

Leon Gurevitch

Cinema Designed: Visual Effects Software and the Emergence of the Engineered Spectacle

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3.1 Cinema Designed: Visual Effects Software and the Emergence of the Engineered Spectacle

BY LEON GUREVITCH

In 1984, after five years of funding both software and hardware development, Lucas Arts decided to find a buyer for Pixar Inc. In the process Lucas Arts approached a number of interested parties. During a protracted period of negotiations Siemens, Phillips Electronics, General Motors, and others all showed interest in a potential purchase of Pixar. In the end no corporate buyers were found and a private buyer (Steve Jobs) bought the company under the illusion that it would function as a hardware (rather than a software) company. However, the fate of these negotiations is less revealing than the type and nature of the companies that entered negotiations in the first place. Despite the fact that Pixar was ultimately to become a dominant animation company, the industrial nature of the companies interested in a takeover points to a so far understudied area of contemporary graphics production in movie culture. Despite the fact that suitors emerged from what at first appears to be a diverse range of industries, the principle underpinning their interest

was that of computer-aided design (CAD). For the automotive, medical, and electronics industries alike, Pixar's value as a computer graphics company stemmed from its capacity to align its visualization capacities with emergent technological, scientific, and industrial requirements.

In his work on what he terms technoscience's visualism—"a term which can accommodate both sciences and engineering, and both imaging and design practices" (Ihde 454)—Don Ihde describes the means by which our contemporary visual culture has moved "from Da Vinci to CAD and beyond" (as the title of Ihde's article puts it). Contemporary software-based visualization programs, he argues, embody a technological and economic imperative to visualize objects empirically—an imperative that emerged during the Renaissance and which "pretty much sets the style for early modern science onward" (458). Ihde is not the only observer to note similar such developments. In his work on "The Mapping of Space," Lev Manovich develops these themes (via theorists of Cartesian perspective William Ivins and Erwin Panofsky) with a specific focus on the effect of the computer and the consequences of automation. The automation of perspective, Manovich notes, completed a process initiated during the Renaissance, allowing for the simulation of dynamic, mathematically calculated, perspectival spaces. For Manovich, as for Ihde, the emergence of empirical visualization of objects and spaces has brought our computationally visualized culture in the 21st century in line with that of our scientific and engineering culture.

With this work in mind I shall, in this chapter, examine the implications of the shift toward computer-automated design in post-celluloid cinema. Specifically, I am concerned with the way in which visual effects cinema has witnessed the transition to a new form of cinema in which the tools and practices of computer-automated design are now a central feature of both Hollywood movie productions and their narratives. As we shall see, CAD is not only a now-constant feature of the VFX process, but it is also increasingly a central pivot of the myriad narratives around which

these VFX movies are constructed. From the *Transformers* franchise to Pixar films, from the *Iron Man* movies to *The Avengers* franchise, computer-aided and computer-automated design literally features as a central function of films that not only display but are also very much *about* technologies that could only be designed with the help of advanced computational processes. This shift has given rise to, and is characterized by, what I call “cinema designed.” However, as is often the way with these kinds of transitions, its origins can be traced back decades, and should not be characterized as a sudden and revolutionary change (though the implications of the CAD-based movie are significant for the study of cinema). An analysis of CAD and the history of its development reveal a telling and recurrent set of interconnections between the conception of automated, computational design and a tendency amongst systems designers and software users to aim for the cinematic. Whilst many of the engineers of the first CAD forms appealed to the cinematic possibilities of their technology, contemporary software companies and visual effects (VFX) industry animators now use CAD-based systems in the fabrication of the assets that make up contemporary cinematic form. In both situations the question of whether CAD has influenced cinema or cinema has influenced CAD is somewhat moot. What is more important is tracing the emergence of this relationship in order to understand what it reveals about contemporary and future understandings of cinema. The rise of CAD programs and their centrality in cinematic production elevates the position of “design” as a practical reality, an ideological construct, and a rhetorical principle of contemporary VFX cinema. In this chapter I will consider the history of the emergence of computer-aided design as a technology in its own right and as a functional corollary of cinema. Most importantly, I will argue that the move to center stage of CAD-based cinema has led to the emergence of design as a structuring principle of contemporary cinema. In this move, we have witnessed a two-way colonization in which CAD has influenced the development of visual effects-based cinema but cinema (and especially notions of “the cinematic”) has equally influenced the development of CAD.

Before proceeding, however, we must consider the specific nature of CAD-based imaging and the meaning of its use, especially in relation to the notion of computer-generated imaging. At its most basic level CAD is, as the name suggests, a process of design that is aided by the computer. Initially in the development of these programs the advantage of the computer was that values set on one elevation (surface plane represented from a specific angle) of a two-dimensional representation could be automatically recalculated immediately by the computer for another, different elevation. Better still, if a designer created the input for all surfaces of an object the computer could automatically calculate the appearance of the object in 3D (both in isometric view and in perspective). CAD, then, laid down the foundations for what has since been called by animation and cinema theorists the “virtual camera” (see especially Jones).

