun and Facts about America* series. Hence, the series extols the virtues of free enterprise to appeal to small business conservatives' economic principles while still advancing corporate liberal ideas. This ideological agenda is also why several films in the series feature independent entrepreneurs. For example, *Going Places* tells the story of a turn-of-the-century inventor who becomes a small business owner and, ultimately, a corporate executive through hard work and determination. Writing in 1951, C. Wright Mills observed that, although the heyday of the independent entrepreneur had passed, as an "ideological figment," he persists "as the man through whom the ideology of utopian capitalism is still attractively present-

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18 Lipsitz, *Rainbow at Midnight*, 61.

19 The Taft-Hartley Act curtailed the power of rank-and-file workers. However, it also consolidated into law the corporate liberal accord between big business, labor unions, and the state. Lipsitz argues this hurt small businesses, which could not afford to make the same concessions to organized labor as large companies. By increasing the state's power to intervene in worker-employer relations, Lipsitz also argues that the law violated small business conservatives' free market principles. Lipsitz, 176–177.

ed."[20] In their persuasive appeals, corporate liberals worked hard to convince small business owners that the same rules that applied to small companies also governed big ones. Accordingly, *Going Places* deploys the ideological figment of the independent entrepreneur to suggest that large corporations are simply former small businesses that grew big by competing successfully in the free market. What gets lost in this bootstraps narrative is that, by the 1940s, big businesses were working closely with the US government, accruing benefits small businesses did not. Economic centralization had made the free market a thing of the past.

Corporate liberalism wasn't a boon to workers, either—a fact that *Fun and Facts about America*'s ostensibly pro-labor messaging tries to obscure. The size and influence of the unionized workforce grew significantly during World War II.[21] After the war, a rash of wildcat and general strikes suggested the scope of American laborers' ambitions. Many workers voiced support for government control of prices and corporate profits, and they demanded more autonomy and influence in industrial relations. The working class's growing power threatened corporate executives' authority and economic interests.[22] In response, corporate liberals brokered a compromise with organized labor leaders. To avoid disruptions to productivity, monopoly capitalists accepted collective bargaining as a fact of industrial life. They also conceded to organized labor's demands for wage and benefit increases. But in return, through the passage of the Taft-Hartley Act, they charged union leaders with the responsibility of policing their ranks for radicals and communists and placed limits on workers' right to strike.[23] This corporate liberal accord between business leaders, legislators, and union leaders hurt rank-and-file workers, cutting short their social-democratic ambitions.[24]

The *Fun and Facts about America* series is corporate liberal in its apparent championing of American laborers and recognition of their right to unionize. But just as corporate liberals offered concessions to organized labor only to undermine the collective power of the working class, *Fun and Facts about America*'s apparent celebration of American laborers is not what it appears to be. For instance, *Meet King Joe* hails the American worker as "king of the workers of the world" because he earns higher wages and enjoys more leisure time than workers in any other country. However, the film makes clear that Joe Worker didn't ascend the throne because of his innate ability or by fighting for higher pay and more time off through collective organizing. Instead, *Meet King Joe* argues that American workers owe these benefits to the American capitalist system and the inventor-entrepreneurs whose labor-saving devices allow American workers to work less and earn more. *Meet King Joe*'s message, then, isn't that the American worker is king; it's that he is indebted

20 C. Wright Mills, *White Collar: The American Middle Classes* (New York: Oxford University Press, 1951), 34.
21 Lipsitz, *Rainbow at Midnight*, 62.
22 Lipsitz, 62.
23 Organized labor publicly opposed the Taft–Hartley Act; however, Lipsitz argues that it empowered union leaders at the expense of workers and that some leaders' opposition to the bill was largely tokenistic. Lipsitz, 175.
24 Lipsitz, 158–181.

to entrepreneurial capitalists, the forerunners of the big business leaders of the 1940s.

In selling Americans on the merits of monopoly capitalism, the men behind *Fun and Facts about America* turned to animation—specifically, animation in the style of Walt Disney Productions—because they believed it had a unique power to persuade. Disney's example loomed large over the project from the beginning. NEP director George Benson hired producer John Sutherland, a former Disney animator, after approaching Walt Disney himself with the idea of producing animated shorts on the topic of free enterprise. Although Disney declined, he recommended Sutherland for the job.[25] In a letter to Alfred P. Sloan, Benson cited Disney in describing Sutherland's plan to use the same characters repeatedly in different films, "just as 'Donald Duck' has been used in so many pictures by Disney."[26] Writing to Benson, Sloan referred to animation as the "Disney technique" and said he was glad Benson and Sutherland shared his belief in its power to impress "simple economic truths" upon the "mass mind."[27] Although they don't say so explicitly, Benson, Sutherland, and Sloan may have attributed persuasive force to the "Disney technique" because of animation's prominence in American mass culture and successful use in military training films during World War II. In a letter to Benson, Sutherland said his experience producing films for the Armed Forces during the war had convinced him of animation's superior propagandistic power, writing, "live action in propaganda is not particularly effective in the short film."[28]

Despite *Fun and Facts about America*'s corporate liberalism, Benson, Sutherland, and Sloan identified as disciples of free enterprise. They championed free markets and individual autonomy and were wary of government overreach. But they occupied different places in the postwar economy. Only Sloan directly benefited from the expansion of monopoly capitalism after World War II. That Benson and Sutherland believed they shared the same economic interests as a monopoly capitalist like Sloan speaks to the persuasiveness of corporate liberalism's appeal to small business conservatives. Of course, Sloan probably bought *Fun and Facts about America*'s sales pitch too. The series suggests that businesses grow big by competing successfully in the free market, not by securing anticompetitive advantages. This message likely appealed to an executive such as Sloan, who was a corporate liberal in practice but not in ideology.[29] Lipsitz describes corporate liberalism as "a kind of neopaternalism in which those in power seek popular legitimacy by making some concessions to potentially dissident groups in order to give them a stake

25 Jack, "*Fun and Facts*," 499.

26 George Benson to Alfred P. Sloan, October 5, 1946, file B-057, folder Alfred P. Sloan Foundation, Correspondence, 1946, George Benson Papers, Ann Cowan Dixon Archives and Special Collections, Harding University (hereafter cited as Benson Papers).

27 Alfred P. Sloan to George Benson, October 9, 1946, file B-057, folder Alfred P. Sloan Foundation, Correspondence, 1946, Benson Papers.

28 John Sutherland to George Benson, October 2, 1947, file B-057, folder John Sutherland Correspondence, 1947, Benson Papers.

29 For Sloan's political and economic views during the 1930s and 1940s, see David Farber, *Sloan Rules: Alfred P. Sloan and the Triumph of General Motors* (Chicago: University of Chicago Press, 2002), 154–219.

in preserving the system."[30] Through corporate advertising, economic education, and animated films such as those in the *Fun and Facts about America* series, monopoly capitalists aimed to persuade both workers and small business owners to accept the terms of corporate liberalism's compromises.

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30 Lipsitz, *Rainbow at Midnight*, 60.

Alla Gadassik

Tracing the Multiplane: Toward a Genealogy of Animation Apparatuses

A multiplane stand is an armature devised for a camera that adapts it for animation cinematography. The structure allows an animator to arrange different parts of a single image on disparate planes (usually glass plates) with variable spatial intervals between them. The planes or items upon them can be moved independently of one another underneath or in front of a camera along two or three axes of motion. Strategic repositioning of the planes or materials they hold achieves many possible effects. These effects include the ability to alter the form or movement of isolated components of a single shot; to produce complex spatial representations using finite two-dimensional layers; and to simulate virtual cinematography movements, including ones impossible to achieve with a physical camera. To describe it in simplest terms, a multiplane stand is a physical frame (built structure) for composing animated frames (built images) using intervals between layers. I will define the entire material arrangement (often called a rig) and the effects it makes possible as the "multiplane apparatus."

My use of the term *apparatus* risks unintended associations with apparatus theory, which focuses on the structure of film spectatorship. In contrast, I am interested in turning theories of the apparatus from spectatorship to production by asking how relationships between filmmakers and specific media devices shape a film's sensibility. My choice of terminology is indebted to philosopher Vilém Flusser, who defines an apparatus as a technical arrangement

of specific materials ("hardware") that open up a particular array of possibilities for thinking or acting in the world ("software"), which are discovered in the process of exploring and using them ("playing").[1] Speculating about a distinct philosophy of photography, Flusser notes that *apparatus* relates to the Latin *apparare*: to make ready, or prepare. He goes on to characterize photography in deliberately sentient terms: "The photographic apparatus lies in wait for photography; it sharpens its teeth in readiness."[2] This language of intentionality helps Flusser tease out why theories of photography cannot think about media devices as artisanal tools or industrial machines but must understand them as participatory agents shaped by their cultural environment and affecting it in unexpected ways.

