# 2 What Is Estranged in Science Fiction Animation?

ISTVAN CSICSERY-RONAY JR.

Histories of science fiction (SF) animation have yet to be written. Whatever approaches they may take, they will have to account for a formidable corpus of works from many national and craft cultures. They will have to decide what fits within the boundaries of SF, that is, which thematic, iconic, cinematic, and graphic qualities are specific to SF. They will have to negotiate with numerous texts that play with science fictional elements but reject confinement to generic protocols. They also will have to make decisions about whether to draw boundary lines between animation as a mode of expression and animated special effects that constitute an increasing proportion of ostensibly live action films. They will have to explore how and why animation artists are attracted to SF as a universe of discourse in which to develop animation as an artistic medium. In this space I suggest some ideas that future historians might find useful in that project.

Generically specific SF animation is a relatively recent art form. Although Meliès's *Voyage dans la lune (A Trip to the Moon,* 1902) is a founding text of both the cinema of spectacle and of SF cinema specifically, there are not many other examples before the second half of the 20th century. Like *Voyage,* movies such as *Interplanetary Revolution* (1924) in the Soviet Union and the Fleischer brothers'/Famous Studios's *Superman* serials in the 1940s proved to be isolated projects, and were viewed less as science-fictional than as elaborations of other media—Constructivist poster art in the case of *Interplanetary Revolutions,* newspaper comics in the case of *Superman.* Although this phenomenon may seem surprising, given the popularity of SF or hybrids with strong SF elements in U.S. comics, such as *Buck Rogers, Flash Gordon, The Phantom, Mandrake the Magician, The Flash,* and *The Justice League of America* (none of which was adapted to animation), there

are good explanations for this lacuna. Animation was slow to develop as a culturally supported form outside the U.S. until the post–World War II period.[1] In the United States itself, where the technical possibilities of animation were being shaped in the heady atmosphere of artistic and technological experimentation in the studios of the Fleischer brothers and Walt Disney, the art form was not particularly attracted to SF's generic strengths. The dominant model was the print cartoon, whose basic line-shapes were subjected to more and more inventive and humorous metamorphoses. The emphasis on high-energy transformations of the image led early animators naturally to grotesque and fantastic scenarios. These animations often were overtly parodistic of other, more settled genres—fairy tales, ghost tales, adventure stories, cabaret performances, and dramatic movies. The high humor of Golden Age cartoons lay in their irreverent and anarchic violation of generic protocols and of stable, contemplation-worthy images. Animation's entire raison d'être appeared to be to mock realism in narrative, in image, and in ontology. The art of uninhibited transformation established an aesthetic zone in which "anything can happen." Even the integrity of a cartoon's graphic world was continually upended, as line drawings shared space with rotoscoped images, stop-action photography, and photorealistic cinema.

When animated film became popular enough to attract large-scale financial and cultural investment, the dominant aesthetic shifted from the zany fantasy of early newspaper comics (which remained popular for shorts) toward the imitation of illustrations for children, especially of fairy tales. This trend, dominated by the Disney studios but followed even by the Fleischer brothers in their version of *Gulliver's Travels* (1939), normalized industrial entertainment animation as essentially an art oriented toward children. The fantastic elements became less surrealistic and disorienting, and more traditionally marvelous and consoling.

Among fantastic genres, SF is in general closely tied to realism. As Darko Suvin has argued persuasively, an SF narrative usually features the disruption of a familiar reality by the intrusion of *novums,* new events, objects, or information that are plausible, or rather, that are rationalizable within contemporary ideas about the existing material world.[2] Much of the action of SF scenarios revolves around the ability of humanlike characters to manipulate physical reality in technoscientific ways in response to these novums. The huge archive of

"sci-fi" spectacles in which novums and their manipulation are barely disguised magical or supernatural devices shows that this generic norm of fantastic realism is very fuzzy and flexible. Yet even in the zaniest parodistic versions of SF novums are given pseudo-scientific rationalizations. Pseudo-science still stipulates the power of scientific reasoning. The core pseudo-mimetic ontology of SF is at odds both with metamorphic anarchy and the sensibility of the fairy tale pervaded by supernatural marvels. A case in point: the eight episodes of *Superman* produced by the Fleischer brothers were the first sustained experiment in SF animation. They included many familiar SF tropes of the time—robots, threatening comets, dinosaurs and giant apes on the loose—but with important counter–science fictional compromises. It is in the Fleischer series that Superman first acquires the power to fly (which in the earlier comics would have been considered magical), and the buildings that he occasionally has to prop up are noticeably bendy (a Fleischer trademark).[3] It was not until the rupture of World War II and the subsequent global technological urban renewal that conditions became favorable for the development of SF animation. As SF itself became a barometer for social anxieties about future shock, and technologies for the production of animation were more widely disseminated, and indeed as cinema and video became dominant as media, both SF and animation attracted global interest.

