

Science, Data, and Cinema

by Rachel Mayeri, *Soft Science* programmer and contributor

Soft Science is a collection of video-curiosities created by artists and scientists. Behind laboratory doors are some of the most astonishing outsider art projects around. Autopoetic bacteria, tethered flies, ebullient nanogears--these data-gems create wonder and beauty--not to mention knowledge. Artists have been mining science for years--in diverse experiments with icky substances, authority figures, and the ever-elusive idea of Reason. The collection is a sampling of contemporary artists' responses to science, the ultimate insider. Experimental documentary, science fictional fables, performance art, and non-narrative shorts are interspersed with musically scored data, called the *Soft Science "Cinema of Attractions."*

Themes

Videos in the *Soft Science* collection explore how science's visual culture shifts in meaning as it moves from the laboratory to the cinema. Scientists produce knowledge in highly ritualized performances in the habitat of universities and corporations. Data is an "audio-visual spectacle,"^[1] according to Bruno Latour, constructed with highly specialized tools and dramatized as fact for an audience of skeptics. How are the artifacts of these tribal performances viewed by other audiences, like artists, cultural critics and moviegoers? No longer in service to establishing facts, and bereft of their lab-coated spokespeople, we can enjoy data as the imaginative depiction of invisible worlds. We can see anatomical studies as masochistic self-dissection. We can interpret psychological testing as surveillance. We can view lectures as demonstrations of technical virtuosity. We can read scientific theories as stories and look for morals. While scientists must present their objects as evidence, artists can explore them as spectacle, propaganda, humor, abstract form, or allegory.

Although art and science have historically been framed as opposites, practitioners today often use the same technology. Computer programming, video, and animation in particular unite art and science as imaginative tools to visualize information, time-based processes, and the invisible. While science is associated with realism and documentation of facts, its visualization techniques often employ abstraction, simplification, and symbolism. Stylized three-dimensional models of molecules enable researchers to visualize dramatic battles between immune systems and viruses. The software programs are not unlike those used for special effects and video games. Like science fiction enthusiasts, artists are inspired by the *mise-en-scène* of science: graphics and diagrams, futuristic technology, and taxonomies of specimen. The works included in this collection reflect the increasing cross-fertilization of the fields of science

and art.

Several videos parody the scientific voice of authority. Many of us learned about science through educational documentaries. Those films' didactic voice, reiterated by high school teachers, was unmistakably a sermon on moral issues. The real subject was sex, death, drugs, gender, and social hierarchy--regardless of whether the film was about prairie dogs or cumulonimbus clouds. Although the traditional, paternal voice of authority is increasingly mediated by jocular banter, NOVA TV programs and science museum exhibits seem no less subject to sophistries about human nature. Soft Science artists play with the conventional voices of popular science media, as educator, advertiser, and crocodile wrangler.

Science is increasingly practiced as a business. Biotechnology firms are aware of the importance of public relations work in the media as the public becomes skeptical of their claims and products. Several of the videos engage with the ideology of progress through technology. Artists consider science's life-altering developments in genomics, biotechnology, and neuroscience, and their profitable commodities--patented information, designed organisms, and drugs.

Often the subject of science is us. Whether charting the human interior, our prospects for health and happiness, or the future of our environment--scientific research's goal is thought to be the human good. Yet, science's impersonal, objective voice tends to separate science from culture, politics, economics, and human prejudice. By showing ourselves as the subjects and objects of our own experiments, artists illuminate the subjective nature of scientific inquiry. "Soft science" refers to research that is based on speculative data--as opposed to hard facts. *Soft Science* is a lens for viewing hard science--as human speculation.

Data and Art: A Cinema of Attractions?

Fishing around the Internet for scientific data, I find a series of unvarnished curiosities. The "Virtual Embryonic Zoo" contains a menagerie of species developing in time lapse. A University of Wisconsin web page is devoted to high resolution, downloadable images of stem cells, some transformed into heart or brain tissue. Presumably, these images are intended for journalists to publicize their near-magical medical potential. NASA regularly updates its page of satellite imagery of dramatic geological events--an ongoing, state-funded documentary program. While surely the scientists who produce this imagery must realize its curiosity-value, their media is posted for the most part unpolished and in the raw.

Science's moving pictures are one-take, one shot wonders--composed frontally for the camera. Editing is scant. Individual frames are evidently not cleaned up or registered; they contain noise and jitter. Aspect ratios are too wide or too tall for cinema; they're tailored to the subject and the recording instrument. Rarely is there a soundtrack, and when there is one, it is a classical fanfare or synthesized drone. A simple title card occasionally marks the subject matter and date, and credits the producers. Is science cinema shy? Is it underdeveloped? Or is it resisting its status as cinema?