There are many more nuances regarding the nature of CAD, but for the purposes of this chapter the most important point to note is that CAD introduced a means of visualizing virtual spaces and objects according to consistently applied calculations, and that this approach formed the basis upon which computer graphics more widely emerged. Today, CAD still underpins many aspects of VFX cinema: the wireframe graphics that form the underlying basis of many objects, or the simulated skeletal forms that function as a character’s “rigging” are generally governed by the same CAD-based approaches that shaped the emergence of vector-based computer graphics in the 1950s. There are, of course, many parts of a VFX-based image that are not determined, simulated, or designed according to the principle of the “computer-aided” calculation, but the overall structure of special effects production still rests on the automated computational process.

Early Computer Graphics and the Spectacle of Engineering

In 1957, a collection of corporate engineers gathered together a working group at General Motors Research Lab (known as GMR) and, in partnership with IBM, agreed to construct a commercially viable computer-based

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car design platform. IBM and GMR were not the only group working toward this goal, however. Famously, in the early 1960s Ivan Edward Sutherland created the “Sketchpad” computer program and submitted his PhD thesis (*Sketchpad: A Man-Machine Graphical Communication System*) at MIT. As Alan Blackwell and Kerry Rodden have pointed out, Sutherland’s Sketchpad software had limited distribution and was only functional as an executable program at MIT itself. The impact of his research and the program that resulted from it, then, was in the idea that it engendered of the potential for computer-aided design, rather than in the spread of CAD itself. Fascinatingly, Blackwell and Rodden point out that these ideas were spread in two ways: through a widely cited conference publication and a movie of the program in use. Ironically, though fittingly for this chapter, the concept of CAD received one of its first public outings in the form of a celluloid record of the interface in action.

The reason that this was both ironic and fitting is that by the 1950s, whilst the cinematic apparatus was still firmly rooted in the technologies of celluloid (as it was to be for decades to come), engineers and computer scientists working at MIT and IBM began the process of automating the production processes of industrial imaging in a digital form that sat uncomfortably between both celluloid and television and which, more importantly, was to ultimately result in the decoupling of cinema’s technological basis in celluloid. For while the cathode ray tube was the obvious means by which real-time data could be visualized, it was not suitable for visual storage or large-scale exhibition in a context in which celluloid was still the preeminent technology for both these tasks. So, for instance, when IBM released its 701 computer they also produced a peripheral with which data could be represented. The 740 cathode ray tube output recorder marked an interesting early example of negotiation between cinematic and televisual hardware technologies—a negotiation that was to continue for another 50 years. The system had both a 21-inch display and a 7-inch display and an interesting relationship with film

technology to capture cathode ray output. As the IBM archives explain,

Formally announced on October 12, 1954, the 740 CRT output recorder was an electronic device attached to the IBM 701 Data Processing System. It provided output which recorded data points on the faces of a pair of television-like tubes at the rate of 8,000 per second. The larger tube, used for visual display and inspection, was a 21-inch tube. The smaller tube, used in conjunction with a camera, was a 7-inch tube. A customer-furnished camera was controlled by the 701 and automatically photographed information directed by the program. (“IBM 740”)

Fred N. Krull, one of the original engineers to work on the IBM GM project has described in detail the large, multimillion-dollar research and development project that he was involved in. Though he does not identify directly by model number, Krull is likely referring to the 740 CRT output recorder when he explains that

During this period IBM marketed a film recorder for the IBM 704 computer that could be used to record “point plots” on 8-mm film. This facility provided engineers with their first opportunity to view computer generated graphs and computer animated movies. Computer generated traffic simulations were recorded on film using this equipment. For demonstration purposes, IBM also provided a display unit that operated as a slave to the film recorder so that the plotting could be seen by the machine operator. The film recorder and display unit became the basis for the initial GMR experiments in interactive computer graphics. (41)

Negotiations between IBM and GMR (General Motors Research) eventually led to the development of the DAC-1 (Design Augmented Computer) system (see Figure 1) and in June 1960, IBM proposed to GM that they design and build a “Graphic Expression Machine” based upon

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the IBM 7094.