My title alludes to Darko Suvin's influential notion that SF as a mode of art is characterized by a mental operation he terms "cognitive estrangement."[4] For Suvin, SF is an "estranged genre," one of several in a class we more often call the fantastic, the marvelous, or *fantastika*, which includes all counter-mimetic genres.[5] Suvin's use of the term estrangement implies that there is a baseline of empirically and socially accurate (or at least consensually accepted) understanding about the real world, and that some genres make their livings by *not* representing it. Of these genres, only SF is, for Suvin, *cognitively* estranged—that is, only SF employs its estranging techniques to create a constructive alienation that will lead the readership to greater awareness of actual conditions. SF uses the techniques of both mimetic representation and also quasi-mimetic but counterfactual deviations from the established ideological world-picture to create a critical distance from it.

Suvin's notion is quite useful, but also quite vague—more a suggestion than a description. Neither of its terms—*cognition* nor

*estrangement*—are clearly defined by Suvin, or used consistently. Suvin's use of estrangement differs from its previous uses by Viktor Shklovsky and Bertholt Brecht, from whom Suvin's concept is derived. Shklovsky and the Russian Formalists intended estrangement to signify devices employed by artists to disrupt artistic techniques and forms that had become habitual and deadened. Brecht used the German term *Verfremdung* for similar purposes, but with the more ambitious goal of breaking up the audience's enchantment by ideological illusions. V-effects were to orient audiences toward the clear scientific understanding of reality, which Brecht considered to be naturally accessible to Marxist analysis.[6]

*Cognitive* is a word that has many meanings in contemporary discourse, but they all seem to share a strong Enlightenment quality of distinguishing true, useful knowledge about the world from delusion. We often hear of cognitive dysfunction or cognitive dissonance, but rarely of cognitive assonance or cognitive accuracy; the term seems by itself to imply that it is doing what it is supposed to do. Cognition implies a correct, healthy apprehension of things—something akin to *understanding.* Cognitive estrangement then seems to imply that a certain mental operation of dehabituation or defamiliarization is required for us to see the world correctly because the pragmatic, empirical reality we have become habituated to is a collective illusion reinforced by ruling-class ideology that masks true apprehension. Suvin grants SF high status among genres because this operation of making the world strange in order to reveal its illusory, ideological character is in his view the genre's guiding purpose. In sum, the thing that is made strange in the operation in Suvin's usage is not artifice, but reality, which has been enchanted and naturalized by ideology.[7]

Suvin's version of cognitive estrangement requires a prior commitment to the notion that one can, and should, have a true perception of reality consonant with scientific-materialist rationality. In narrative, it privileges realistic style—as if to say that realism would be the default style of true description if people's understanding of the real world weren't so distorted by irrational, consciousness-manipulating power. This is why the Suvinian notion of SF has been opposed constantly to fantasy—so that even as sophisticated a critic as Fredric Jameson sees the opposition as one between a genre that opens its public's minds and one that lulls them into infantile dreams.[8] Hence also the anxiety

by many followers of SF that the genre is continually being infiltrated by putatively irrationalist elements and corrupted by the blending of the two supposedly fundamentally opposed genres by booksellers and undiscriminating fans.

The notion of estrangement in this context may be fuzzy and tendentious, but it is nonetheless on to something: specifically, why SF has elective affinities with satirical indirection. More generally, it calls attention to the way critical discourse can contest the ideological illusion of scientism, namely that empirical science delivers a total world-explanation appearing to be politically neutral, while in fact legitimating a capitalist world system—all without calling into question the privileged role of materialist rationalism. There are certainly many texts that work in this way, with the purpose of making their audiences see the world at a critical distance by imagining alternatives to it and yet retaining a realist world picture. As long as we recognize that estrangement tactics always work in dialectical tandem with naturalization, that is, the re-emplacement of disruptive novums into a realist world picture, estrangement can be one of the most powerful of the genre's psychological and aesthetic effects-engines. One of its great drawbacks, however, is that it guides critics toward essentially realistic interpretive values: we identify the real, material social phenomena that are estranged and then measure the distance between the two termini. What happens then when we apply this notion to animation, where empirically identifiable referents, no matter how displaced they may be, simply are not required? Where is the core stratum of real empirical experience for a medium that in its essence rejects the norm of representation of a consolidated, totalized objective reality?