Flusser's work has received criticism for ascribing too much opaque power to media devices and offering a deterministic model of technology. Yet in her recent book *Wild Blue Media*, Melody Jue revisits Flusser's creature metaphors to reassert their urgency for contemporary media studies. Jue proposes an expansion of Flusser's medium-specific analysis toward "milieu-specific" analysis, which takes seriously different forms of media in the context of different environments, such as the ocean.[3] Reading Flusser's portrait of the vampire squid as a metaphor for what he imagined to be an anti-photographic organism, Jue suggests that a "terrestrial bias" in Flusser's philosophy limited him from imagining a more expansive ecology of photography. Pursuing photography into an aquatic milieu leads Jue to the fluidity of cameraless photography that Flusser did not take into account. More ambitiously, the aquatic milieu opens up possibilities of photography as a non-inscriptive medium.[4]

My brief sketch of the multiplane stays in the terrestrial realm, but I am similarly interested in approaching animation technology through milieu-specific analysis, tracing a single device across a variety of environments. Thinking about the multiplane as an apparatus, whose imaging capacities are activated by different makers in different milieus, reimagines its history as one in which various possibilities are realized, neglected, or developed during the process of production. This history brings together specific hardware (variations in physical iteration), software (various cultural and political forces shaping the hardware's use), and the aesthetic approaches generated via encounters with specific makers.

When we observe the multiplane solely in its industrial studio habitat, which is how it has been almost exclusively considered, its development seems to emphasize two features: division of a single image into separate planes and variability of the interval between those planes in relationship to one another and the camera. Animation studios produced a diverse range of moving images with just those features. In the opening scene of Walt Disney Productions' *Pinocchio* (Ben Sharpsteen and Hamilton Luske,

1   Vilém Flusser, *Towards a Philosophy of Photography*, trans. Anthony Mathews (London: Reaktion, 2000), 30.
2   Flusser, 21.
3   Melody Jue, *Wild Blue Media: Thinking through Seawater* (Durham, NC: Duke University Press, 2020), 21–26.
4   Jue, 88–111.

1940), for example, a single multiplane shot uses just three layers to produce the effect of a complex establishing shot that descends from an aerial stargazing position, swoops down past towers and chimneys of a small town, lands on a sunken cobblestone street, and pushes toward the single lit window of Geppetto's house. In just twenty seconds and one multiplanar movement, the film traverses an astonishing spatial and narrative range—from a bird's-eye view to a cricket's-eye view; from the expansive world of the film to an intimate home. Achieving this sequence required rethinking the studio's approach to painted backgrounds for the multiplane's distinct way of rendering space. Background painters had to reject single-point linear perspective in order to accommodate a multi-perspectival rendering of the scene on a single plane. The surreal seams between different perspectives blended on a flat canvas, such as the aerial and street positions, were carefully hidden by buildings arranged on a foreground plane during the rotation of layers under the camera.[5]

As Kristin Thompson argues in her formative essay on multiplane animation, the apparatus is capable of producing stylistic heterogeneity between different layers of a single scene as well as approaches to rendering space and time that are distinctly different from live-action cinematography. However, the ideology of naturalism that shaped Hollywood animation largely repressed this potential, with the exception of rare moments of "formal disruption" that Thompson identifies.[6] Such formal disruption, or rather alternative potential, is discussed by Thomas Lamarre in his more recent investigation of the multiplane. Lamarre turns to Japanese animation to pursue a different lineage, in which the intervals between various planes are made perceptible and simulation of virtual camera movement is replaced by movement "on and between surfaces."[7] Lamarre avoids cultural explanations for why this approach to the multiplane thrives in the context of Japanese anime. However, Miho Nakagawa argues that this layered compositional approach treats the planes as sliding screens with palpable gaps, embodying the space-time principle of *ma* (dynamic spatial and temporal intervals) that also shapes architecture, printmaking, and performance traditions in Japan.[8]

Even considering these different global contexts, industrial studio production nurtured a relatively finite range of multiplanar possibilities. The apparatus was limited by bulky armatures built for efficient control, proprietary patent enforcements, and pressures of commercial conventions. In the studio milieu, moreover, the stand was intimately harnessed to cel animation, largely serving as a mobile container for paper and celluloid sheets. The multiplane's potential expanded in artisanal and independent production

5   The multiplane special effects in this and other Disney features in the 1930s to 1940s are documented by John Canemaker in *The Lost Notebook: Herman Schultheis & the Secrets of Walt Disney's Movie Magic* (San Francisco: Walt Disney Family Foundation Press, 2014).

6   Kristin Thompson, "Implications of the Cel Animation Technique," in *The Cinematic Apparatus*, ed. Teresa de Lauretis and Stephen Heath (London: Macmillan, 1980), 106–123.

7   Thomas Lamarre, *The Anime Machine: A Media Theory of Animation* (Minneapolis: University of Minnesota Press, 2009), 7.

8   Miho Nakagawa, "Mamoru Oshii's Production of Multi-layered Space in 2D Anime," *Animation: An Interdisciplinary Journal* 8, no. 1 (2013): 65–83.

environments, where it was less restricted by standardization and available for divergent incarnations.

For instance, animator Clive Walley engineered his multiplane rig to bridge painting and cinematography.[9] The glass panes of Walley's stand are not used as shelves for holding images but as surfaces for directly applying pigment and layering painted strokes. In different films making up Walley's *Divertimenti* series (1993–1995), painted gestures gradually appear and disappear on different glass layers, revealing and occluding one another. The outer edges of the panes are sometimes visible in the frame. As they recede away from the camera, they form a long rectangular tunnel. Walley developed his rig to explore under-the-camera animation as an improvisational painting method, allowing the animator to try different interventions on different layers of a composition. However, as his films revealed effects of depth and movement added by the camera, he began to cultivate a very simple feature of the multiplane that was barely interesting to studio animation: the capacity to continually restack and reorder the same planes. The limited number of planes in the *Divertimenti* films steadily shift their shelf positions in between frames, with the bottom pane eventually coming back to the top for reuse. The effect produces a continually moving shot without any stable depth coordinates. The multiplane transforms into a temporal three-dimensional easel extended into infinity, allowing smeared and glistening brushstrokes to dance across its edges indefinitely.

Joanna Priestley developed a multiplane for *Surface Dive* (2000) that fully embraces the spatial volume between the planes, playing with the physical dimensionality of the intervals. *Surface Dive* combines drawn animation (pastel and watercolor) with object replacement animation (glass and polymer sculptures) arranged on separate layers of the stand and captured through sequential photography. Importantly, *Surface Dive* treats the actual glass material of the multiplane as a vital participant in its optical arrangement. Pieces of glass with different edges, textured surfaces, and refractive properties are used to modify the composition, breaking up the surface of each layer and transforming drawings and sculptural pieces into multifaceted figures. A white background on the bottom layer registers bouncing light and shadow from objects moving on the panes above, adding further dimension. The multiplane thus becomes a glass tank in which glossy biomorphic forms swim into and out of depth, intermingling with oceanic flora in a pool of shimmering light.

Yuri Norstein's multiplane for *Yózhik v tumáne* (*Hedgehog in the Fog*, 1975), which he designed and built with cinematographer Alexsandr Zhukovskiy, also plays with the materiality of glass. Dusted or frosted glass is used to diffuse light and obscure images behind successive layers, creating a dense, foggy environment that is essential to the film's atmosphere. According to Norstein, the diffusion was achieved by letting dust or condensation settle

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9   According to Walley, the stand was influenced by the animation of Oskar Fischinger and Berthold Bartosch. See Clive Walley, untitled article in *Film Waves*, no. 6 (1998), republished on artist's personal website, accessed August 2020, https://clivewalley.uk/other-texts/.

on the glass or camera lens during production and remain undisturbed.[10] Whether this story is factually true or deliberately coy, it is noteworthy that the apparatus in Norstein's account inhabits a space of intimacy and slow work. The film's lauded atmosphere was made possible, the animator also implies, in a milieu that did not care about controlled sterility.

Rather than relying on glass or celluloid, whose primary feature is facilitating transparency, some multiplane animators welcomed the opacity of different materials instead. Lotte Reiniger's multiplane stand, which is the earliest documented iteration, embraced paper as textured screen material. Inspired by Chinese shadow puppetry and landscape painting (particularly its layered perspective), Reiniger combined backlit silhouette animation with layered paper to establish atmospheric depth. In films that occasionally adopted orientalist themes, such as her famous feature-length *Die Abenteuer des Prinzen Achmed* (*The Adventures of Prince Achmed*, 1926), paper strips are overlapped to filter more or less light, their contours suggesting receding mountain ranges or undulating waves. Noburō Ōfuji's silhouette animation layered paper in similar ways but more fully embraced the material's fiber. In *Kokka Kimigayo* (National anthem, Kimigayo, 1931), Ōfuji's animated adaptation of Japan's national anthem, *washi* papers of different textures are lit from various angles to portray light as an element with density and force. Early in the film, a layer of backlit grainy paper moving in the foreground produces a striking effect of fog rolling across a landscape. Later, a brightly lit grouping of triangular strips creates the effect of sunlight bursting into a dark cave.