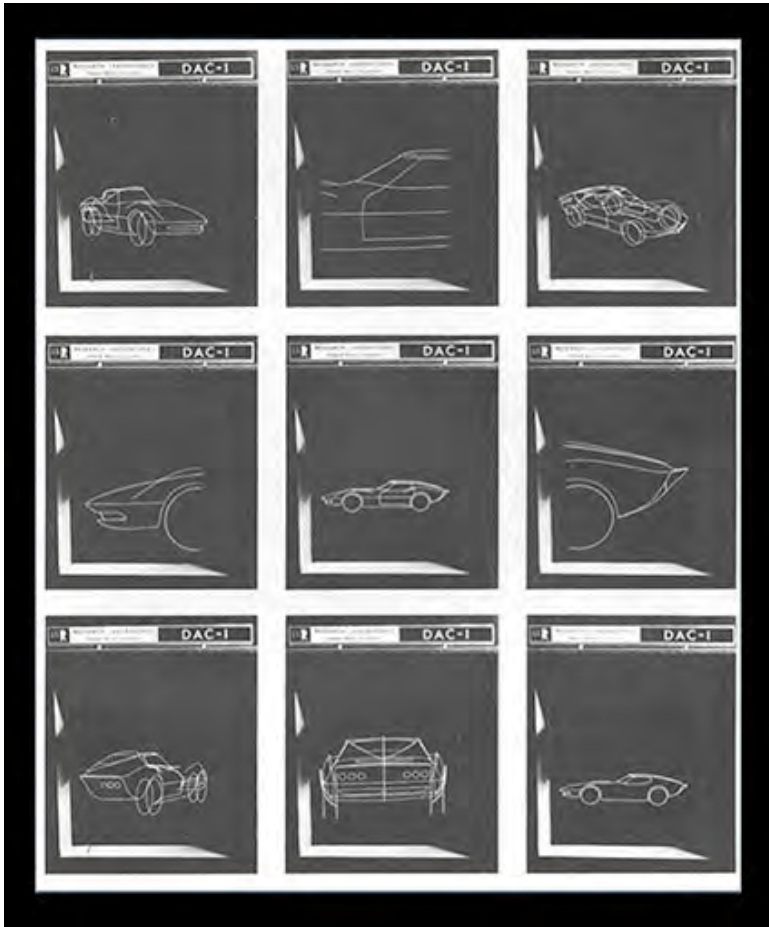


Figure 1 – IBM and GMR Labs DAC-1 CAD Program

As Krull explains, IBM proposed to design and construct a number of hardware components, three of which in particular were a display unit, a photo-recorder-projector, and a photo scanner (44). These output devices were ultimately marketed by IBM as the 2250 display device, the 2280 film

recorder, and the 2281 film scanner. What we see in both IBM's archival description of their CAD R&D project and the hardware that came from it, and from Krull's corroborating descriptions, then, is an amalgam of both televisual and celluloid technologies deployed in the process of extracting CAD images from early computer hardware and software.

Beyond image storage and exhibition, however, the CAD-based image also negotiated another path between televisual and cinematic forms that was as cultural in dimension as it was technological. As Manovich has argued, the computer automation of mathematically described space in imaging began to complete a process initiated with the emergence of perspectival rendering during the Renaissance; in other words, long before celluloid or televisual technologies and industries. With the emergence of automated computer perspective came image forms that were both technical and mathematical at the same time they were spectacular. As Da Vinci's notebooks attest, visualizations of vast and innovative engineering projects acting as fascinating and astonishing spectacle have existed for many hundreds of years. What the computational automation of engineering-based visualization did for the relationship was, however, new in terms of scale and circumstance.

To return to Don Ihde's assertion that Da Vinci's notebooks function within a history of European visual culture and demonstrate the rise of "technoscience's visualism": one of Ihde's central claims is that the spectacles of science and engineering were not simply functional but also ideological. For Ihde, the genre of isometric exploded visualizations exemplified in Da Vinci's drawings sought to lay out a way of seeing the world and an ideology of empirical design and engineering that communicated scientific and industrial prowess as much as they operated functionally. This form of "technoscientific visualism" was not restricted to drawings, however, as it also found impetus in the machine and industry exhibits that emerged across Europe and America, culminating in the great exhibitions of the 1850s onward. In both Da Vinci's drawings

and the machine exhibits several centuries later, the relationship between the spectacular technical plan and the spectacular technical object that resulted was mediated by the industrial processes required to turn an inert plan into a three-dimensional and fully operational moving spectacle governed by the physics of the world. In the 20th century, however, the CAD-based image collapsed the boundaries between the spectacular industrial plan and the object that results from it, and the nature of the way this change has been effected reveals much about its existence as a cinematic, as well as industrial, form of imagining.

CAD-Based Cinema and Cinema-Based CAD

Perhaps one of the more revealing aspects of the emergence of both CAD and early CGI simulation in the middle of the 20th century was the commitment that many computer systems engineers had to the technological specificity of celluloid and, by extension, the wider cultural and economic value of cinema. Around a decade after GM and MIT produced their pioneering work in CAD-based systems, two software scientists, Robert Goldstein and Roger Nagel, published a research paper outlining an (at that point, in 1971) advanced process whereby industrial objects were not only described according to mathematical vectors, but were also to be rendered according to the mathematical simulation of light. This early description of the ray tracing process in which light rays are simulated (originally, it was nuclear radiation rays in the military-funded research that precipitated this description) is fascinating when seen in the context of cinematic and post-cinematic media:

The simulation approach treats an object as a set of three-dimensional surfaces that reflect light, and it is this *reflected light impinging on photographic film . . .* that forms an image of an object. The result is, therefore, a fully toned picture, *closely resembling a photograph of the real object*. It is this added degree of realism that makes the simulation approach attractive for many applications. (Goldstein and Nagel 25, emphasis added)

Interestingly, Goldstein and Nagel chose the photographic process and the physical, indexical, and chemical specificities of film as their reference point with which to explain ray-traced light simulation. Of course this is understandable given that they could not at that point know the technological developments that were to come for the exhibition of large-scale and high-definition imaging. At that point, both high-quality and large-scale imaging was inextricably bound up in celluloid-based photographic and cinematic technologies.^[1] However, Goldstein and Nagel's bid to have the value of ray tracing recognized was not solely based upon its potential to operate in the technological arena of the celluloid-based image; the authors explained toward the end of their paper that:

