Early History of French CG

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ABSTRACT

This paper provides an historical summary of the emergence of computer graphics research and creation in France between 1970 and 1990, a period of innovation that transformed artistic practice and French visual media. The paper shows the role of these developments in the history of art, the evolution of digital technology, and the expansion of animation and visual effects in the film industry.

Early History of French Computer Graphics

The first books devoted to the discipline of computer science were published in the late 1970s, in Britain and the United States [1]. In France, the first symposium on this topic took place in 1988 [2], and Pierre Eric Mounier Kuhn in particular has been a leading voice for the discipline since the 1990s. At the same time, the subdiscipline of computer graphics (CG) has had very little presence in this history of computers and computer science, although some initiatives exist, since CG affects the history of technology, the history of images, and the history of special effects [3]. If the state of the industry is sometimes studied in the United States, this is not the case in France, where researchers and authors have so far only focused on the history of major groups [4] and networks [5].

This paper presents a history of computer graphics in France, as a heritage that is worth keeping alive, since France was very active in CG in the early 1980s. Based on the dynamics of French creativity, the government's plan, known as "Recherche-image" [6], has promoted many initiatives. Post-production companies, research laboratories, and training programs were created and geared towards specialized CG [7]. SIGGRAPH Computer Animation Festival selections are evidence of this. Since 1987, 6–13 percent of selected films were French [8], but still we know little of this history. If some landmark events in the history of computer graphics occurred in France [9], no books, no theses relate a French history of CG. When we look at the reference books [10], only a few lines are devoted to French practitioners and outputs.

For this reason, a research program devoted to the history of CG in France is now gaining popularity [11]. Our research constitutes a historical archive from the perspective of preservation. Indeed, if this topic deserves to be discussed, and should eventually lead to a comparative study between France and other countries, such as the United States or Japan, an overview of French CG history needs to be written first.

By relying on historical documents and testimonies of computer graphics pioneers, this paper presents a historical overview as well as descriptions of some significant initiatives that took place in France between 1970 and 1990. It aims to highlight why and how this environment of computer graphics was constituted and to summarize its origins.

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Scientific Research

Even before the creation of genuine academic research teams, isolated individuals conducted critical work in the field of computer graphics. In the early 1960s, Pierre Bézier [12], at Renault, invented the curves that bear his name and are still used in the objects that surround us, in the texts we read, for instance. At the same time, Gilbert Comparetti [13] presented the basics of what animation software should be, developed the idea into a tool, and tracked its development of computer-animated productions [14]. Since he is considered "the father of the French computer-animated cartoon" [15], in 1965, a research team was formed in Grenoble that gave rise to the first thesis in the field of computer graphics [16]. In 1971, Henri Gouraud, after graduating from the École Centrale and Sup Aero (in Paris), obtained a PhD from the University of Utah. He collaborated with all the men who were to develop computer graphics in the 1970s, such as John Warnock, Ivan Sutherland, Tom Stockham and Dave Evans. The result of his research—the Gouraud shading—is still programmed in the heart of today's graphics cards (Figure 1). In 1972, Ed Catmull, future cofounder of Pixar, and Fred Parke created the first 3D film [17] using Gouraud rendering, whose results were published in the United States [18]. In France in the early 1970s, a team was formed in INRIA [19] as well as a graphic working group within the AFCET [20]. They organized many meetings and workshops, including the Seillac seminar [21] in 1976, which brought together researchers from around the world in order to standardize graphics software. Research teams multiplied: École des Mines de Saint Étienne [22], ENST Paris [23], ACROE Grenoble [24], as well as other teams in Lille, Toulouse, and Nantes. In 1980, the Eurographics Association was created, while Institut national de l'audiovisuel [25] was established along with Arc Senans in 1981, a seminar on processing and image synthesis applied to audio/visual creation.