While the examples mentioned so far focus on the armature of the multiplane stand, the camera has also played an important role in the apparatus's history. For example, Nickolai Troshinsky's self-engineered rig for *Astigmatismo* (2013) takes advantage of a DSLR camera's capacity to precisely shift focus in a shallow depth of field. *Astigmatismo* plays with the spatial fields between the multiplane's layers, bringing different surfaces into or out of focus. The film deliberately divorces optical depth from visual clarity, oscillating between sharpness and blurriness to bounce perception forward and backward across the scene. In one scene of underwater diving, the blurred effect evokes underwater cinematography and reframes the titular theme of flawed vision as vision transposed into an aquatic milieu.

By examining all of these films according to different possibilities of the multiplane, I am avoiding a chronological timeline of a device's birth and death and pursuing a genealogical coral instead. The *coral*—a phylogenetic metaphor used in biology as an alternative to the vertical and hierarchical *tree*—allows me to speculate about multiplanar possibilities not yet encountered or realized. For example, in all of the variations, the multiplane stand has lived in darkened interior milieus with carefully controlled lighting. Animator Martin Rose describes making his film *Trawna Tuh Belvul* (1994) on a multiplane stand at the National Film Board of Canada as an environmental and psychological inferno: "I shudder to think how much electricity was required to make the film, to power the lights and air conditioning to cool

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10 Yuri Norstein and Francheska Yarbusova, *Skaska Skazok* (Moscow: Krasnaya Ploshjad, 2005), 26, 202–203.

the studio." The heat, combined with hours of meticulous work in cramped conditions, resulted in Rose "burning out" from the process.[11] With that in mind, what might it mean to bring the multiplane into natural light? How might it function without careful control over each individual layer?

Appreciating the diversity of the multiplane highlights the political stakes of confusing any specific iteration of an apparatus (a single genetic variant) for an entire species. Such confusion profoundly affected the multiplane, which became synonymous with the Walt Disney Studios and cel animation throughout the twentieth century. This was the result of deliberate efforts by the studio to promote its towering multiplane rig (engineered by William Garity after an earlier design by Ub Iwerks) as a symbol of sophisticated cinematographic naturalism and a mascot for the studio's technological prowess. The studio deliberately used the patent application for Garity's structure and heavy promotional material connecting it to the studio's animation style to disingenuously lay claim to the entire concept of layered animation and its potential effects.[12] This campaign was so successful that the studio's international competitors considered the multiplane to be Disney's device, ignoring existing and low-budget precedents even among their own artists.[13] The rhetorical move of connecting specific technical arrangements of an apparatus with entire animation approaches still operates in contemporary commercial animation and needs to be treated with skepticism.

In Flusser's model of media apparatuses, innovation of a medium does not denote technical improvements but rather shifts in its application. "The question of ownership of the apparatus is irrelevant," he writes, "the real issue here is who develops its program."[14] As my overview of the multiplane demonstrates, the apparatus led many lives in different milieus, before and after its adoption and abandonment by commercial studios. As a distinct species of cinematography, it bridged physical and virtual movement to produce numerous spatial and atmospheric effects. And while some of its features made their way into digital software, its analog incarnations endure, and its possibilities are still open. As a particularly well-known apparatus, the multiplane offers a model for similarly considering light tables, optical printers, index card decks, rendering platforms, and other animation apparatuses as distinct and enduring species of animation.

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11 Martin Rose, personal website, accessed June 2020, http://martinrose.ca/slip /production-notes/camera-stand/.

12 Garity's patent makes no mention of antecedents and lays claim to the entire concept of multilayered animation. See William Garity, control device for animation, US Patent 2,198,006, filed November 16, 1938, and issued April 23, 1940.

13 See, for example, Rolf Giesen and J. P. Storm's discussion of Deutsche Zeichentrickfilme's development of the multiplane camera in *Animation under the Swastika: A History of Trickfilm in Nazi Germany, 1933–1945* (Jefferson, NC: McFarland, 2012), 92.

14 Flusser, *Towards a Philosophy*, 30.

Mihaela Mihailova

Studio Melnitsa's *Bogatyr* Cycle: Notes on a Global Approach to Contemporary Studio Animation

With the exception of anime scholarship, studies of contemporary commercial animation remain predominantly focused on Hollywood studios implicitly positioning their output as the dominant and indeed paradigmatic mode of animated cultural production.[1] This article aims to move beyond Anglophone animation studies' often uncritical embrace of an enduring Western canon by advocating for and modeling close analysis of commercial feature-length animation in comparatively understudied national contexts. Specifically, the following pages present a brief examination of twenty-first-century Russian studio animation, which offers an illuminating case study of the ways in which the medium can function as a space for negotiating the parameters of a nation's social, political, and artistic landscape.

Mixing Hollywood animation tropes with recognizably nation-specific narratives, historical references, and visual influences has become a leading trend in Russian animation in the twenty-first century. This is especially true

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1   Recent examples include Dietmar Meinel, *Pixar's America: The Re-animation of American Myths and Symbols* (London: Palgrave Macmillan, 2016); and Sam Summers, *DreamWorks Animation: Intertextuality and Aesthetics in Shrek and Beyond* (London: Palgrave Macmillan, 2020).

of Melnitsa Animation Studio's *bogatyr* (Russian epic hero)[2] cycle, a series of animated features loosely based on Russian heroic epics that begins with *Alesha Popovich i Tugarin Zmey* (Alesha Popovich and Tugarin the serpent, Konstantin Bronzit, 2004). In their *bogatyr* films, Melnitsa's signature aesthetic is defined by traditional two-dimensional animation shaped by the visual language of caricature. While the Alesha Popovich of oral tradition is described as sly and crafty, Melnitsa transforms him into a bumbling jock, overemphasizing his physical prowess and exploiting his dim-wittedness for comedic effect. His juvenile haircut, combined with his large ears and small nose, contrasts with his barrel-like chest and impossibly thick arms, creating the overall impression of a baby-faced bodybuilder. While a priori amusing, such a representation of the epic hero—which set the tone for the portrayal of *bogatyrs* in subsequent franchise installments—registers as transgressively, irreverently humorous to Russian audiences accustomed to somber, majestic visual depictions of the folk hero, as exemplified by Viktor Vasnetsov's emblematic 1898 oil painting *Bogatyrs,* featuring Dobrynya Nikitich, Alesha Popovich, and Ilya Muromets (all three of whom appear as protagonists in Melnitsa's animated cycle). *Alesha Popovich i Tugarin Zmey* parodies the visual gravitas and pathos characteristic of such traditional *bogatyr* iconography by exaggerating some of its elements (such as the hero's strength) and distorting others (such as his noble steed, which becomes an irritating talking animal). Additionally, as Anzhelika Artiukh has observed, this animation style mocks the ceremonial, government-sanctioned nationalistic fervor of Soviet cinema's heroic live-action epics, which goes as far back as Sergei Eisenstein's *Alexander Nevsky* (1938).[3]

Alesha Popovich i Tugarin Zmey's embrace of flatness and caricature earned positive reviews, most of which framed it as a welcome resistance to the hegemony of three-dimensional digital animation.[4] Yet despite the *bogatyr* cycle's efforts to emphasize its home-grown flavor, both within its historically epic diegesis and through its aesthetic links to the historical lineage of Russian drawn animation, its brand of comedy is strongly influenced by American sources. In particular, the films borrow from *Shrek* (Andrew Adamson and Vicky Jenson, 2001) in parodying folklore both visually and verbally. When the familiar Hollywood tropes are applied to a quintessentially native narrative about a folk hero, the resulting humor owes much more to DreamWorks than it does to Russia's legendary Soyuzmul'tfil'm studio. For example, critics have noted more than a passing resemblance between Shrek's cheeky sidekick Donkey and Alesha Popovich's wise-cracking horse Yulii, whose incessant running commentary and exasperating demeanor likewise recall his American predecessor.[5] On a more fundamental level, the Russian series uses the self-referential parody

2   For more on *bogatyrs* and Russian epic folklore, see James Bailey and Tatyana Ivanova, trans., *An Anthology of Russian Folk Epics* (1998; London: Routledge, 2015).