The area where visual simulation will find its greatest application is in the field of computer generated motion pictures, or, as it is more commonly called, computer animation. Although the term animation has traditionally been synonymous with simple hand-drawn cartoons, we are concerned here with the more realistic, fully shaded pictures obtainable with visual simulation techniques. (28)

There are many telling points in this statement worth consideration. Firstly, we might ask why Goldstein and Nagel would identify computer-generated (CG) visualization's "greatest application" as that of the motion picture industry? After all, they must surely have been cognizant of its potential also to transform industries as diverse as architecture, industrial design, engineering, construction, and manufacture, to name just a few. This first point aside, however, what is also telling about their claim is the pains that they go to clearly articulate the distinction between potentially photorealistic computer-generated simulation and more traditional animation (far less culturally valued and therefore not the market the authors wanted to suggest their research might affect).

Despite the fact that the first feature-length CG movie was in fact an animated one (*Toy Story*, 1995) rather than the more photorealistic

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film form they may have been imagining when they carefully qualified the use of the term “computer animation” and rejected the notion of the “cartoon,” Goldstein and Nagel’s prediction turned out to be accurate. To be sure, industrial design, game design, architectural design, engineering, construction, and manufacture have been no less transformed by computer-aided design and computer-generated imaging than the movie industry. Nevertheless, their paper, like the accounts of CAD research and development before it, suggests that celluloid in general and cinema specifically held a cultural value for the software engineers envisaging potential futures for their applications. Goldstein and Nagel did not simply utilize celluloid as a handy reference point with which to explain the mechanism that allowed computer simulation to render “light”; they utilized celluloid because of the cultural value that both the technology and the industry could provide to a whole new media of image rendering.

Ironically, these image forms—including Goldstein and Nagel’s own spin-off firm MAGI—got their first breaks in television rather than cinema. In an early history reminiscent of cinema’s own emergence as both a promotional attraction (see Gurevitch, “The Cinemas of Transactions”) and a disposable form considered culturally insignificant at the time, early computer-generated designs were employed as a spectacle valuable to the attention economy of television advertising. These advertisements all followed a familiar pattern, first conjuring the wire frame vector graphics of industrial objects underlying computer-aided design, before subsequently wrapping these designs in primitive ray-traced skins. Unsurprisingly, the subjects of these advertisements tended to be the industries that contributed to the development and utilization of the CAD software in the first place: automobiles, airplanes, home appliances, and any number of architectural and industrial manufactures. Just as Westinghouse Works had utilized cinema at the turn of the 20th century to advertise the spectacle of their production lines, so Braun, Phillips, Nissan, Siemens, and Ford, among others, used CAD and the cathode ray tube in the run up to the 21st century to advertise their virtual production processes as industrial spectacle.

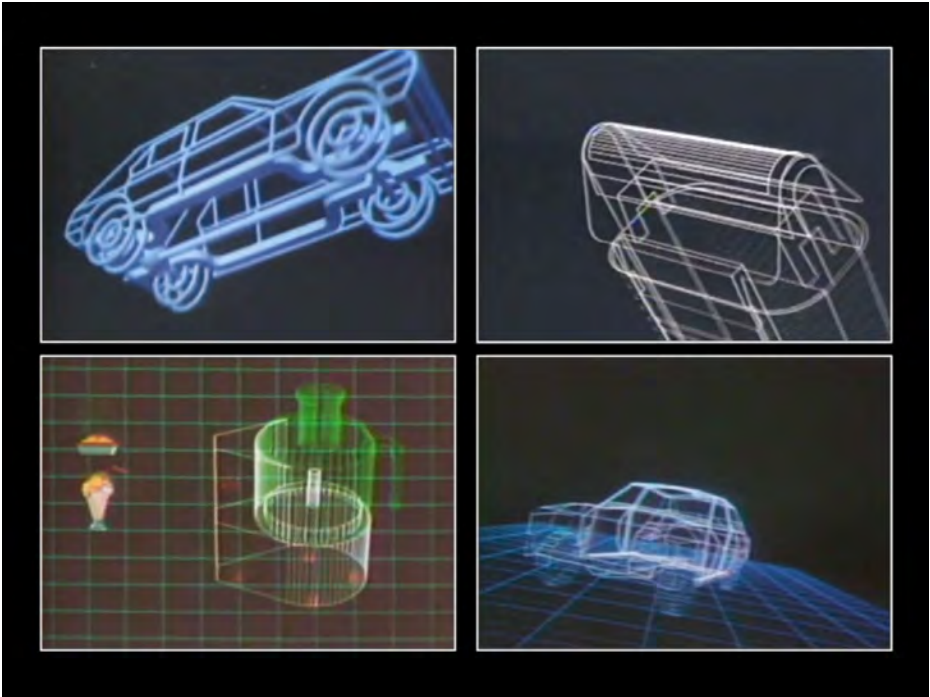


Figure 2 – From CAD of industrial objects to CAD of industrial advertising

With the rise of high-concept cinema (see Wyatt) in the 1980s, it was not long after these advertisements arrived on broadcast television that Hollywood made its first large-scale attempt to incorporate such imaging into a feature-length movie: *Tron* (1982). My point in all of this is not to draw a dichotomy between televisual and cinematic imaging industries and technologies—in fact, quite the opposite. By the time Disney made *Tron*, the companies that they contracted to do the work were hired precisely because they were already leading the production of such image forms in television.^[2] This tells us much about the relationship between cinema and television during the emergence of CAD-based visual effects; namely, that the two production industries and exhibition technologies interacted significantly over the cultivation of early CAD-based VFX.