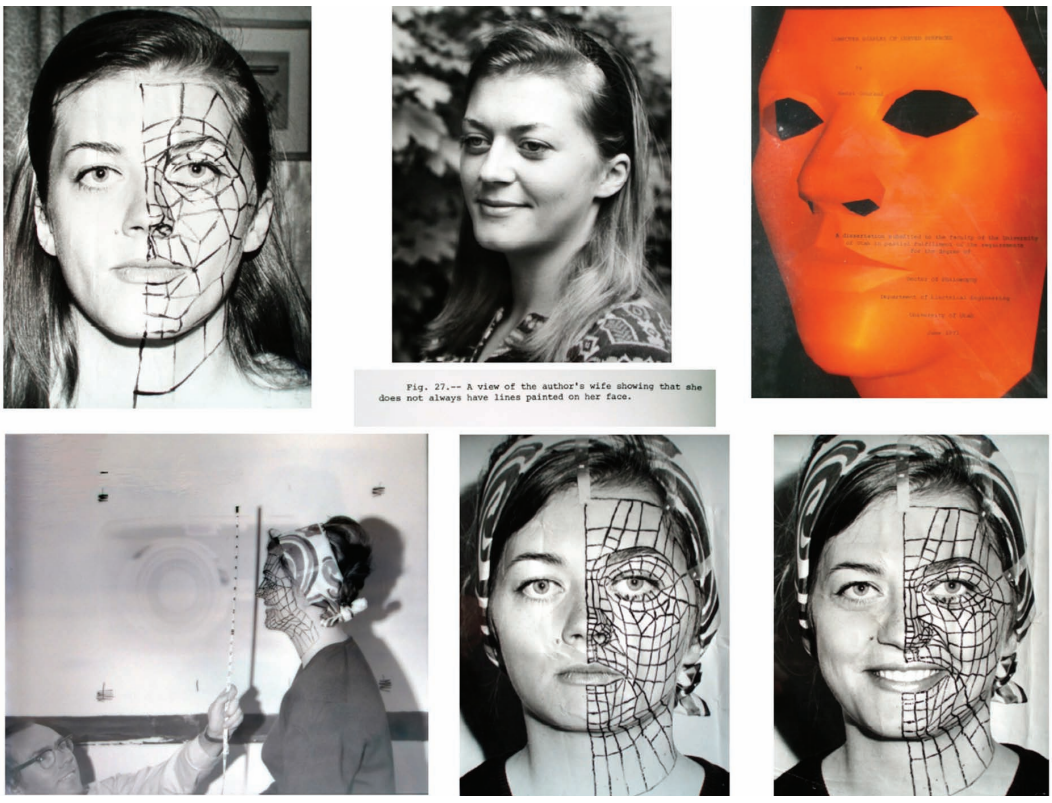

Figure 1. A view of the artist's wife showing that she does not always have lines painted on her face. © 1971 Henri Gouraud.

Many initiatives demonstrated the emergence of a circle of researchers working on developing computer graphics in France. This is confirmed by the report Michel Lucas produced in 1995, which describes "the evolution of research on computer graphics from 1965 to 1995" [26]. In parallel, artists showed an increasing interest in computers, ranging from computer-assisted painting to the use of computers as medium.

Figure 2. "Hunger," Peter Foldès. © 1973 National Film Board of Canada.

Artistic Experimentation

The first generation of computerized still images was created by Frieder Nake, Georg Nees, and Michael Noll, who worked on "the principle of chance" theorized by Abraham Moles in 1971 [27]. Manfred Mohr, for his part, systematized the idea of series, and presented the very first museum exhibition [28] in France of works calculated using a computer. The journal *Computer and Automation* had already organized a contest of drawings by computer in 1963. This episode was decisive, for the selection criteria were not merely mathematical or technical, but also artistic. The exhibition Cybernetic Serendipity in London in 1968 would be one of the first consequences of this change in status. It is therefore often cited as a precursor to what is now called digital art [29].

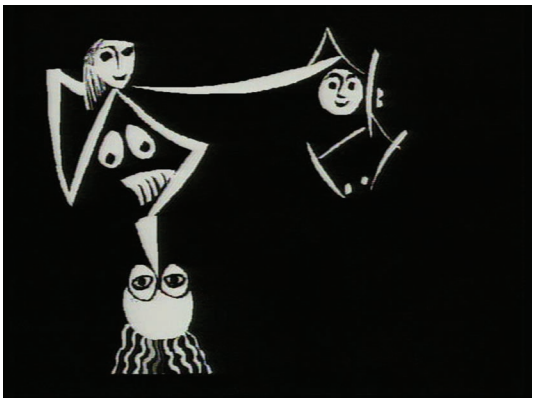

Figure 3. "Femme spectacle." © 1987 Michaël Gaumnitz.

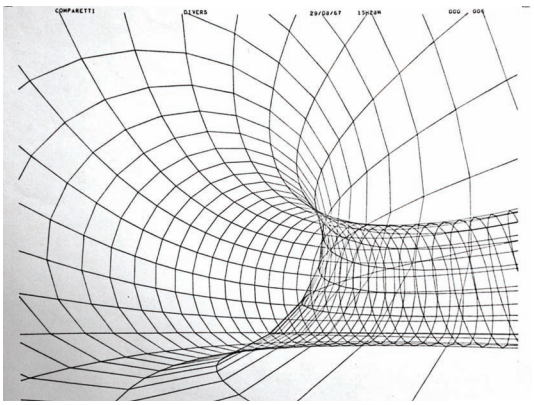

Figure 4. "Jeu avec la caméra et sa focale." © 1967 Gilbert Comparetti.