Science cinema might resist aesthetics for a reason. Data's value as evidence would be diminished if it were to appear be anything less than a imprint of lab instruments recording an experiment. Scientific experiments are highly controlled, staged performances, which take advantage of the privileged relationship of photographic images to truth. The scientist's hand as director, cinematographer, or set designer must be erased because it would diminish the data's appearance of objectivity. The scientist may then narrate data as viewable exhibits in an exuberant argument with "obstinate dissenters."^[2] This performance of empiricism--"see for yourself / images don't lie"--Latour compares to opera.

The cinema of scientific data has an aesthetic similar to the "cinema of attractions" found in early cinema. Tom Gunning's term^[3] describes a distinct, non-narrative mode of visuality akin to the entertainments of the fairground or carnival. Early cinema (1895 to approximately 1906) consisted of one-shot wonders: boxing cats, Méliès' magic tricks, a city scene in Moscow. This visual mode started before the rules of narrative continuity were set, but Gunning argues, the aesthetic was to continue with avant-garde filmmakers like Eisenstein, with his 'montage of attractions.' Unlike narrative cinema, the cinema of attractions was exhibitionistic, playing to a crowd in direct address, like other attractions--dancers, comedians, acrobats--with which the new technology of motion pictures was showcased. Short, non-narrative curiosities brought exotic, novel, and spectacular images to broad audiences. This visual mode--one emanating from 19th Century science--helps describe data's aesthetics and links it to theatrical display.

The *Soft Science "Cinema of Attractions"* is a series of scientific movies found on the web for which I commissioned media artist and writer Joe Milutis to compose soundtracks. In this experiment, we moved data from the Internet to a video art context, exploring its theatrical possibilities. The background stories for these movies--at least as fascinating as their visuals--are provided below. Videos by Dockray, Burns and Martin, and Newhouse are similarly presented as a series of vignettes, showcasing curious visualization techniques. These videos suggest ties between the non-narrative spectacle of art installation and scientific data.

The more narrative videos in *Soft Science* mix modes of cinematic realism and scientific display (see Brinson, Rynard, Mayeri, and Trainor, below). Their characters shift role from storytellers to object lessons. These shifts are sometimes marked by changes in point of view: from the external, visible world lived by characters to the internal, invisible world inscribed by scientific technology. The deep, full-color pictorial world of video realism flattens into color-coded diagrams, illustrations, two and three-dimensional computer graphics. [4] These anatomical displays undercut illusions of self-determination, and cohesive, stable identity. Scientific representation, which sees beneath the surface, carries discomfiting views of life. As Foucault argued, the power of medical discourse to see and name is also a power to regulate. Artists in this compilation have a morbid curiosity to see what science makes of them.

Data as spectacle belongs to art as much as to science. Its production combines artful techniques with scientific ones, even as it hides this fact. Artists use scientific data and its aesthetic in a variety of ways in the *Soft Science* collection. Data-as-art forms an in-between space akin to a cabinet of curiosities: combining the manmade and the natural, high and low culture, prurient and pure interests, the un-categorizable and the rare. The audience is left to wonder, attempting to link disparate and strange objects.

Program Notes

In Peter Brinson's video, *It Did It*, a depressed character conducts what appears to be a scientific experiment with Zoloft, with the investigator/videomaker as the sole test subject. Like many a mad scientist movie plot, he imbibes chemicals in *noir*-ish lab sessions. But instead of unleashing a beastly libido or perfecting the antidote to an alien virus, Brinson's movie documents the failure of medical discourse to answer his ontological question: "If I am always happy, will I still be me?"

The video invites questions about the relationship between scientific method, narrative, and life. Structured by inter-titles outlining scientific method, the video charts the character's thoughts and feelings before, during, and after anti-depressants:

- The Scientific Method
- Ask Question
- Formulate Hypothesis
- Conduct Research
- Experiment
- Record Data
- Formulate Conclusion

Revise

Like narrative formulae, the scientific method suggests conflict, action, and resolution. Brinson's introspective drama is a series of conflicts--whether to live with depression, whether to take drugs for his depression, whether to continue to take the drug when it changes his outlook and artwork, and how to assess the experience when he decides to stop taking the drug.

As doctor and patient, scientist and artist, Brinson's character searches for a satisfactory lens with which to regard his condition as much as a solution to his unhappiness. Imagining himself an object of science, he animates his lackadaisical serotonin pathways. Yet, he is dismayed: "I don't like to think of my thoughts and feelings as nothing more than chemical combinations. It makes me seem so simple." As a cinematographer, he projects symptoms of despair unique to Southern California--labyrinthine housing developments, UFO sightings, roses desiccating in the sun, the sanctuary of the apartment interior. He weighs the wisdom of a fellow outsider--one who looks remarkably like a cat--who says, "Happy people have their eyes closed. Feeling bad is a symptom of seeing things for what they are." Brinson's cinematic depiction of the interior world contrasts with the generic rubrics of a psychological assessment test. For Brinson, a world without depression is perhaps a world that is limited in its range of expression.