Since the 1950s, a great many SF animation texts have been produced for many different occasions in enormously varied styles and via many different technologies. Many are made because they are relatively inexpensive and the market has a continual demand for combinations of catchy things: cartoons and SF being a natural pair. At the other end of the spectrum, SF has been the pretext for ambitious artistic and philosophical experiments in animation. Given such variety, no definition even of the medium of SF animation can ever be more than a provocative heuristic tool.

SF cartooning became popular especially when television created an insatiable demand for programs in every country that introduced

TV after World War II. In Central and Eastern Europe, the already well-established culture of animation was harnessed for many kinds of fantasy in a great variety of animation modes—stop motion, Claymation, paper cutouts, and diverse graphic styles. The story of Japanese animation is one of the best known in our time.[9] In the United States, cartoons aimed at children became one of the mainstays of the new television regime. These shorts and series were sold transnationally. Where U.S. programs were too costly to import, non-U.S. animation became an important television resource. Eastern European cartoon series were played in Japan, Western Europe, and even China. Japanese anime series were sold to Europe, the United States, and throughout Asia. These series tended toward fantastic genres, and were among the main vehicles for the nonmimetic popular imagination in the otherwise realism-obsessed media of postwar cinema and television. In part, this tendency occurred because the medium of animation was inclined to fantasy (because animation is essentially an art of stylized metamorphic transformation), but animation artists were also discouraged from developing realistic styles and subject matter. Animation was viewed as manifestly inferior to photorealism by the cultural elites. (This differed from culture to culture. In Japan, cartooning had an established educational tradition, and in Eastern Europe television animation was considered a rich new creative medium for visual artists.) In this climate, SF's particular kind of fantasy was favored. The advent of the techno-scientific age after the war, with its nuclear fears, the rise of the Security State and its ideological organs, the penetration of high technology into everyday life, and pulp SF's historical association with popular techno-science gave SF animation an influential place in the media landscape. Since then, thousands of television cartoon series have been produced throughout the world, and many feature-length animated films with SF-inflected themes have been shown in theaters. Computer graphic imaging (CGI) techniques are in our time supplanting most of the earlier techniques of animation, and with the dominant hyper-realistic aesthetic of contemporary CGI, the line between animation and photorealism is increasingly blurred—a development that favors SF's generic interest in the technologically induced breakdowns of previously hard-and-fast ontological distinctions. The great diversity of styles and techniques that characterized different regional and national attitudes toward SF is evidently thinning out,

as CGI techniques, especially mimetic 3D modeling, and globalized entertainment industries consolidate popular animation's universe of discourse. At the same, new combinations of old and new techniques are inspiring stunningly original new kinds of SF animation in films such as Don Bluth and Gary Goldman's *Titan AE,* Mamoru Oshii's *Kōkaku Kidōtai* (*The Ghost in the Shell*), Rintaro's *Metoroporisu* (*Metropolis*), and Richard Linklater's *A Scanner Darkly.*

With these developments, the question becomes even more topical: What, if anything, do the texts in SF animation's archive have in common? What is it that lets us speak of SF animation as a distinctive mode of art? If we limit what we mean by SF animation to animated versions of literary narratives with SF themes, or to the adoption of SF iconography, we have a fairly unambiguous set to work with, but it provides little information about why animation artists find SF particularly illuminating and inspiring for their art. We are still left with the question: What does SF offer animators as a way not only to tell stories, but to develop animation as a distinctive medium?

There are doubtless many answers to this question. It is also legitimate to question whether it is a purely academic concern; should one ask a popular entertainment genre to reflect on its own conditions of aesthetic possibility? However, I believe these are questions that all artists, whatever their media, ask themselves in the languages of those media. Whatever the broader social functions of a medium like animation are, it "answers to itself," an answer embodied in the relationship—congruent or dissonant—between a given work's themes and its artistic design. The sudden and swift ascendance of CGI over traditional animation techniques has marked those earlier techniques as "others," which can be made intelligible by exploring their embedded, and embodied, aesthetic and intellectual values.