3   Konstantin Bronzit, interview by Anzhelika Artiukh, *Iskusstvo Kino*, no. 8 (2005): 118.

4   For example, see Birgit Beumers, "Folklore and New Russian Animation," *Kino Kultura*, no. 43 (2014), http://www.kinokultura.com/2014/43-beumers.shtml; and David MacFadyen, "Alesha Popovich and Tugarin the Serpent," *Kino Kultura*, no. 9 (2005), http://www.kinokultura.com/reviews/R7-05alesha.html.

5   Beumers, "Folkore."

mechanisms that were reintroduced into mainstream animation thanks to *Shrek*'s success to both verbally mock and visually deconstruct folkloric and cinematic clichés.

To complicate their intertextual and political framework further, the *bogatyr* films owe their approach to physical reality and movement to a different facet of US animation; their visual humor relies on the rules of "cartoon physics" defined during the Golden Age of Hollywood animation.[6] For example, in an early scene from *Alesha Popovich i Tugarin Zmey*, the titular hero's plan to drop a giant boulder on an attacking horde goes disastrously wrong, resulting in the boulder rolling down a hill and into his village, where it jumps from house to house, smashing every building to the ground until it suddenly breaks into pieces on top of a church. This recalls the visual style of Tex Avery and Chuck Jones (among others), with its feverish dynamics and its disregard for Newton's laws of motion. For that reason, it would be problematic to read this film solely as a return to traditional drawn Russian animation. Instead of drawing exclusively on its national artistic lineage, *Alesha Popovich i Tugarin Zmey* mixes American animation comedy tropes (both classic and recent) with a parody of Russian folkloric iconography.

To fully understand the implications and contradictions of the *bogatyr* cycle's representational strategies, one must take into consideration the political context this franchise was navigating. Scholars have noted the central role that cinema has played—and continues being incentivized to play—in the Putin regime's continuous effort to "mobilize popular emotions of Russian nationalism."[7] Animation did not remain unaffected by this rising tide of nationalist sentiment; in fact, government oversight of animation production became explicit following Vladimir Putin's highly publicized meeting with well-known animation auteurs Yuri Norstein, Andrei Khrzhanovsky, Leonid Schwartzman, and Eduard Nazarov in June 2011. Following their conversation, Putin publicly expressed support for Russian animation, pledging a significant annual increase in state funding.[8]

The terms of this support are essential to consider. In subsequent reports on the state of the animation industry, the government was said to be prioritizing animation because of its capacity for "propaganda of moral values and patriotism."[9] Indeed, the connection between the regime's push toward nationalism and the style and content of Russian animation features had been noticeable for at least the previous decade. As Stephen Norris has pointed out, animated features released in the first decade of the twenty-first century "used the past . . . to articulate messages about history and nationhood needed for the present." As he notes, symbolizing Russianness via historical figures or legendary heroes such as *bogatyrs* marks the revival of a

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6   Scott Bukatman, "Some Observations Pertaining to Cartoon Physics; or, The Cartoon Cat in the Machine," in *Animating Film Theory*, ed. Karen Beckman (Durham, NC: Duke University Press, 2014), 312.

7   See Perry Anderson, "Incommensurate Russia," *New Left Review* 94 (2015): 29.

8   Kirill Agafanov, "Sredstvo Massovoi Animatsii," *Kommersant*, December 19, 2011, https://www.kommersant.ru/doc-rss/1832679.

9   Agafanov."

century-old propaganda strategy employed by right-wing Russian politicians after the 1905 revolution.[10]

Echoing this sentiment, Anglophone animation scholarship has read the *bogatyr* cycle as emblematic of some of the Russian state's most problematic long-standing propaganda strategies.[11] Notably, Michel Bouchard and Tatiana Podyakova argue that Melnitsa's franchise affirms "a very nationalist vision of history whereby Kievan Rus was populated by Russians and is considered ancestral to Russia"; they point out that this is not a novel propaganda strategy but "merely an extension of older Russian national narratives that affirm Russia's one thousand year history and view Kievan Rus as the ancestral state to modern Russia."[12] Furthermore, they posit that, in portraying various ethnic groups (such as Asians, Muslims, and Roma) through stereotypes that code them as exotic, dangerous, and inferior to the Russian heroes, the series presents a "Russian for [ethnic] Russians worldview" and promotes "a new vision of nation that is ethnically Russian and Orthodox in faith, with all others being represented as enemies."[13]

In contrast to such critical responses to the *bogatyr* series, the Russian box office has favored the franchise. When *Alesha Popovich i Tugarin Zmey* came out in 2004, it earned more than all its domestic animated competitors combined.[14] Subsequent installments of the *bogatyr* series continued to generate ever-increasing revenue; in late 2012 and early 2013, *Tri bogatyrya na dalnikh beregakh* (*Three Heroes on Distant Shores*, Konstantin Feoktistov, 2012) managed to win the top box office spot during the holiday weekends, eclipsing (albeit briefly) the first part of Peter Jackson's *The Hobbit* trilogy.[15]

The commercial appeal of studio Melnitsa's productions inspired the Russian *Forbes* to ask leading figures in Russian commercial animation to unpack the formula behind the studio's success. Most responders pointed to one key aspect: successfully applying a Hollywood-inspired twenty-first-century franchise model to familiar Russian iconography refashioned according to American animation conventions.[16] Animation director Sergey Seregin has noted that Russian viewers respond well to films that are rooted (however superficially) in native culture and history and recognizable visual tropes. Seregin explains that the current film distribution system in Russia,

10 Stephen M. Norris, *Blockbuster History in the New Russia: Movies, Memory, and Patriotism* (Bloomington: Indiana University Press, 2012), 215.

11 For a historical discussion of nationalist ideology in folklore-based Russian cartoons (with a relevant emphasis on depictions of Ukraine in particular), see Natalie Kononenko, "The Politics of Innocence: Soviet and Post-Soviet Animation on Folklore Topics," *Journal of American Folklore* 124, no. 494 (2011): 272–294.

12 Kievan Rus refers to a medieval federation that's considered a predecessor state to the modern East Slavic nations of Russia, Ukraine, and Belarus. See Michel Bouchard and Tatiana Podyakova, "Russian Animated Films and Nationalism of the New Millennium: The Phoenix Rising from the Ashes," in *Children's Film in the Digital Age: Essays on Audience, Adaptation and Consumer Culture*, ed. Karin Beeler and Stan Beeler (Jefferson, NC: McFarland, 2014), 120.

13 Bouchard and Podyakova, 122.

14 Bronzit, interview, 121.

15 Anastasia Zhokhova, "V chem secret 'Trekh bogatyrei,' odolevshikh 'Hobbita' v kinoprokate," *Forbes*, December 27, 2012, https://www.forbes.ru/svoi-biznes/predprini mateli/232123-v-chem-sekret-treh-bogatyrei-odolevshih-hobbita-v-kinoprokate.

16 Zhokhova.

which continues to ensure the omnipresence of American animated imports, "makes it very hard for an animated feature to come out and be profitable, unless it is based on something very familiar like the *bogatyr* stories."[17]

The notion that audiences' familiarity with the subject matter and visual design of these films was crucial to their success is often introduced in critical discourse on the *bogatyr* franchise. For instance, Artiukh has attributed Melnitsa's success to the studio's strategy of drawing on folkloric narratives and a visual storytelling medium that has historically enjoyed mass popularity among Russians, namely *lubok*.[18] Artiukh implies that by evoking an artistic genealogy to *lubok* and presenting themselves as the twenty-first-century successors of that particular art form, Melnitsa's features tap into a long-standing national fascination with flat, relatively simplistic, brightly colored popular imagery that goes even further back than Soviet caricature. Moreover, as she points out, the "flat lubok aesthetic" is a smart branding choice because it immediately differentiates this franchise from Hollywood features, which typically employ three-dimensional animation.[19]

Vlad Strukov introduces a more overtly political interpretation of Melnitsa's success, suggesting that the box office returns of the *bogatyr* films are the result of their "massaging of the national ego of Russian people." He defines them as examples of "Slavic epos—a cinematic form that may be loosely defined as a fantasy genre based on Slavic/Russian folklore as well as the creatively reworked or vigorously adapted history of early Russia." According to him, Slavic epos "belongs to the ongoing Russian search for historical lineage and self-definition exacerbated by the metastasis of imperial fatigue."[20]

Strukov's argument reflects the nationalist moods and policies dominating contemporary Russian political discourse, but it does not account for the appeal of Melnitsa's humor-based approach to epic legends. Elena Gracheva points out that Russian viewers are likely growing tired of solemn, pathos-filled historical propaganda and are thus ready to embrace a low-brow, comedy-based treatment of historical subjects. She writes that "a perfectly heroic hero" is more likely to evoke boredom than sympathy from Russian viewers. She posits that the answer to the "inertia of the state-mandated patriotic tedium" is not Alexander Nevsky or even St. Vladimir but a character like Alesha Popovich, "a goof with the uncomplicated charisma of a 'simple man' who is not very smart, but is strong, good-natured, and simultaneously in love with his lady and his motherland."[21] Indeed, productions like the *bogatyr* series likely resonate with Russian viewers precisely because they provide an entertaining, pop culture–inflected alternative to more didactic takes on the Putin regime's patriotic imperative.