The *Soft Science "Cinema of Attractions"* is a series of short, digital movies by scientists with original sound compositions by Joe Milutis. Part I documents fly aerodynamics and behavioral research by Michel Dickinson, Professor of Integrative Biology at Caltech ^[5]. Dickinson uses a fly "flight simulator" developed by pioneering "biological cybernetics" researchers, Werner Reichardt, Karl Götz and others. Flies are tethered, or fixed in place, in a wind tunnel. This makes them think they are flying through space while actually they remain stationary and flap their wings as the wind flows over them. Flies are surrounded by a virtual reality light show that can be programmed to manipulate the fly's steering and speed. In the first video, *Steering*, a tethered fly watches an off-screen show and attempts to adjust the direction of its flight by adjusting its wings, cocking its head, and kicking out its hind legs. In *High Speed Saccade*, one sees three views of the same fly in slow motion transforming the buzzing wings (200 times a second) to a slow paddle. Dickinson's lab has begun to study the fly's free flight in three dimensions with this data, tracking its seemingly haphazard flight paths. In *Fly Eye*, we see the fly's virtual reality show. In *Haltere Motion*, we see a side view of a tethered fruit fly in slow motion.

Like Brinson's piece, Su Rynard's *Bug Girl* expresses an ambivalence towards

technological intervention in our lives and in the world. The video is filled with a sense of loss as it imagines a thoroughly managed ecology. In Rynard's Technicolor "near future," childhood, the environment, and animals all seem like quaint relics of a bygone era. Nature resembles the Photoshop-ed stock scenery of decongestant advertisements. In a circular vignette, we see the story of a girl's search for a lost pet, as if viewed through a microscope or telescope. Unwittingly, the girl becomes the glue holding the ecosystem together, part of a larger, inscrutable-but-technical process. Rynard and Brinson's stories seem to lament a loss of mystery as the world is inscribed and disenchanting by science.

Artists working with insects have created a similar cinema of attractions - revealing unseen processes and forms through animation. Kaipo Newhouse's *Re-animation 3, 4, 2* brings life to the carcasses of insects by carefully registering each specimen frame by frame. Diversity of form at the moment of death for 245 flies, 142 ants, and 71 beetles, creates loops of dancing appendages. *Ameising 1* is an excerpt of Sean Dockray's 45-minute "pheromonal portrait of an ant colony." While Newhouse uses traditional animation, Dockray uses a combination of video, motion tracking, and other software to trace the paths of ants. Like pheromones, the chemical scent that ants use to communicate with each other, the charcoal tracings eventually fade away.

Stories from the Genome: An Animated History of Reproduction, by Rachel Mayeri, places contemporary genetics within a history of speculative theories about human heredity and reproduction. To understand scientific theories as stories--provisional, imaginative, unaware of their own blind spots and biases--one need only look to the past. The video contains mini-documentaries on genetics history: one on the 17th century homunculus theory, which cast God as the creator of the bloodlines of aristocrats and peasants. Another is on the 19th century artist-zoologist Ernst Haeckel, who popularized Darwin in Germany and planted the seeds for its eugenic interpretation. As Stephen Jay Gould^[6] pointed out, scientific ideas like homunculus theory and "ontogeny recapitulates phylogeny" had an attractive narrative symmetry and far-reaching explanatory power. Their proponents tautologically employed entrenched prejudices about hierarchy between the races, classes, and genders to justify their theories. Despite blatant contradictory evidence, homunculus theory was taken very seriously for two hundred years, until cell theory could better explain embryonic development. Eugenics, of course, had believers not only in Germany, but also in the USSR and USA, until only fifty-odd years ago.

A character not unlike Craig Venter, the former CEO of Celera Genomics, alternately narrates the documentary segments (described above) and journal entries. Venter invented a "shotgun" gene sequencing method that dramatically accelerated the

identification of individual genes. With gene patenting at stake, “Darth Venter”^[7] as he was dubbed in the press, threatened to decode the human genome years before the target date of the Human Genome Project, a public, international consortium of scientists administered by Francis Collins and others. Ultimately, the historic publication of the human genome was shared by both private and public groups, gracing the cover of *Science* magazine amid much fanfare about the diversity that the genome represents. The video begins with an egocentric and insecure CEO-geneticist who admits to using his own genes as the basis for the map of humanity’s genome--as Venter scandalously confessed. The character identifies a marker for Alzheimer’s in his genes (after this point, the fictional and factual part ways), he creates clones of himself as researchers and specimen, doctors and patients, and sets them to work on a cure.