In *The Seven Beauties of Science Fiction,* I proposed that the putative science in SF texts is always to a greater or lesser degree imaginary and counterfactual because it is placed in the context of fiction, a context that necessarily transforms all the signs it manipulates into nonassertive, ludic displays.[10] Indeed, the creative freedom of SF's ontology of fiction always trumps the deterministic ontology of the science that it ostensibly describes in its (fictional) worlds. Thus, pace Suvin, one of the main things that SF may indeed estrange is science itself, or rather the view that scientific rationality is adequate for understanding

the (real) world. In a similar way, I contend that SF animations—at least as evidenced by the texts that explore their media with artistic commitment—dislodge their publics' rigid habits of thought in at least one way, by estranging the "physics engine" of the world. A genre medium that is intimately enmeshed with technologies of representation, that works with organized shape-shifting and metamorphoses from one imaginary ontology to another, and that plays with conceptions of counterfactual but plausible alterity is necessarily fascinated by physics and its role in world construction.

A physics engine in contemporary parlance is a cluster of algorithms that regulates the simulated physical constraints of digital games and CGI effects. The algorithms determine the parameters of all the quasi-physical aspects that the game masters consider relevant—how the characters move, how they manipulate space, the resistances of bodies, the norms of space and time. Ultimately it is all about gravity. A physics engine is the gravity driver of a given digital world's construction.

In computer games and CGI-crafted artifacts we have seen a trend toward more and more "realistic" physics and bodies. One can legitimately infer that full hyper-realism is the ultimate goal, if only to establish a baseline against which to set creative deviations. But many things are devilishly difficult to simulate realistically. Often several physics engines need to be coordinated, each independently governing things like the movement of hair in the wind, the reflection of light on flowing water or human skin, the Brownian motion of dust specks in moving air, the slipstream of a speeding vehicle. The difficulty of representing a physical world visually tends to bring the problem into consciousness *as a problem*—especially if the narrative involves machines that articulate or manipulate imaginary matter. Even if earlier animators did not have physics engines per se, they were certainly aware that the world does have one—and that it is one of many in the universe. From its earliest works of SF, animation has constructed sublime and grotesque gags of wonder out of playful violations of the physics of bodies and mechanical devices. Think of the rocket poking in the eye of Meliès's Moon. Think of Koko and Bimbo in the Fleischer brothers' *Koko's Earth Control* (1928) striding along the rim of the Earth on their way to the Center for Earth Control, and the lunatic mayhem caused when Bimbo pulls the lever to end the Earth—which is of course what the Fleischer brothers wanted to do all along. (In-

deed, the Fleischer corpus is filled with jokes on physics—basically saying that the animator-as-trickster can undo what that Great Over-disciplined Killjoy of a God has made.)

Although it may seem counterintuitive that animation artists would be concerned with a constraint they are almost entirely free of, in that no animated universe needs to adhere to mundane gravity, all animators who depict imaginary worlds in which embodied characters interact with other bodies according to an overarching design are concerned with the rules that govern those interactions. So the physics in question here we might call a *lyrical physics,* in which affect and imagination determine the parameters of what can and cannot happen in a quasi-mimetic world, where the design limits the possibilities of metamorphosis. In SF animation, this design is dialectically bound to real mundane physics, which it simultaneously respects (knowing that the audience has a base in experience against which all deviations are measured) and defies. In abstract form, this is the appeal of Wile E. Coyote's relationship with abysses, Sylvester the Cat's tendency to be sliced into slivers, and Tex Avery's falling anvils. In SF animation, these abstractions tend to be consolidated into rich and varied, but also systematic, worlds.

So what happens when we consider this lyrical play with physics, this creation of a selectively altered imaginary universe with different rules of time, space, and motion, as a core motive of SF animation? I suggest that animators are drawn to the possibility of depicting fictive worlds operating by different physical rules, and indeed worlds operating by several different kinds of physics. Each of these worlds is appropriate for a distinct style of animation, and each such style appropriate for an aspect of the constructed world, and each style and world is equivalent to an ontology. Thus, I propose, different cultures and subcultures of SF animation begin with different orientations toward physics. Their differing interests and traditions of physics uncover different problems for our exploration of SF animation

It would be foolish to generalize too emphatically about such differences. Animation has been the freest form of filmmaking. Its freedom from the mechanical and social constraints of photographic realism encourages artists to vary their styles of metamorphosis within individual works, so that most artistically ambitious works of animation represent more than one distinct ontology in the same world. Indeed,

this creative tension between the possibility of infinite flexibility and the order of a creative design in which all elements are interrelated is one of the guiding energies of the art form. Similarly, animation's relative freedom from many other cultural constraints—most notably national language and social-realistic specificity—allows works to travel from one culture to another more freely than photorealism, and consequently to have greater cross-cultural influence. That said, animation artists, like artists in all media, work from within certain traditions of craft and production, which they elaborate, de-form, and resist in culturally determinate ways.