Although art production in these years was mostly inspired by geometric abstraction, the artist Charles Csuri and the engineer James Shaffer won the Computer and Automation contest in 1967 for their work *Sine Curve Man*. This was a move toward figurative representation, as they created computer programs that were more flexible and produced portraits using deformation. Computer memory and printouts were limited, so these preliminary works were expressed in black and white. Some products, however, are recognizable by their colors. Hervé Huitric and Monique Nahas developed an interest in color and its algorithmization, making silkscreen frames printed from a computer [30]. Pierre-Louis Neumann attempted to reproduce his own conceptual approach through programming so as to find the most accurate composition, which he then realized in painting. Peter Foldes [31] came up with the idea of animating these two-dimensional drawings by computer. His first tests, carried out with the support of the National Film Board of Canada and entitled "Metadata" and "Hunger" [32] (Figure 2), depicted an animation interpolation process using digital technology that creates "a flat perspective effect through chained metamorphoses" [33].

Graphics tablets appeared in the early 1980s and allowed experimentation by designers as well as artists in 2D-animated productions. In 1985, Michaël Gaumnitz began to work on Graph 8, a paint system made by a French company, X-Com, with which he has directed several short films for television, "Femmes" and "Le courier des téléspectateurs" series [34], in particular (Figure 3). These videos captured the moving image, "the image being drawn" [35].

Many French researchers had already experimented with 3D-animated images in the 1970s. Gilbert Comparetti [36] (Figure 4) and Manfred Mohr [37] provided outstanding examples of 3D animation work using Wireframe.

After the military, medical imaging, and industrial applications, another area began to incorporate the interest of CG imagery, the audio/visual. A market for computer graphics appeared in France in the 1980s, with the initiative of the company Sogitec in particular, which declaimed "the hopes for a new world created by the computer" [38].

From Flight Simulators to the Audio/Visual Industry

In 1981, in response to a commission from the aircraft manufacturer Dassault, Sogitec established a computer graphics department, under the direction of Claude Mechoulam, in order to develop a flight simulator system and real-time image generation [39]. Like the U.S. company Evans & Sutherland, Sogitec was a striking example of the impact of the military in the history of computer graphics. Very quickly, the company turned to new productions, when Xavier Nicolas, head of broadcasting, utilized the potential of these systems to model and animate images for TV and film [40]. The first applications included rendering and skinning in television commercials, thereby supporting the development and learning of the relevant techniques. Advertisers such as Canon [41], GDF [42], and BNP [43] promoted their brands by launching themselves into modernity. Sharp communicated "a journey to perfection" in 1983 [44], incorporating new images [45] in an ad for copying machines and calculators (Figure 5). The same year, André Martin and Philippe Quéau presented "Maison vole" [46], the French-scripted short film, whose images and sounds are totally synthetic (Figure 6), co-produced by Sogitec and the research and development department of the Institut national de l'audiovisuel.

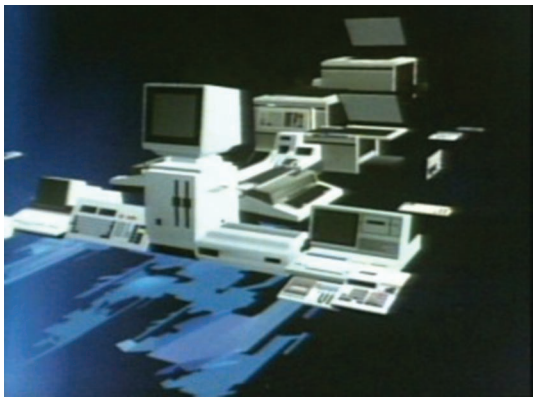

Figure 5. "Sharp." © Sogitec.

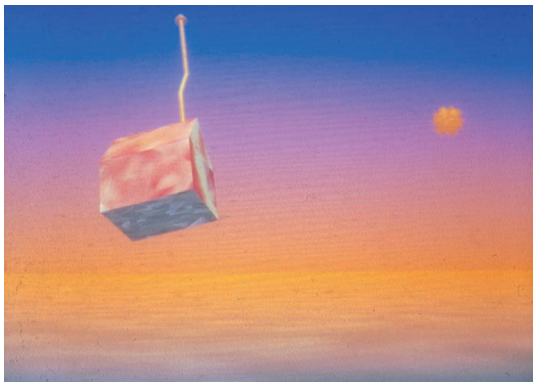

Figure 6. "Maison vole." © 1983 André Martin, Philippe Quéau, Ina-Sogitec.

The cinema started using digital effects later. In 1986, Christian Guillon directed the special effects in CG of the first French full-length animated feature [47], "L'unique" [48] (Figure 7). Then everything accelerated when the main creators of actual 3D opened their own studios. In 1985, the architect Pierre Buffin, with Henri Seydoux, created BSCA, which later became Buf compagnie [49].

Figure 7. "L'Unique." © 1986 Jérôme Diamant-Berger.