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More precisely, what this somewhat convoluted history of negotiation between television and cinema suggests for our understanding of CAD-based VFX is that despite computer generated imaging's logical affinity with the continual real-time update technology of the cathode ray tube, the cultural value of the "cinematic" was a central force in the emergence and development of the form (see Mulvey, "Passing"). Initially, software designers and engineers working with computer imaging strove hard to overcome the limitations of cathode ray-based exhibition systems so that the results of their research could function in a cinematic context—because the cinematic equated to widespread cultural legitimacy in a way that its industrial use (be it in product production or in televisual promotion) did not. Ironically, in the long term the technologies and institutions of computer imaging that recruited the cultural and economic power of cinema were also to be some of the very things that helped to transform cinema into a digital form and move its industrial base away from celluloid.

Today, despite the transition of cinematic technology to a digital screen that more closely resembles televisual technologies, we still see the legacy of the cultural value of the "cinematic" in CAD-based VFX. As scholars have argued for a long time now, Hollywood cinema as an industrial entity has rarely represented a major proportion of the US economy when compared to other sectors such as oil, manufacturing, or IT, and yet Hollywood's role at the apex of the audio-visual food chain has long provided it with credence far greater than its immediately quantifiable economic footprint (see Wasko, *Hollywood*). With this in mind, though CAD-based software may have started out as a means by which any number of industrial production processes (automotive, aerospace, health, engineering, architecture) were automated and revolutionized, it was in cinema that computer-aided design was able to break out of its niche in industrial production and make its way into the mass consumption of the public domain.

There is a danger here, however, that we draw a false distinction between other forms of industrial CAD in terms of "production" and cinematic

forms of CAD in terms of mass “consumption.” This would be a mistake, for cinematic production itself was no less revolutionized by CAD than every other industry. Ironically, given Nagel and Goldstein’s earlier protestations that cinematic VFX must be distinguished from the computer-aided design of (cartoon-style) animation, perhaps the first instance in which the transformational nature of CAD-based rendering software became abundantly clear was in the meteoric rise of Pixar animation. In an already familiar industrial trajectory, Pixar, like many of its contemporaries, began its life as a company involved very broadly in the process of industrial visualization. As I briefly mentioned at the beginning of this chapter, private industrial buyers far beyond the movie industry were mooted for Pixar a number of times during its pre-cinema period (for more details, see Price). Apparently, following a number of failed bids involving Siemens, Phillips Electronics, and General Motors, Pixar (then owned by Steve Jobs) made modest sums of money (though by no means enough to cover its costs) as a producer of television advertisements. Like its predecessors, then, Pixar’s early life was intimately bound up in the promotional value of its capacity to visualize modern industrial products. Indeed, the company’s choice of iconic brand mascot, The Luxo Jr. Architectural/Designers desk lamp (Figure 3), could not be more of a quintessential signifier of the industrially designed object (for more on this, see Gurevitch, “Computer”). Naturally, this tendency toward CAD as a structuring principle underpinned Pixar’s first feature, *Toy Story*—a movie in which everything from the packaging of the Buzz Lightyear action figure on up was industrially product-designed (Figure 3).

“Design, Engineering, and Entertainment Software”

Not only did CAD revolutionize cinematic *production* processes but it has revolutionized, and still is revolutionizing, the relationship between cinematic spaces, objects, and the structures of 21st-century industrial production and consumption. More specifically, we are now not only reaching a point at which cinema *is literally designed* but also a point at which the potential for this design process to be ever more automated and

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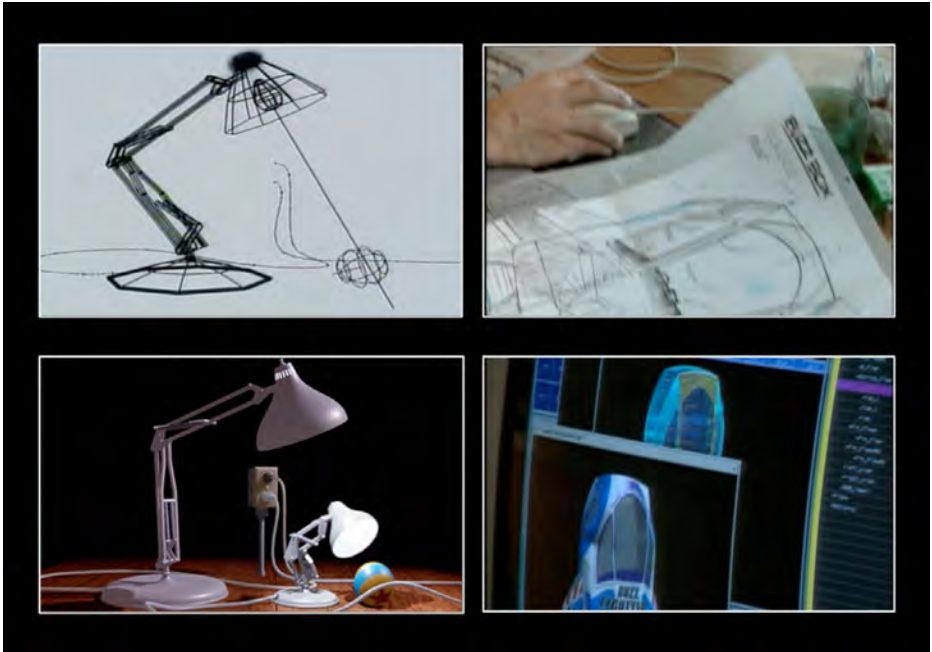