René Laloux, the director of *La Planète Sauvage* (*Fantastic Planet*) (1973) and one of the most influential SF animators, drew a sharp distinction between American and Continental styles of cartooning.

> In animated cartoons, contrary to what one may think, the needs of graphics do not necessarily correspond to the needs of movement. Faced with this dichotomy, the artist must find a balance between these two "enemies," in order not to prejudice the rights of both: a difficult task easily prone to failure. The easiest way out then, obviously, is to favor one of the two contenders. Consequently, the American School ties drawings to animation; the European School (tied to its cultural heritage) generally tried to do the opposite, basing itself upon graphic imagery. What resulted is very interesting. The total freedom of movement (with its implied association with the Anglo-Saxon taste for nonsense) led Americans to a taste for curved lines, quick movement and comedy, as well as an emphasis on character. In Europe, the emphasis on graphics favored the straight line, slow movement, fantasy and a lesser emphasis on psychology of individual characters.[11]

The distinction is schematic, but it has some validity at least for the period preceding the industrial culture of serial animation produced for television. With little change we can alter Laloux's craft terms into quasi-physical ones: the American school exploring a kinetic flexibility of form that seems to defy any settled physics, European animation emphasizing contemplation of more static visual design linked to the traditional reception of graphic arts and the acknowledgment of a con-

structed world. The advent of computer graphics represents, in this sense, a major historical rupture that reconfigures these local cultures of lyrical physics, just as the digital revolution reconfigured national cultures across the globe.

Laloux intended his contrast to cover all kinds of animation, not just SF. Arguably the estrangement of physics is something that happens in animation of all kinds as a matter of course; even highly mimetic cartooning like Isao Takahata's *Hotaru no haka* (*Grave of the Fireflies*) (1988) calls attention to this worldly physics by eschewing variants and alternatives that audiences of animation come to expect. Mimetic animation also draws attention to the artistry of depicting natural phenomena that may be taken for granted in everyday experience, which become objects of wonder when they are made visible as artifacts, such as the flight of butterflies and birds in films like *Bambi* (1942) or the fireflies themselves in *Grave*. I suggest that animation intended to be seen as specifically science fictional builds on the tension between SF's inherent tendency toward pseudo-mimesis and animation's inherent tendency toward metamorphic abstraction. In other words, the quasi-realistic gravity that distinguishes SF from other kinds of fantastic imagining—oneiric, metaphysical, marvellous, magical, visionary, uncanny, psychotic, and so on—works to contain the shape-shifting energies of the medium, while it simultaneously enjoys the freedom to depict more flexible worlds than mundane physical mimesis allows.

In European, and especially Central and East European animation, for instance—which has produced more SF animations than other kinds of SF film—I suggest that there has been a particular interest in making worlds that operate according to a set of physics that is entirely different, esoteric, ostentatiously stylized, yet just as internally consistent as the mundane. Perhaps because of the close linking of animation to avant-garde and experimental graphic arts in Central and Eastern Europe, Czech/Slovak, Polish, Hungarian, and Russian animation artists have tended toward vividly grotesque and decidedly nonrealistic world frames. Laloux, perhaps the most famous European SF animator, was drawn to make *La Planète Sauvage* in the Prague studios of the great Czech animator Jiři Trnka because of what he felt was the deep aesthetic affinity of the French style developing around Moebius's and Philippe Druillet's *Métal Hurlant* and the Czech tradition of linking puppetry and found objects with surrealism. Laloux's

films demonstrate quite clearly the principle of subordinating flexibility of movement and character psychology to striking visual design and narrative symbolism. In our context, Laloux's three SF films—*La Planète Sauvage, Maîtres du temps* (*Time Masters*) (1982), and *Gandahar* (1988)—each presents its alien SF world in the somewhat static form of illustration. Although some of the stasis of the later films is attributable to Laloux having to use increasingly cheaper studios (moving from Prague to Budapest to Pyongyang), in *Fantastic Planet* one can see that the painterly qualities of the two-dimensional paper cutout animation intentionally removed any sense of a naturalistic physical world. This flat aesthetic was shared by Jean-François Laguionie's *Gwen, ou le livre de sable* (*Gwen, or The Book of Sand*, 1985), which used the explicit juxtaposition of flat paper surfaces and highly stylized movement to emphasize the two-dimensionality linking the film to the tradition of artistic illustration.