17 Sergey Seregin, interview by the author, November 5, 2014.

18 Bronzit, interview, 117. A *lubok* is a Russian popular print dating from the seventeenth to the nineteenth century. See Alla Sytova, *The Lubok: Russian Folk Pictures, 17th to 19th Century* (Leningrad: Aurora Art Publishers, 1984).

19 Bronzit, interview, 117.

20 Vlad Strukov, "Vladimir Toropchin: *Il'ia Muromets and the Nightingale-Robber* (*Il'ia Muromets i solovei-razboinik*, 2007)," *Kino Kultura*, no. 22 (2008), http://www.kinokultura.com/2008/22r-muromets.shtml.

21 Elena Gracheva, "Novye vremena Konstantina Bronzita," *Seance*, February 2, 2010, https://seance.ru/blog/novyie-vremena-konstantina-bronzita/. (my translation).

In conclusion, it is this tension between negotiating the impact and allure of the North American model and striving to honor its own artistic roots, while also adapting to increasingly technologically determined and globalized market forces, that makes Russian animation a productive case study of the complex and interrelated nexus of political, cultural, and industry imperatives that shapes contemporary studio animation produced in the shadow of Hollywood imports. The Russian context not only allows one to analyze animation as a platform for ideological discourse within a specific, understudied national framework, but it also opens up avenues for a larger examination of the various tensions—between national and transnational cultural heritage, independent business and state-run industries, aesthetic traditions and innovation—that non-Western animation studios are often compelled to navigate and negotiate.

Focusing on Russian animation also brings into sharp relief the need to rethink preexisting, US-centric notions of the animation studio and what commercial studio production entails. It is important to note the key ways in which most contemporary Russian studios—and, indeed, many international studios—differ from their Hollywood counterparts. The most readily apparent distinction is their relative size and production capacity. In 2019, Melnitsa's entire full-time staff numbered about three hundred employees.[22] For comparison's sake, in 2015 alone, DreamWorks laid off five hundred people.[23] This is at least partially related to the complex funding situation in Russia; animation production in the country has been historically state-sponsored and remains largely dependent on government funds to the present day. While the practice of securing independent investments has become increasingly widespread, many studios still rely at least partly on state support. Since government subsidies cannot compete with Hollywood capital, the budget of a typical Russian studio production constitutes a fraction of that of an American animated feature of comparable length. For instance, *Snezhnaya Koroleva* (*The Snow Queen*, Vladlen Barbe and Maksim Sveshnikov, 2012) cost $7 million to make, whereas the original *Frozen* (Chris Buck and Jennifer Lee, 2013) set Disney back $150 million.[24]

While mine is a limited case study, many of the insights it generates can be generalized toward formulating a broader, more global-minded understanding of contemporary commercial animation production and animation politics. At the same time, this type of analysis not only helps disrupt the US-oriented scholarly status quo and broaden the scope of intellectual inquiry

22 Ramin Zahed, "Russian Studio Melnitsa Celebrates 20th Anniversary at Annecy," *Animation Magazine*, June 7, 2019, https://www.animationmagazine.net/tv/russian-studio-melnitsa-celebrates-20th-anniversary-at-annecy/.

23 Marc Graser and Dave McNary, "DreamWorks Animation Cutting 500 Jobs; Dawn Taubin and Mark Zoradi Exiting," *Variety*, January 22, 2015, https://variety.com/2015/film/news/dreamworks-animation-cutting-500-jobs-takes-290-million-charge-1201412212/.

24 See Amid Amidi, "The Russian 'Snow Queen' Will Open This Friday," Cartoon Brew, October 7, 2013, https://www.cartoonbrew.com/feature-film/the-russian-snow-queen-will-open-this-friday-89439.html; and Dustin Rowles, "The Return on the Investment of the 10 Most Expensive Animated Films Ever Made," Pajiba, December 2, 2013, https://www.pajiba.com/box_office_round-ups/the-return-on-the-investment-of-the-10-most-expensive-animated-films-ever-made.php.

into the subject but also serves to defamiliarize American studio animation aesthetics and politics by providing context that both challenges and complicates existing assumptions about their exceptionality and the nature of their international impact.

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Jordan Schonig

Designed by Chance: Form and Recorded Motion

> A new jargon was heard around the [Disney] studio. Words like
> "aiming" and "overlapping" and "pose to pose" suggested that cer-
> tain animation procedures gradually had been isolated and named.
> Verbs turned into nouns overnight, as, for example, when the sug-
> gestion, "Why don't you stretch him out more?" became "Get more
> stretch on him." . . . As each of these processes *acquired a name*, it was
> analyzed and perfected and talked about.[1]

At first glance, not much is remarkable about this anecdote from Disney
animators Frank Thomas and Ollie Johnston. A specialized vocabulary is
a necessary feature of any craft, and phrases such as "squash and stretch"
and "rubber hose" are ubiquitous terms for categorizing stylistic differences
within the history of animation. But when viewed from the vantage of the
history of film theory and criticism, a striking set of distinctions emerges.
Whereas film scholars have devised a formal vocabulary to describe varia-
tions in shot scale and angle, editing patterns, and approaches to mise-en-
scène, animators and animation scholars have developed terms to describe
forms of *onscreen movement*. To identify a "squash and stretch" within a
character's leap or to compare a flailing limb to a "rubber hose" is to identify
a sense of unity—a form—perceived across a succession of visual sensations.
In what follows, I'll show how film studies stands to gain from thinking of
movement in this particular way and how an attention to forms of movement
can change the way we think about film form more generally.[2]

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1 Frank Thomas and Ollie Johnston, *The Illusion of Life: Disney Animation* (1981; New
   York: Hyperion, 1995), 15 (emphasis mine).
2 I investigate this question in more depth in *The Shape of Motion: Cinema and the
   Aesthetics of Movement*, forthcoming from Oxford University Press.

By *forms of movement*, I do not simply mean types of movement, where such types might be divided into the movement of human subjects, the camera's movement, or the movement that results from editing.[3] Rather, I mean perceptual wholes or shapes of motion mentally stitched together through time. Think of forms of movement as temporal *gestalts*, except instead of perceiving the aural unity of a melody across the succession of individual notes, we perceive a visual unity: a shape or pattern of motion. In everyday life, forms of motion enable us to identify things in the world, such as when we recognize a friend from behind by their gait.[4] Our friend's way of walking—as distinct from, say, the contours of their body—has a motion signature that we are able to identify across time.

For animators, this ordinary cognitive faculty of stitching together forms from fields of motion is indispensable. Animators don't simply see characters who move; they see forms and styles within and across those movements. This way of seeing undergirds Norman McLaren's oft-cited definition of animation as "not the art of drawings-that-move, but the art of movements-that-are-drawn."[5] For animators, forms of movement such as squash and stretch or rubber hose often take perceptual priority over the design of the object or character that is moving.[6]

This faculty is as well documented in animation scholarship as it is in animation practice. We can see it in Sergei Eisenstein's notion of the "plasmatic," a way of moving marked by the metamorphic flexibility of a figure's contours, or in Thomas Lamarre's distinction between cinematism and animetism, two opposing aesthetic tendencies for representing mobile views of animated space.[7] We can see it in Vivian Sobchack's phenomenological analysis of the computer-animated "morph"—itself a form of motion subsumed within the broader form of the metamorphic—and Aylish Wood's study of the "spatial transformations" in Caroline Leaf's sand animations.[8] In each of these cases, forms of movement are identified and named as a means of expanding the reader's ability to *see* those forms.[9]

While forms of movement abound in live-action film—such as the onrush of space typical of forward camera movement or Charlie Chaplin's

3   Vivian Sobchack offers such a taxonomy in "The Active Eye: A Phenomenology of Cinematic Vision," *Quarterly Review of Film and Video* 12, no. 3 (1990): 21–36.

4   Perceptual psychologists often refer to this phenomenon as a "motion signature." See, for example, Fani Loula, Sapna Prasad, Kent Harber, and Maggie Shiffrar, "Recognizing People from Their Movement," *Journal of Experimental Psychology: Human Perception and Performance* 31, no. 1 (2005): 210.

5   Quoted in Maureen Furniss, *Art in Motion: Animation Aesthetics*, rev. ed. (Eastleigh, UK: John Libbey, 2007), 5.

6   In Alla Gadassik's words, studio animators "[privilege] movement and energy over an outlined shape." Alla Gadassik, "Assembling Movement: Scientific Motion Analysis and Studio Animation Practice," *Discourse* 37, no. 3 (2015): 288.