Figure 3 – The Industrial wireframe design of Luxo Jr. (left), and Buzz Lightyear Packaging (right)

democratized is apparent. Of course, for all the heady talk of “revolutions,” the production and distribution monopolies across Hollywood’s global cinema industry will not melt away even with a democratization of cinematically designed VFX. Whatever can be achieved in a bedroom by one person can and will always be achieved in exponentially greater quantities by an industry that has spent a century consolidating its position as a mechanism to turn capital into image (see Debord; Beller). Nevertheless, the direction of travel in this new environment of “cinema designed” holds fascinating questions for the cinema scholar, and here again we can return to Pixar’s emergence as a feature filmmaker for instructive examples.

Currently, the Disney Corporation (which eventually bought Pixar, long after Siemens et al. had rejected it a decade earlier) is developing 3D-printed toys in its research and development labs. This is a logical development of Disney's well-studied corporate strategy of several decades now (see Smoodin; Giroux; Wasko, *Understanding*; Pallant), but what it demonstrates is the potential for cinema designed. Where the music, television, and film industries have "dematerialized" their content through the delivery system of the Internet, the same cannot be said of their vast merchandising empires. It does not, however, take a great leap of imagination to envisage a future in which a 3D printer in every home equates to a Disney Store in every home. Of course, at present 3D printers are both much hyped and much undeveloped as a technology. It is entirely possible that current 3D-printing technology sits at an equivalent level of development to VR headset technologies of the 1980s: utterly enthralling for its possibilities and utterly incapable of delivering such possibilities in its present form. Nevertheless, the possibility that CAD-based characters (think Buzz from *Toy Story*) could be selected by children watching a movie on a mobile touch screen for print-out as a toy (at an additional and no doubt much-anticipated cost) is consistent with the research emerging not only from Disney but also corporations such as Lego who are pioneering the capacity to seamlessly translate virtual and physical objects between one space and another (see Milne; Gardner). In light of this, *Toy Story's* narrative of an insecure wooden Woody character, feeling threatened by the plastic fantastic Buzz Lightyear, was remarkably prescient. Not only did this storyline stand as a metaphor for the changing of the guard between cel-based animation and CAD-based animation (Gurevitch, "Computer"), it also spoke (if somewhat unintentionally) of a future in which the "toyetic applications" of this CAD-based animation could be made physical again at the touch of a screen and the initiation of a 3D printer. All that was really missing from the *Toy Story* narratives—which are even replete with self-conscious references to the transformed digital screen (Gurevitch, "Computer"; Gurevitch, "From Edison")—were the 3D printers themselves. Watch this space.

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This, then, marks an entirely new relationship between the screen and the wider domain of industrial objects, spaces, and production and consumption cultures of the 21st-century digital screen. In his work on contemporary culture, Andrew Wernick describes a condition of “promotional culture” spawned during the industrial revolution, defined by endless circularity of both the industrial object and the promotional practices by which its consumption is encouraged. For Wernick, this historical (and now contemporary) condition has “no unique starting-point nor any unique terminus in a specific commodity offered for sale.” Rather, Wernick contends, the “intertext of promotion is an indeterminate circle which may be entered anywhere” (94). For Wernick the inception of this unique condition can be located in the design and production of Wedgwood ceramics, dating back to the latter half of the 1700s. Wedgwood’s genius, Wernick argues, was that he not only developed a means of mass producing classical ceramics but that he harnessed a whole system of integrated promotional networks with which to sell these new industrial products. Wernick is at pains to argue that this production/consumption nexus may have a definable initiation point with the Wedgwood ceramics of the 1780s, but notably did not reach its apotheosis until the 20th and 21st centuries. In this sense, Wernick’s thesis could be—and indeed has been—applied to previous iterations of cinema. Justin Wyatt’s articulation of a “high-concept” cinema, in which promotional process and final product are intimately interwoven so that they create a “product differentiated through an emphasis on style in production and through the integration of the film with its marketing” (20), constitutes a cinematic take on Wernick’s broader thesis. For the remainder of this chapter, however, I suggest that what we see now with the rise of CAD-based cinema is an order of magnitude more integrated with the operative processes of contemporary industrial production, design, and promotion than in the past.