The highly experimental feature-length *Chronopolis* (1982) by the Polish director Piotr Kamler working in France—a half-SF/half-metaphysical fantasy about a race of immortals who keep from being bored by manipulating time-space modules that appear to them as floating balls—is concerned with imagining how time out of time might look. Following in this tradition, the prize-winning short film *Katedra* (*Cathedral*) (2002) by another Pôle, Thomas Baginski, based on a story by the acclaimed SF writer Jacek Dukaj, depicts the grotesque transformations of human beings (probably explorers) into tree-form architectural components of a vegetable cathedral-like structure on an alien world, a transformation depicted as physical effects of their exposure to the light of a mysterious sun. In the comic Hungarian cartoon series, *A Mézga család* (*The Mézga Family*), which was a regular feature on Hungarian television before the evening news during most of the 1970s, a petit bourgeois Budapest family acquires a time machine that lets them communicate with one of their descendants in the far future. Among the many jokes about time travel and its psychic consequences, in one episode they travel to an ancient Mayanesque civilization that is essentially a two-dimensional flatland based on Mayan hieroglyphics. Complementing the extended visual joking about how to be effective in a flat world, the civilization speaks a stylized Hungarian that employs only one vowel—an amazingly possible thing to do, given the remarkable preponderance of the vowel *e* in the language. Similarly,

in the brilliant 2004 Hungarian film *Nyócker!* (*The District*) directed by Áron Gauder, a group of Magyar and Roma friends from the most infamous lumpen district of Budapest invent a time machine that takes them to primeval Hungary to complete a plan to kill and store all the mammoths in ancient Hungary, thereby creating a reservoir of oil in central Budapest when they return. The episode is jammed with jokes about impossible time, impossible space, and impossible bodies.

The dominant Japanese style of SF anime has developed different attitudes toward lyrical physics. Before digital production technologies, the need to produce animated films on low budgets for television encouraged a minimalist visual style that had a long pedigree in Japanese visual arts, a style of abstract representationalism in which quasi-realistic settings and figures were evoked through a few marked and stylized details. At the same time, Disney's influence on postwar Japanese animators and cartoonists was enormous.[12] A dialectic between a suggested environment and overtly cartoonish figures led to a distinctive hybridity of the drawn universe in each manga and anime. Figures that appeared to be drawn from different comics inhabited the same frames, and mood changes in characters were often represented in new graphic styles. Hybrid visual ontologies based on different graphic styles became the norm in Japanese cartooning. Such hybridity was common in other comic/animation styles—the Fleischers' use of rotoscoped Gulliver in a world of hand-drawn Lilliputians, the occasional overlay of photography and cartoons in Porky Pig and Daffy Duck cartoons, the racy romance between Betty Boop and Bimbo the dog, the strange Disney universe in which some animal forms can speak and others cannot (for example, Goofy versus Pluto). But the Japanese manga/anime style of fantasy normalized the coexistence of different graphic worlds, eschewing both the anarchic malleability of the Fleischer universe and the smoothing of incongruities of the Disney universe. This ontological hybridity was carried over from manga into anime, where the hybridity of graphic styles was applied to styles of movement and became a source of Japanese SF anime's distinctive culture of lyrical physics.

Early generations of SF anime emphasized lyrical physics in a number of inventive ways. Often still flat frames will feature a single physical effect, which might suggest mimesis, as in a gusting wind in *Macross Plus* (1994), but sometimes it might be a purely fantastic evocation,

as in the distinctive flowing clouds of steam in outer space generated by the interstellar railroad engine in Rintaro's *Ginga tetsudô Three-Nine* (*Galaxy Express 999*) (1979). The technical constraints surrounding Hideaki Anno's twenty-six-episode television anime *Shin seiki evangerion* (*Neon Genesis Evangelion*) (1995–96) led to a number of stunningly sophisticated variations on the depiction of space, time, and bodies in a two-dimensional universe—a mundane world continually penetrated by beings from a mysterious continuum whose physical features are never explained. The intricate architecture of effects ranging from sequences consisting of minutes of stillness to the balletic coordination of giant mecha bodies moving at high speed make *Neon Genesis* a veritable textbook of SF anime's two-dimensional physics.