7   Sergei Eisenstein, *Eisenstein on Disney*, ed. Jay Leyda and trans. Alan Upchurch (London: Methuen, 1988), 101; and Thomas Lamarre, *The Anime Machine: A Media Theory of Animation* (Minneapolis: University of Minnesota Press, 2009), 27.

8   Vivian Sobchack, introduction to *Meta-Morphing: Visual Transformation and the Culture of Quick-Change* (Minneapolis: University of Minnesota Press, 2000), 136; and Aylish Wood, "Re-animating Space," *Animation* 1, no. 2 (2006): 133–152.

9   For a reflexive investigation and application of this kind of analysis in animation studies, see Ryan Pierson, *Figure and Force in Animation Aesthetics* (Oxford: Oxford University Press, 2020).

tramp walk—they are rarely presented as objects of analysis. Part of the reason for this is that form has been understood in film studies as the product of artistic choices. Moreover, in live-action film, movement is recorded rather than designed frame by frame. In painting, sculpture, music, and literature, the work of form—the spatiotemporal arrangement of the artwork—is generally attributed to the hand of the artist (or the group of artists and craftspeople) that does the arranging. But what authorial hand is responsible for the movement of the wind in the trees or the unconsciously produced micromovements of a facial expression? It's conceptually difficult to locate form in the tiny intervals of successive frames that seem to happen *between* the discernible choices made by artistic agents. Film scholars thus tend to seek out form at scales that seem consistent with artistic decision-making—say, in the ordering of shots, the sequencing of narrative events, and the spatial composition of the frame.

This way of thinking is not just a mainstay of undergraduate-level film studies textbooks; it also pervades the history of film theory. A case in point is Gilles Deleuze's exclusion of the cinematic movement "of characters and things" from his concept of the "movement-image."[10] Identifying the birth of cinema proper with the emergence of editing and camera movement, Deleuze adheres to the intuition that cinematic form exists where artistic agency is discernible. Perhaps the most extreme example of this type of thinking comes from the formalist film theory of Rudolf Arnheim, who wrote that the medium of film will reach its artistic apotheosis only "when it frees itself from the bonds of photographic reproduction and becomes a pure work of man, namely, as animated cartoon or painting."[11] It should come as no surprise that Arnheim's idealization of animation as a purely manual mode of cinematic construction has been reinforced by a number of animation theorists, many of whom have celebrated the medium's complete control over and against the contingencies of photographic recording.[12] On this view, animated movement is *formed* by hand, whereas live-action movement is *transposed* from the material world.[13]

But what might it look like to see the contingent micromovements of actors and objects as formed rather than transposed, akin to the movements designed by the hands of animators? To put pressure on the dichotomy of contingency and control, I want to examine a well-known moment from a live-action narrative film whose movement seems at once designed and

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10 Gilles Deleuze, *Cinema 1: The Movement-Image*, trans. Hugh Tomlinson and Barbara Habberjam (London: Athlone Press, 1986), 24. See also Tom Gunning, "Animation and Alienation: Bergson's Critique of the Cinématographe and the Paradox of Mechanical Motion," *Moving Image* 14, no. 1 (2014): 1–9.

11 Rudolf Arnheim, *Film as Art* (Berkeley: University of California Press, 1957), 213.

12 For an account of this theoretical trend, see Andrew Darley, "Bones of Contention: Thoughts on the Study of Animation," *Animation* 2, no. 1 (2007): 63–76; and Mihaela Mihailova, "The Mastery Machine: Digital Animation and Fantasies of Control," *Animation* 8, no. 2 (2013): 131–148.

13 Such a dichotomy has been interrogated from a number of angles. For example, Hannah Frank has examined the indexical traces of manual labor in cel animated cartoons to challenge the presumption that the photographic process is only incidental to the production of cel animation. Hannah Frank, *Frame by Frame: A Materialist Aesthetics of Animated Cartoons*, ed. Daniel Morgan (Oakland: University of California Press, 2019).

contingent, precisely choreographed and purely accidental. The moment comes from a pivotal scene in Howard Hawks's *Scarface* (1932) in which crime boss Tom Gaffney (Boris Karloff) is shot dead in a bowling alley by rival Tony Camonte (Paul Muni) and his gangsters. Just after Gaffney is shot at the peak of his bowling stroke, the camera closely follows the ball gliding down the lane. When the ball lands a would-be strike, the camera lingers upon the only remaining pin as it stubbornly twirls, pauses, and then falls as if to its death, a clear visual metaphor for Gaffney's death.[14]

François Truffaut famously singled out this moment in a brief review of *Scarface* for *Cahiers du cinéma*: "The most striking scene in the movie is unquestionably Boris Karloff's death. He squats down to throw a ball in a game of ninepins and doesn't get up; a rifle shot prostrates him. The camera follows the ball he's thrown as it knocks down all the pins except one that keeps spinning until it finally falls over, the exact symbol of Karloff himself, the last survivor of a rival gang that's been wiped out by [Paul] Muni. This isn't literature. It may be dance or poetry. It is certainly cinema."[15] Both Christian Keathley and Rashna Richards have cited this passage as a key example of what they term a *cinephiliac moment*, a brief fragment from a film that compels rapturous description and that resists systematic analysis by dint of its apparent contingency.[16] As Richards explains, cinephiliac moments like this one are derived from "the cinephile's belief that, *because of cinema's indexicality*, even in the most controlled circumstances, something of the real can appear on the screen inadvertently."[17] On such a reading, then, the pin's fall is appealing because the contingency of its spin and bounce resists the controlled circumstances—that is, the formal choices—that surround it.

But this explanation misses something crucial, for Truffaut's enthusiasm seems to rest precisely on his sensitivity to the form of the pin's fall. What makes the pin's fall "certainly cinema" is not simply that the pin becomes a symbol for Karloff through clever juxtaposition but that the particularity of the pin's movement so overwhelmingly creates this impression. Upon close inspection, the form of the pin's movement takes on an anthropomorphized pathos, exhibiting an almost histrionic suspension of its fatal plummet.

To perceive this sense of form, we need to describe the pin's movement (a mere four seconds of screen time) with an attention commensurate with descriptions of animated motion, even if the "hand of the artist" that crafted such movement is nowhere to be found. The pin's first sign of anthropomorphism emerges from a sudden and unexpected change of trajectory: just after the violent collision that sets it into motion, launching it into a leftward slide, the pin surprisingly spins back in the other direction. Seemingly independent of the laws of physics, this movement gives the

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14 For an earlier version of this reading, see Jordan Schonig, "The Haecceity Effect: On the Aesthetics of Cinephiliac Moments," *Screen* 61, no. 2 (2020): 266–267.

15 François Truffaut, *The Films in My Life*, trans. Leonard Mayhew (New York: Simon and Schuster, 1975), 70.

16 See Christian Keathley, *Cinephilia and History, or The Wind in the Trees* (Bloomington: Indiana University Press, 2005), 84; and Rashna Wadia Richards, *Cinematic Flashes: Cinephilia and Classical Hollywood* (Bloomington: Indiana University Press, 2013), 7.

17 Richards, *Cinematic Flashes*, 12 (emphasis mine).

pin a flickering semblance of life. Crucially, it is at this very moment that we hear off screen gunshots, which we know to be aimed at Gaffney's men but here seem to riddle the pin's body. As if that momentary liveliness were halted by the bullets, the pin immediately decelerates. Each of its rotations begins to widen in circumference and slows down until the pin finally loses its momentum, displacing its center of gravity just enough that it loses its balance and teeters into a prolonged fall. The aggregate impression created by these formal details is unmistakable: the pin's movement resembles the dramatically suspended deaths throughout *Scarface*, in which a gunshot victim suddenly stops, slowly sinks or teeters or drops to their knees, and then falls with a thud.

If such a moment *feels* designed, what do we do with the fact of its contingency?[18] It is not enough to say that the pin's style of movement sufficiently resembles a human fall in order to stand in for Karloff's death; more precisely, this movement is remarkably singular, that is, serendipitous, in achieving this resemblance. No human agent, it seems, could have planned this perfect movement in just this way. While its particularity is clearly a function of contingency (as theories of cinephilia suggest), this contingency does not wrest it from its form. The opposite is in fact the case: the form of the pin's fall is so perfectly apt that it strikes us as designed, not by hand but by chance itself; in sum, it's a glimpse of fate.