To flip on its head my earlier point that notions of the “cinematic” had a profound effect upon the development of CAD, then, we might also ask:

what is now the lasting legacy of CAD upon the cinematic? This is where we truly begin to see the rise of “cinema designed”: the move to center stage of design as simultaneously a concept, a structuring principle, and even a rhetoric of the contemporary (post-)cinematic image. The rhetoric of cinema designed is a unifying narrative of the cinematic image’s production, exhibition, and consumption alike, while at the same time this rhetoric is moving beyond cinema and manifesting itself in games culture, advertising, and contemporary audio-visual culture more generally. In all of these media forms and more, there is frequently an explicit acknowledgement of the structuring principle of cinematic design.

To focus, for the sake of brevity, upon mainstream cinematic production, in the contemporary industrial context the vast majority of visual effects software is underpinned by the same principles of CAD that underlie a multitude of 3D industrial visualization packages; so much so that many of the CAD-based VFX companies often fail to make a distinction between the types of industries that will utilize their software or the types of uses to which their packages will be put. To take one of the leading VFX industry software production packages, Maya, as an example, the platform is owned and distributed by Autodesk, the company that also owns and distributes the leading CAD packages of the automotive, engineering, design, and construction industries. The briefest of Internet searches on Autodesk will return a banner that indiscriminately advertises its industrial reach as encompassing “3D Design, Engineering & Entertainment Software” (Figure 4).

Here, then, we have a practical example of the way in which, for Autodesk, cinema becomes simply one industry among many whose production practices have been rationalized under the requirement to call upon the computer-aided design software that it creates and retails. After cinema helped define the emergence of CAD in the late 20th century, it is perhaps only logical that the next step would be to see CAD returning the favor.

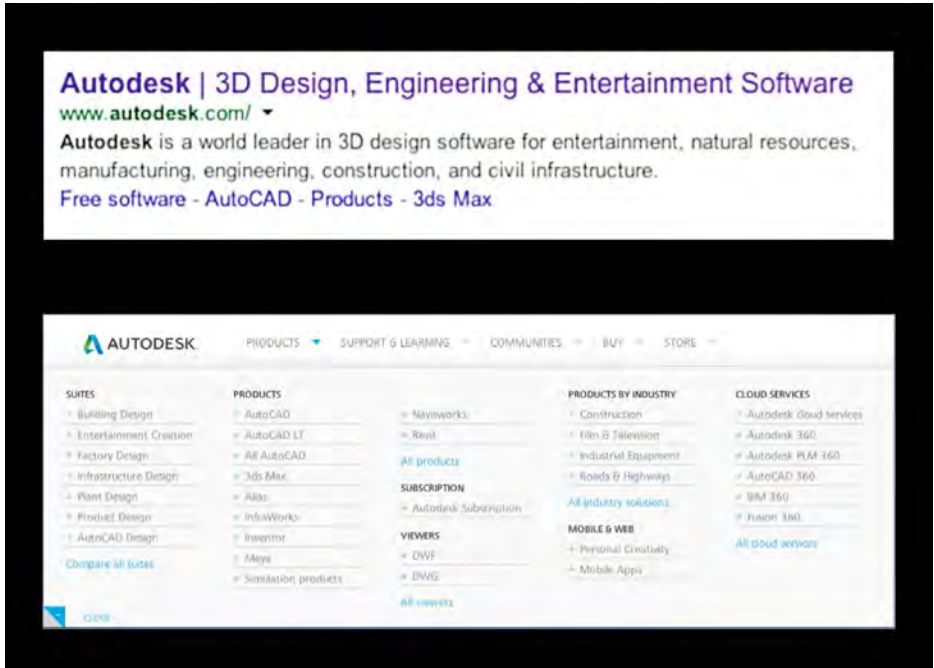


Figure 4 – Autodesk, 3D Design, Engineering & Entertainment

The degree to which computer-aided design is now shaping contemporary mainstream Hollywood cinema is apparent, not only in paradigmatic moments of transformation such as Pixar’s entry into, and rise to dominance of, the animation industry, but also in more seemingly mundane cinematic fare. While his films receive little critical attention amongst film scholars, Michael Bay’s *Transformers* franchise has changed the nature of the VFX blockbuster through its extreme adoption of both CAD-based cinema and the rhetorical acknowledgement of the designed image. Having grossed 1.3 billion dollars over seven years, the *Transformers* franchise currently stands as one of the most economically lucrative franchises in Hollywood’s history. Certainly (though this is the complaint of every film critic), its success is not based upon the artful

construction of complex and thought-provoking narratives. Rather, in the *Transformers* franchise we see an extreme example of cinema designed—in which narrative revolves, in every instance, around the spectacle of cinematic design. Robots, cars, fighter jets, trucks, cell phones, stereos, and just about any other modern industrial object to be thought of writhes and metamorphoses on screen. In her essay “Visual Pleasure and Narrative Cinema,” Laura Mulvey describes a film audience constantly presented with moments of show-stopping, narrative-halting spectacle based around the female body. In Bay’s *Transformers* movies a very different audience is presented with a similar dynamic, but the object of erotic desire in this new attention economy is not only the woman’s body (though that does feature too) but also the non-human objects of industrial capitalism. The high-definition renderings of car bodies are represented in all their industrially refined and perfectly packaged beauty, at the same time as their transformation into otherworldly robots allows for something more to feature in their spectacle.