The strong cultural support for anime—and specifically SF anime—in Japan provided it with the encouragement to develop new animation techniques while retaining the emphasis on hybrid ontologies and lyrical physics. The most artistically ambitious projects—Otomo's *Akira* (1988), Oshii's *The Ghost in the Shell* (1995), Rintaro's *Metropolis* (2001)—depict futuristic metropolitan settings dense with quasi-mimetic details side by side with spectacular novums. These two continua are simultaneously distinguished and blended in virtuoso physical episodes of bodies moving and moving things in space, explosions, complex rigid objects flying at great speed against hard limits, and bodies being agonizingly transformed from one continuum to another. In *Metropolis,* for example, the figures and compositions based on Tezuka Osamu's original manga are often depicted as static, alongside precipitous Moebius-inspired abysses, fantastic yet hyper-realistic environmental effects (such as a gigantic carp in a gigantic aquarium), complex steampunk machines moving with dreamlike slowness, the coordinated movements of crowds in space, elevators, escalators, and a fantastically mobile virtual camera—combining to create a symphonically coordinated fantasia of physical rhythms.

The application of computer graphics has opened several paths, among them the hyper-realistic simulation of the cinematic camera, adoption of computer game aesthetics, the coordination of all physical movements, and a myriad of remediations of diverse earlier techniques. Although the elements of animation were constructed by hand, a certain hybridity was inevitable simply because not every element of the animated universe was done by the same hand. Laloux writes

of the tension between the artists responsible for the backgrounds versus those responsible for characters in Golden Age industrial cartoons.[13] The contrasts between the static graphic worlds and the relatively thin but dynamic forms of characters can create a sense of two worlds superimposed on each other. Similarly, two-dimensional figures and three-dimensional ones inhabiting the same frame can create a dissonance that animation artists will sometimes work to smooth, and other times to emphasize.[14] Some of the most ambitious artistic projects of recent SF animation—*Akira, Titan A. E.*, Oshii's *Ghost in the Shell* and *Ghost in the Shell II: Innocence* (2004), *Metropolis,* Otomo's *Steamboy* (2004), *A Scanner Darkly*—have explored the combination of digitally composed realistic effects and backgrounds with traditional hand drawing, hand coloring, and cel-animation techniques to create worlds in which the hybrid physics of the visual styles play out virtuoso dialectics of digital hyperrealism and manual fantasy.[15] Other artists have set out to explore the possibilities of abandoning traditional techniques altogether and to represent the physical hybridity entirely in terms of computer graphics. Hironobu Sakaguchi's *Final Fantasy: Spirits Within* (2001) and Dreamworks' *Monsters vs. Aliens* (2009), for all their many differences in mood and technique, set out to create SF worlds in which all elements are coordinated through a metaphysics engine that calibrates even the alien into a fully naturalized, even if "alternative," pseudo-three-dimensional physical world. *Final Fantasy*'s experiment proved to be a heroic failure. The attempt to create hyper-realistic simulations, especially of human bodies, in the film drove it straight into the uncanny valley. Dreamworks' more commercially savvy *Monsters vs. Aliens* brings the playful diversity of character forms under an overarching visual ontology—a physics in which each object, no matter how weird its properties, behaves in ways that manifest the same overarching physical rules of 3D simulation—the play of light off surfaces, the repertoire of speeds and angles available to all objects, their appropriate physical tolerances.

Digital techniques have transformed animation. For many viewers they are as disorienting as rotoscoping must have been in the old days, yet also just as much a natural dimension of animation. But the career of CGI has markedly affected the dominant visual regimes of animation. Because it can supply ever more sophisticated physics engines, it has encouraged a drift toward hyper-realism and richly detailed yet

fully consolidated quasi-phenomenal worlds not only in SF, where it has a natural place, but in other forms of fantasy as well. (Gore Verbinski's *Rango* [2011] and Andrew Stanton's *Finding Nemo* [2003], for instance, are replete with physics wonders, as are many Pixar productions.) My suspicion is that we will see increasing hybridization and multi-ontologies in future SF animation—here too on a spectrum: from a variety of regimes of being collected in a single overarching quasi-mundane physics (as in *Monsters vs. Aliens* and Stanton's *Wall-E* [2008]) to the overlay of incongruous graphic ontologies in flat layering that Thomas Lamarre considers the great contribution of anime to animation (as in the South Korean film *Sky Blue* [2003]).[16]

The popularity of digital effects and their relative inexpensiveness has reconfigured the cultures of SF animation as well. The marked national or regional character of animation styles has given way to international networks based less on craft and narrative traditions, than on shared production regimes and commercial aims. *Final Fantasy* in game form was, for example, a flagship of the Japanese game industry in its first incarnation, although the film was produced by an international crew, in English, in Honolulu Studios. (Even its original title is English.) *Monsters vs. Aliens* includes many elements drawn from Japanese monster movies, renormalized for a global, "pixarized" audience.