Where does this leave the status of the form of recorded movement? In many ways, our assumption that form must be the product of artistic agency has rested on the conflation of *art* with the *aesthetic*. This conflation hasn't always been assumed, nor need it be. In Immanuel Kant's *Critique of Judgment*, aesthetic judgment applies equally to nature as to art, and *form* simply refers to the sense of unity—component parts arranged into relations—that our minds intuitively put together from our sensuous apprehension of the world.[19] Whether the configuration we intuit is of a painting or a tree, we cannot help but organize what we sense. Similarly, for Maurice Merleau-Ponty, the phenomena of the world are themselves "pregnant" with form, even in the ways they move.[20] "In the jerk of the twig from which a bird has just flown," Merleau-Ponty writes, "we read its flexibility or elasticity, and it is thus that a branch of an apple-tree or a birch are immediately distinguishable."[21] Like the falling bowling pin whose very movement embodies an image of death, or the flailing limb compared to a "rubber hose," the precise jerk of

18 In presuming the "contingency" of the pin's fall, I do not mean to foreclose the possibility that this remarkable trick shot was achieved without multiple takes or even special effects. In fact, a frame-by-frame examination of the bowling ball's initial collision invites the hypothesis that special effects—such as double exposure—or profilmic manipulation—such as a non-standard pin setup—may have been used to achieve the desired result (I am indebted to Oliver Gaycken for this observation). My ascription of "contingency," however, is confined to the final pin's fall, whose movement appears to be a result of actual physics rather than stop-motion animation.

19 For an account of the primacy of nature in Kant's aesthetics, see Immanuel Kant, *Critique of Judgment*, trans. Werner S. Pluhar (Indianapolis: Hackett Publishing, 1987), 26–28; for Kant's understanding of form as spatiotemporal arrangement, see *Critique of Judgment*, 71–72.

20 Maurice Merleau-Ponty, *Phenomenology of Perception*, trans. Colin Smith (1962; London: Routledge, 2005), 340.

21 Merleau-Ponty, 267.

the branch contains a unified shape or character that comes together and is seized upon in a matter of seconds.

Form is not only a product of analysis or reflection, something that must be deliberately excavated from beneath the immediacy of content. Form is also an intrinsic part of the flow of temporal experience. "The perception of forms," Merleau-Ponty writes, "understood very broadly as structure, grouping, or configuration should be considered our spontaneous way of seeing."[22] Constantly emerging and dissipating, coming together and breaking apart, forms organize our experience of movement across our world, animated worlds, and recorded worlds alike. While animated movement and filmed movement have long remained methodologically divided—one a product of deliberate design and the other marked by irreducible contingency—changing our idea of form across both disciplines can help erode such a division. Seeing recorded movement with the eyes of an animator, we can learn to see what's always been onscreen but rarely, if ever, articulated: cinema's innumerable forms of motion.

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22 Maurice Merleau-Ponty, "The Film and the New Psychology," in *Sense and Non-Sense*, trans. Hubert L. Dreyfus and Patricia Allen Dreyfus (1964; Evanston, IL: Northwestern University Press, 1992), 49.

Thomas Lamarre

Ecomation

Definitions of animation tend to oscillate between making something move and bringing something to life.[1] Yet what could be more different than striking a billiard ball on a table and bringing that same ball to life? Are these two propositions not worlds apart? Animation brings them into relation, however. The relation between making something move and bringing something to life is thus an ongoing source of perplexity both for producers and critics of animation. Two distinctive ways of dealing with this relation have emerged, implying profoundly different images of thought. According to one line of thinking, movement is always *movement of something*. Another line of thinking submits that *movement is something*.[2]

The first line of thinking takes its cue for making something move from classical mechanics: an action on a body produces a reaction; something or someone imparts movement to a body, usually a figure or character. A figure made of clay or plasticine is pushed into motion. A hand-drawn figure is sketched into motion, position by position. In keeping with Newton's laws, the initial frame of reference for this line of thinking is inertial: an object remains at rest unless some force acts upon it.

The first line of thinking has its drama of creation. When movement is considered as force imparting movement to the inert object, a creator inevitably makes an appearance as the animator responsible for imparting the force. The creativity of the animator is thought to lie above all in the act of producing an illusion of life.[3] Animation is a matter of imparting a

1   See Donald Crafton, "The Veiled Genealogies of Animation and Cinema," *Animation* 6, no. 2 (2011): 93–110.
2   See Gilles Deleuze's distinction between *conscious of something* and *conscious is something* in *Cinema 1: The Movement-Image*, trans. Hugh Tomlinson and Barbara Habberjam (Minneapolis: University of Minnesota Press, 1986), 56.
3   Alan Cholodenko reflects at length on the illusion of life in his introduction to *The Illusion of Life II: More Essays on Animation* (Sydney: Power Publications, 2007), 13–95.

force to an object, thus bringing it to life. The animator is a demiurge who *brings to life.*

When the goal is bringing something to life, the illusion of life depends on resemblance. A computer brought to life still looks like a computer, but it must also bear some resemblance to life. Resemblance to life usually means resemblance to an animal, almost always the human animal but sometimes non-human animals who differ from human animals in degree, such as mammals. Indeed, resemblance in animation often evokes anthropomorphism. WALL-E (*WALL-E*, Andrew Stanton, 2008, Played by Ben Buertt), for instance, resembles both a robot or computer and a human animal. Such resemblance is not entirely stable, however. Neither is anthropomorphism. WALL-E might readily morph into some other kind of animal. It is narrative, or more precisely, a set of consistent behaviors organized in relation to a goal, that intervenes to sustain WALL-E's resemblance to both computer and human. For human audiences, sustaining anthropomorphism is arguably what most effectively shores up the illusion of life.

The illusion of life demands a certain kind of invisibility on the part of the animator or animators. Animators must not appear in the animation, at least not directly. Like absent causes or invisible forces, they are perceptible only through their effects. They appear partially. Early animation was fond of showing the hand, a part of the creator, which sets the tone for a kind of partial perception of the work of animators.[4] Their creative force is perceptible in the figural traces of their performative gestures in the process of applying force to figures, drawing, shaping, bending, turning, angling them, or imparting their facial expressions to characters, or even rotoscoping their own bodies. Creative force is at once perceptible and imperceptible.[5] It is in-perceptible.

This first way of thinking about movement, precisely because it implies an inertial frame of reference, always entails an initial *separation* between force and figure.[6] Force is applied to the body to make it move; creative force is dexterously applied to inert materials to bring them to life. The animator stands outside their creation, separate from it, even as they dwell in it, in-perceptibly. The problematic of this line of thinking is, How does one inhabit separation creatively?

Two orientations emerge for the illusion of life. On the one hand, signature styles develop, attesting to the in-perceptibility of the animator or animators. Character animators, for instance, introduce a distinctive style into their rendering of characters. Between action and reaction arises an interval in which a force acting on a figure or character does not meet with

4   Donald Crafton writes at length on the appearance of creators' hands in early animation in *Before Mickey: The Animated Film, 1898–1928* (Chicago: University of Chicago Press, 1993), establishing a break between early animation and studio animation on this basis. In a genealogical manner, I stress discontinuity and continuity.

5   See James J. Hodge's account of the sense of indirection arising from effects of digital inscription in *Sensations of History: Animation and New Media Art* (Minneapolis: University of Minnesota Press, 2019), 83.

6   Ryan Pierson speaks directly to the relation between figures and forces in animation in *Figure and Force in Animation Aesthetics* (New York: Oxford University Press, 2020), 2.

an immediate reaction in the manner of a billiard ball struck by another ball. The active force is prolonged and reverberates through the figure. At one extreme is the plasticity associated with the "squash and stretch" technique; the figure is wildly deformed, only to spring back to its initial shape. At the other extreme, figures are largely rigid, but a profound tension runs through their graphic design—reverberation on the surface, as it were.[7] This prolongation of the interval between action (active force) and reaction (reactive figure) is the domain of affect. Nonetheless, for all that the illusion of life gesticulates and pulses, it remains constrained by the steep embankments of personality; affect remains subordinated to the movement of figures or characters, individualized or personalized.[8] When directors impart a signature style or overall tonality to a collective work, it is as if the entire animation takes on such a personality, as if character animation had been scaled up.

On the other hand, a second orientation within this way of thinking is the effects of mise-en-abyme that follow from the founding separation between animators and objects-to-be-animated. Such effects may be produced around the hand of the animator appearing in the animation—drawing figures, imparting force to lines, and bringing figures to life.[9] The drawn figure may even begin to act on the animator. The result may feel like a hall of mirrors, with a hand drawing a hand drawing a hand, ad infinitum. For all their reverberation, such effects still recall classical mechanics. Newton's third law holds that when one body exerts a force on a second body, the second body simultaneously exerts a force equal in magnitude and opposite in direction on the first body.