In the *Transformers* franchise, *the act of transformation itself* is an act of revealing to the audience the prowess of contemporary cinema’s capacity to utilize, master, and redeploy the language of contemporary industrial production.^[3] Of course, the relationship between cinema and industrial production is not at all new and can be traced back to the inception of cinema itself. Indeed, a quick scan of the archives of 20th-century cinema reveals a long and close relationship between cinema and automobile production. It has hardly been lost on scholars of film that both cinema and the automobile went together as interrelated cultural and industrial forms at the beginning of the 20th century (see Singer; Arthurs and Grant). The current moment, however, is quantitatively and qualitatively different in the sense that the operative processes by which the automobile and film industries brought their products into being were never before so intimately interrelated. Admittedly, early 20th-century Hollywood quickly rationalized its production practices in accordance with the Fordist modes of production that spread across all industries at that time, but the tools and techniques

with which cars were made were never the same as those by which films were made. In the contemporary context in which the automotive industry literally funded and developed the CAD-based software systems that were then adopted by cinema, this is no longer the case.

Conclusion: Cinema Designed

In this light we can see that it is no accident that *Transformers* has become one of the most successful franchises of all time to date. General Motors Research Labs' development of the first industrial CAD software and IBM's early development of traffic simulation and its inscription on film technology suggest a certain inevitability of future redeployment. As Manovich has argued, the development of forms of computer graphics is frequently the result of R&D investment made by various military and/or industrial (including cinematic) actors (*Language* 175). It stands to reason, then, that cinema, the quintessentially modernist kinetic technology, would enter its 21st-century computational renovation hand-in-hand with the auto industry. It also stands to reason that this relationship would be grounded in a context in which contemporary Hollywood cinema functions first and foremost as a fundamentally promotional form (see Gurevitch, "Cinemas"). In his analysis of the car and its promotional culture, Andrew Wernick argues that:

The production of cars as signs is a special case of the way in which, since the industrial revolution of the late eighteenth century, all mass-produced consumer goods have come to intersect with the world of meaning. That is: their visual appearance is designed to be continuous with the advertising through which they are mass marketed. But, as a self-promoting commodity-sign, the modern automobile has two additional distinctive features. . . . First, besides their function as transport, cars have always had a promotional role for users themselves. . . . Secondly, unlike such products as pottery, furniture, and clothes which were previously hand-made, the automobile was a new invention. It never existed outside the framework of industrialized mass production. (71)

And here, succinctly articulated, we have the heart of the relationship between the *Transformers* franchise and cinema designed. To paraphrase Wernick, we might say that, unlike such products as cinema props, film sets, and costumes which were previously physically constructed and hand-made, cinema designed (of which the virtual automobile is symptomatic) is a new invention. It never existed outside the framework of industrialized mass production. In other words, just as cars never existed outside the framework of industrialized mass production, the cinema, which emerged at the same time, found itself in a similar situation. But what is so telling about the *Transformers* franchise as the quintessential example of cinema designed is the way in which the automobile forms contained within these movies have never existed at all in physical reality. The endless parade of new robotic cars that pass across, through, around, and over the screen do not occupy a physical, industrially manufactured space, nor will they ever. Rather, the product really advertised here is industrial convergence: the capacity to imagine, design, and showcase industrial fabrication and transformation in action. The objects themselves are secondary to the capacity to photo-realistically simulate them: their existence (onscreen only) stands testament to cinema designed and its continued intimate relationship with the auto industry.

We should note, however, that it is not only the cinema screen itself on which the drama of cinema designed is performed. Crucial to the Hollywood blockbuster today (and for some time now) are the constant cycle of post-release “making of” videos in which the rhetoric of the designed cinema image is rehearsed over and over. This can be found across all of the Hollywood majors output, and Industrial Light and Magic (ILM) with its very own YouTube channel is no different. Here, the design of the image at every level is picked apart, analyzed, and treated as a centrally promotional subject in its own right. Videos circulate that reveal the many hundreds of “passes” performed on a scene as it moves through the VFX production pipeline from initial pre-visualization to wireframe construction to particle effects simulation, lighting, and final

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composite (not to mention all the many other stages in between). In these videos the ideology of the designed cinematic image is reinforced repeatedly. These videos are explicit in demonstrating to the spectator that the objects on screen are calculated, simulated, and constructed like any other product-designed object. Here, in the same way as a new Apple product is obsessively fetishized in each new advertisement eroticizing each layer of the industrial object, VFX “making of” videos likewise strip down and rebuild the layers of the special effects movie for spectators to witness the depth and detail of design work invested in each cinematic image (Figure 5).

To return, finally, to where we started, contemporary visual effects movies not only utilize technoscience’s visualism in the construction of the many spaces and objects that make up the fabric of these films, they also proudly display such visualism as a badge of honor that encapsulates this new cinema and its industrial promotional foundations: this is cinema designed.



Figure 5 – Cinema Designed. CAD as a rhetorical and ideological principle of VFX Cinema

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Notes

[1] Ironically however, the development of computational imaging eventually led to the industrial decline of celluloid.

[2] Chiefly these companies were MAGI, Able and Associates, Information International, and Digital Effects.

[3] See also Denson, who emphasizes the self-reflexively demonstrative nature of these transformations in a somewhat different context.