What then is estranged in SF animation? Many things, certainly, but one thing for sure: the illusion that there is a physics independent of the imagination.

## NOTES

1. Cf. René Laloux, *Ces Dessins Qui Bougent: 1892–1992 Cents Ans de Cinéma d'Animation* (Paris: Dreamland editeur, 1996), 27–37.

2. Cf. Darko Suvin, *Metamorphoses of Science Fiction* (New Haven: Yale University Press, 1979), 63–84; Istvan Csicsery-Ronay Jr., *The Seven Beauties of Science Fiction* (Middletown, Conn.: Wesleyan University Press, 2008), 47–75.

3. Cf. J. P. Telotte, "Man and Superman: The Fleischer Studio Negotiates the Real," *Quarterly Review of Film and Video* 27, no. 4 (2010): 290–98.

4. Suvin, *Metamorphoses of Science Fiction*, 3–15.

5. Cf. "Fantastika in the World's Storm," in *Pardon This Intrusion: Fantastika in the World Storm,* ed. John Clute (London: Beccon, 2011).

6. See Simon Spiegel, "Things Made Strange: On the Concept of Estrangement in Science Fiction Theory," *Science Fiction Studies* 35, no. 3 (November 2008): 369–85.

7. Simon Spiegel argues that exactly the opposite is the case, at least on the formal and narrative level, which is where the term *estrangement* has been generally applied in criticism. SF does not, according to Spiegel, estrange the real; it naturalizes the marvelous. The realistic gravity of SF's universe of discourse transforms heteronormative wonders into natural-material phenomena that fit into the modern world picture dominated by rational cause and effect. Suvin and Spiegel, in my view, each articulate one aspect of SF's dialectic, in which the marvelous is set up against the plausible, and then this is made to fit into a plausible-seeming new world picture. The naturalization of the marvelous is the first step toward placing it into a new rationality, and shuttling back to a re-vision of the real. Spiegel contends that SF requires a stabilization of the world, a calming down of metamorphic energy and discipline, a suppression of estrangement. This isn't just a question of internal formal development. In the early years there was a fascination with technology by modernizing artists as a means to transform a world that they viewed as inertial and antitechnological; by World War II it became apparent that technological transformations had occurred on a global scale affecting most areas of social life. At this point SF becomes a form of realism even more than a form of fantasy.

8. Cf. Fredric Jameson, "Radical Fantasy," *Historical Materialism* 10, no. 4 (2002): 273–80.

9. See Mark Wheeler Macwilliams, ed., *Japanese Visual Culture: Explorations in the World of Manga and Anime* (Armonk, N.Y.: M. E. Sharpe, 2008); Marc Steinberg, "Immobile Sections and Trans-Series Movement: Astroboy and the Emergence of Anime," *Animation* 1, no. 2 (November 2006): 190–206; Koichi Iwabuchi, " 'Soft' Nationalism and Narcissism: Japanese Popular Culture Goes Global," *Asian Studies Review* 26, no. 4 (December 2002): 447–69.

10. Cf. Csicsery-Ronay, *The Seven Beauties of Science Fiction,* 111–16.

11. Laloux, *Ces Dessins Qui Bougent,* 121. The translation, unacknowledged but presumably by Giannalberto Bendazzi, appears in Giannalberto Bendazzi, "Book Review: Rene Laloux," *Animation World Network* (October 10, 2013).

12. Cf. Fredrik L Schodt, *Dreamland Japan: Writings on Modern Manga* (Berkeley: Stone Bridge Press, 1996).

13. Laloux, *Ces Dessins Qui Bougent,* 124.

14. In the directors' commentary included on the DVD of *Titan A.E.,* Bluth and Goldman declare that they would have worked to smooth the friction between the two-dimensional drawn cartoon figures and the three-dimensional digital graphics of the backgrounds if they had had access to the appropriate

technology when the film was made; Rintaro and his crew state the opposite on the commentary track of the DVD of *Metropolis*: that the contrast between 2D hand-drawn figures and 3D backgrounds was a desired effect.

15. Shane Acker's *9* (2009) occupies a special transitional space, in that it was conceived with traditional methods in mind at all times, especially Svank-majerian stop motion, which were then digitally modified and enhanced into 3D.

16. Thomas Lamarre, "From Animation to Anime: Drawing Movements and Moving Drawings," *Japan Forum* 14, no. 2 (2002): 329–67.