If the first line of thinking movement in animation gravitates toward, and delights in, effects of creative mise-en-abyme, it is because such effects multiply and complicate the separation of force and figure but without troubling it. The demiurge remains transcendent in their in-perceptibility. Movement remains movement of something. What fascinates and troubles this manner of thinking more than the intrusive and quasi-deconstructive hand of the creator is the automaton, especially the moment of their awakening, when energy flickers over their skin in silvery white or neon blue, their eyes flutter, and their lips quake. By appearing *causa sui*, the automaton promises a perfect solution to the fundamental separation of force and figure.[10] Yet the rift divides them, and unable to forget their creator, automatons carry the separation everywhere, fracturing everything they touch. This multiplying of separation is not limited to the animation as art object; the automaton shudders into life across movies, comics, commercials, and television series.[11]

7   Andrew R. Johnston addresses this pulsating doubleness of the animated line in *Pulses of Abstraction: Episodes from a History of Animation* (Minneapolis: University of Minnesota Press, 2020), 54.

8   What is thus individualized may be racialized; reverberations turn into an innervated agitation that Sianne Ngai calls animatedness in *Ugly Feelings* (Cambridge, MA: Harvard University Press, 2005), 33.

9   See William Schaffer, "Animation 1: The Control-Image," in Cholodenko, *Illusion of Life II*, 456–485.

10 Cholodenko's introduction to *The Illusion of Life II* again provides an excellent example.

11 See Marc Steinberg's "Immobile Sections and Trans-Series Movement: *Astroboy* and the Emergence of Anime," *Animation* 1, no. 2 (2006): 190–206.

Mise-en-abyme extends to media forms, animation unraveling to provide connective tissue for multiplex frames of references converging into a tumorous growth.

The second manner of thinking—that *movement is something*—recalls fluid dynamics, especially when it addresses chaotic mixing, fractal patterns, or blinking vortices. Tracers mark patterns arising through the interaction of forces, dye swirling in turbulent waters, ink seeping into textured paper, dust particles and leaves swept into the whirlwind, or even a plastic bag, puffed with air, caught on the wind, bobbing and soaring.

In contrast with the drama of bringing something to life, there is the theater of improvisation dedicated to finding life where it emerges from things. The animator here is an explorer or experimenter. Their challenge lies in locating conditions, or setting conditions, under which something happens, something *comes to life*. The emphasis here is on potential life instead of the illusion of life. Anything that moves is potentially life. Because movement is relative to the observer, potential life is relational. It lives in relation, and the animator and the animated evolve together.

To be sure, in both instances (illusion of life and potential life), life is a matter of likeness. But likeness means something different for these two ways of dealing with movement. WALL-E resembles both a computer and an animal, and this doubling of resemblance brings into play two horizons of desire. There is the desire to stabilize the personage of WALL-E, to distance it from both creator and audience. A set of behaviors implying psychological motivation impart a sense of independence to the character, making it feel autonomous of its creator.[12] But there is also a desire to play with this character, or more powerfully, to play it, to take on its role. This is how resemblance flips into semblance. Semblance is the child pretending to be a windmill, or acting like a cloud in the sky, or perhaps improvising the life of a computer.[13] Key of *Key the Metal Idol* (Discotek Media, 1994–1997) comes to mind. She is a human who believes herself to be a robot with the potential to become a human. Her enactment of a robot simultaneously gestures toward childhood trauma and superpowers.

Now, although resemblance and semblance are different in kind, the inherent duplicity of figures of life in animation means that reading practices may allow the one to flip into the other. Where is the line between playing with WALL-E and playing WALL-E?

Narrative form often proves decisive yet elusive, decisive because elusive. The paradigm of classical film form or classical narrative form, however, has proven too rigid in cognitive and geopolitical terms to offer much insight into modern and contemporary forms of transmedial, transnational, interactive, or participatory storytelling.[14] For instance, the distribution format in

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12 Imamura Taihei highlights how character psychology and motivations are the key to the vitality of 1930s Disney cartoons in "Japanese Cartoon Films," trans. Thomas Lamarre, in *Mechademia 9: Origins*, ed. Frenchy Lunning (Minneapolis: University of Minnesota Press, 2014), 107–124.

13 Walter Benjamin uses some of these examples in "On the Mimetic Faculty," in *Selected Writings*, ed. Michael W. Jennings, Howard Eiland, and Gary Smith, vol. 2, *1927–1934* (Cambridge, MA: Harvard University Press, 1999), 720–722.

14 See Miriam Hansen, "The Mass Production of the Senses: Classical Cinema as Ver-

which Key of *Key the Metal Idol* undertakes her oscillation between robot and human—"original video animation" (OVA)—is one that enhances the prolongation of the performativity of semblance through serialization. Its story unfolds across media, cultures, and sectors in a very different manner than *WALL-E*. Serialization across media, across cultures, and across "sectors" (e.g., production, consumption, and distribution) undermines presumptions about the unicity of narrative form.[15] At the same time, the contemporary proliferation of feature-length animated films in the global market entails an almost desperate imposition of conventions for narrative-character unicity on animation form.

Animation today remains caught between these two images of movement, oscillating ever more frantically. Such conditions make careful consideration of the second way of thinking movement, the other side of movement, an urgent task. The automaton is the pivotal figure for such an endeavor. For that is precisely what the first image of movement generates through its separation of force and figure: the automaton.

The other side of the automaton is the *ecomaton*, a figure that carries force with it, a body that gathers its movement, a form of life that is "inseparate" precisely because its movement is something and thus is susceptible to adopting different directions.[16] This way of thinking looks at figures and characters through their milieu.[17] The life of the plasticine figure is not limited to the force imparted by the animator. It comprises the give-and-take of the plasticine under the heat of lights and the demiurge's thumb. The basic unit of animation, then, is not the figure or character. The basic unit is the "individual-milieu coupling."[18] The milieu comprises both the external or environmental forces (such as the heat of the lights and the touch of the animators) and internal forces (the bonds of the plasticine that impart elasticity or plasticity). It is called *milieu* because it goes through the middle of the external and internal milieus, so to speak. It emerges where external and internal forces meet. The life of animation emerges where forces interact: the pressure of human hands, the warmth of lamps, the bonds of plasticine. And other forces might be implicated and explicated, for the basic unit of animation, the individual-milieu coupling, is not an inert object but an occasion, a process of individuation spanning individual and milieu. Thus, the idea that movement is something arrives at an ecological image of thought.

In contrast, inertial frame of reference gives rise to an environmental image of thought. The separation of force and figure is extended into a separation of figure from background, and thinking tends to oscillate between focusing on the action of the ground (environment), the figure (human),

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nacular Modernism," *Modernism/Modernity* 6, no. 2 (1999): 59–77.

15 Thomas Elsaesser, "The Mind-Game Film," in *Puzzle Films: Complex Storytelling in Contemporary Cinema*, ed. Warren Buckland (Oxford: Wiley-Blackwell, 2009), 13–41.

16 Muriel Combes, *La vie inséparée: Vie et sujet au temps de la biopolitique* (Paris: Dittmar, 2011), 52. I here translate her term as "inseparate," although "inseparated" or "non-separated" would be equally fitting.

17 Isabelle Stengers, "Reclaiming Animism," *e-flux* 36 (2012), https://www.e-flux.com/journal/36/61245/reclaiming-animism/.

18 Gilbert Simondon, *Individuation in Light of Notions of Form and Information*, trans. Taylor Adkins (Minneapolis: University of Minnesota Press, 2020), 3.

and the reaction of the figure to the ground. Thinking risks becoming mired in human impacts, in the animation of anthropo-scenes. Ecologists are always reminding us, however, that ecology affords a larger view than environmentalism, for it ranges deeper and higher in ontogenetic terms.[19] Surely the time has come for our image of animation to do the same.

Needless to say, thinking animation is not merely a matter of choosing between two images of movement. Thinking animation aims at the relation between two images of movement, two images of thought. It is a reading practice. Here the long-standing preference for worlds of myth and fantasy in animated fare may prove an unexpected boon. What is more integral to such worlds than the feeling that the first creation, based on a movement of separation, went wrong?[20] Indeed, the first movement, tending toward environmental separation, was fated to be too straight and narrow.[21] Thus it paved the way for the second movement to begin again, to repeat athwart. That is the task of ecomation.

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19 Charles Krebs, *The Ecological World View* (Clayton, Australia: CSIRO, 2008), 2–3; and Colin R. Townsend, Michael Begon, and John L. Harper, *Essentials of Ecology*, 3rd ed. (Malden, MA: Blackwell, 2008), 3–16.

20 Gilles Deleuze, "Desert Islands," in *Desert Islands and Other Texts, 1953–74*, ed. David Lapoujade and trans. Michael Taormina (New York: Semiotext(e), 2004), 9–14.

21 Resonant here is Jack Halberstam's evocation of transbiology for an ecological queering of this straight and narrow anthropocentricism in "Animating Revolt/Revolting Animation: Penguin Love, Doll Sex and the Spectacle of the Queer Non-human," in *Queering the Non/Human*, ed. Noreen Giffney and Myra J. Hird (Farnham, UK: Ashgate Publishing, 2008), 265–281.