Science appears weird when taken out of its tribal environment. In a movie context, scientific practices can appear as curious, arbitrary, anachronistic rituals. Sound artist, teacher and writer, Joe Milutis selected the videos for *Soft Science “Cinema of Attractions” Part II* and composed soundtracks for them, playing with incongruities and resemblances between data and Movies. The scores range from *Keystone Cops* to techno-accordion to electronic sound effects. *Spread the Aliquot over the Agar Plate Surface* is an educational video found on a university web site to instruct students in the process of preparing a Petri dish to grow bacterial colonies. In *Non-Linear Shape Statistics in Tracking*, a silly bunny statue is the proving ground for motion and shape tracking technology. *Carbon Nanotube Gears*, by NASA, is remarkable for the Jello-y softness with which the atoms of a carbon molecule are visualized in 3D animation.

Furthering the exploration of science as performance, Torsten Zenas Burns and Darrin Martin alternately play doctor and patient, teacher and student, in their video, *I am Today’s Lesson Plan*. The doctor’s office is a polymorphously perverse jungle gym for Burns and Martin, who use Q-tips and Rubik’s cubes to probe medical discourse and each other. A kaleidoscopic, hallucinatory orifice unites the soft body of Man with the Technosphere. In this world, high technology has evolved to invent disco, find man’s inner woman, and levitate spoons.

The third part of the *Soft Science “Cinema of Attractions”* could be the latest frontier for animation: genetically programmed fluorescent bacteria. Caltech Professor of Biology and Applied Physics, Michael Elowitz and his co-workers use a jellyfish protein that fluoresces as a visual “reporter”--a flare that varies in intensity with the level at which a gene is expressed--for processes he studies in colonies of bacteria. The individual cells in these colonies resemble digital pixels or facets of colored glass, creating an organic, abstract film-painting. While these cells are genetically identical, they communicate with nearby cells and respond to changes in their environment as they self-replicate,

generating surprising patterns that reveal the complexity of genetic expression. Elowitz's animations are synthetic bacteria, each a visualization of a genetic algorithm: *Repressilator*, for instance, "is a synthetic oscillatory network constructed in the bacteria *Escherichia coli*."^[8] By creating feedback loops with "repressors," genes that affect other genes' level of expression, he creates timed "twinkling," that could be related to the phenomenon of circadian rhythms. In *Repressilator+Noise*, Elowitz is actually studying the "noise" or random variation between identical cells--twins or clones, seen through the colors red, green, and yellow. In *Multispore Variants*, we see the clones of *Bacillus subtilis* responding to starvation--some by creating spores and some by dying.

Jim Trainor's felt-tip pen animation *The Bats* seems inspired by 1950's science educational films, those 16mm reels produced with orchestral scores that swell with the glory of nature. Trainor's subtle twist is to narrate the bats' natural history from a "first person" perspective instead of from the familiar, paternal voice of post-war documentary. What would be a matter of fact description of mating habits and competition among species becomes a journey of sexual discovery with a menacing subplot. Instincts, aroused by scents and the moon, form the basis of one bat soul's metaphysical contemplation – instead of examples of evolutionary theory. What would have been comfortably descriptive in the distant observer's third person narration, becomes, in the first person, bizarrely confessional of stark animal crimes. Fifties nature documentaries were often thinly veiled affirmations of the nuclear family, monogamy, and normative gender roles.^[9] Trainor's strategic anthropomorphism reveals the inescapable tendency to interpret animals through human morality, and at the same time, lust for their apparent "self-actualization."

More information about the collection and its participants can be accessed at <http://www.soft-science.org>. Rachel Mayeri is Assistant Professor of Media Studies at Harvey Mudd College.

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[1] Latour, Bruno, *Science in Action*, (Cambridge, Massachusetts: Harvard University Press, 1987), 67-71.

[2] Latour, pp. 67-71.

[3] Gunning, Tom, "The Cinema of Attractions: Early Film, its Spectator and the Avant-Garde," *Early Cinema: Space – Frame – Narrative*, ed. Elsaesser, Thomas, (London, British Film Institute: 1990). See also, Gunning, Tom, "An Aesthetic of Astonishment: Early Film and the (In)Credulous Spectator," *Viewing Positions: Ways of Seeing Film*, ed. Linda Williams, (New Brunswick, New Jersey: Rutgers University Press, 1995).

[4] Cartwright, Lisa. *Screening the Body: Tracing Medicine's Visual Culture* (Minneapolis: Minnesota University Press, 1995).

[5] <<http://dickinson.caltech.edu/>> (26 July 2005)

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[8] < http://www.aph.caltech.edu/people/elowitz_m.html > (26 July 2005).

[9] Mitman, Gregg, *Reel Nature* (Cambridge, Mass.: Harvard University Press, 1999).