Simultaneously, five students were meeting over weekends and realized "La vie des bêtes" [50] (Figure 8), which resulted in the creation of the studio Mac Guff Ligne [51]. After a few achievements in the Ina and Sogitec, Georges Lacroix, Renato and Jean-Yves Grall created Fantôme [52], known for the series "Fables géométriques" [53] (Figure 9).

The possibilities offered by the virtual camera and synthetic objects suddenly freed writers and directors from physical restraints due to gravity, reminding us that these early images were created by adapting the techniques of flight simulators. They would make excessive use of this new freedom, especially as textures and animations were still very poor. Early computer graphics illustrate both modernity, often using a universe of science fiction, and the technical constraints of the time [54].

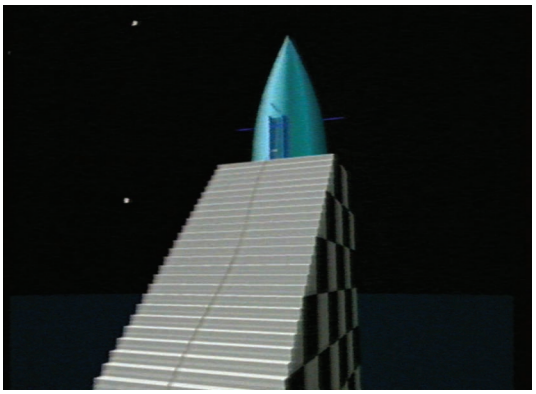

Figure 8. "La vie des bêtes." © 1987 MacGuff.

Digital techniques contributed to the invention of new visual and fictional worlds. The French pioneers also experimented with purely artistic perspectives.

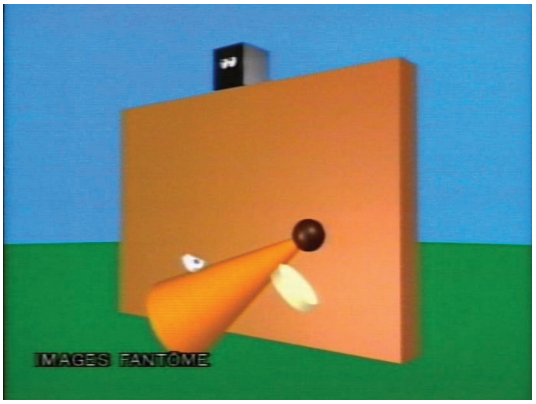

Figure 9. "Les fables géométriques." © 1988 Renato, Georges Lacroix, Jean-Yves Grall, Fantôme.

Towards Digital Art and Virtual Reality

In 1975, IBM France dedicated an issue of its magazine to art and computers [55]. Alongside international works, there were many French achievements, such as research and artistic work by Pierre-Louis Dahan and Phac Le Tuan [56], the Groupe de Belfort, and CAD with images by Jean-Marc Brun and Michel Théron [57]. In 1976, Vera and François Molnar created one of the first programs for image generation, Molnart. Hervé Huitric

and Monique Nahas made their first movie on a computer in 1979 [58] as part of the activity of the computer group of Vincennes, which was created a few years earlier. The Art and Technology of Image Department (ATI) of Université Paris 8 was created in 1982, and the department AII, Workshop Image and Computing, was also created at the École Nationale Supérieure des Arts Décoratifs de Paris in the same year [59]. The ATI team, consisting of Hervé Huitric, from fine arts; Monique Nahas, professor of theoretical physics; Michel Bret, painter and professor of mathematics; and Edmond Couchot, designer of interactive installations, "set up a hybrid research program and teaching syllabus, at the crossroads between art and programming"[60].

Figure 10. "La petit danseuse." © 1985 Michel Bret.

Figure 11. "La plume." © 1988 Michel Bret, Edmond Couchot, Marie-Hélène Tramus.

The notion of interactivity with the viewer was not born with the computer: *Op'art* is just one example among many [61]. In this line, the apparatuses built by Edmond Couchot, Yaacov Agam, and Myron Krueger in the 70s [62] react to the viewer's movements by shifts in light and sound to incorporate notions of temporality. Piotr Kowalski allowed the viewer to act remotely on a synthetic image [63], or to intervene in real time on the video [64], and in 1982, Tom DeWitt developed an interactive screen [65, 66]. The first trials of computer graphics at ATI plunged the spectator deeper into interactive installations and virtual universes, implementing the principles of virtual reality, gradually distinguishing different degrees of interactivity. "La petite danseuse" [67], a model synthesis, began to execute typically digital movements (Figure 10). "La plume" [68] was the beginning of what would later become "Je sème à tout vent" [69], where viewers blowing on feathers or synthetic flowers on the screen realize that they have an impact on their movement (Figure 11).

These works laid out the principles of virtual reality, as defined by Fuchs in 1996 [70]. The various features of what is called virtual reality—changing time and place through interactions—and the purpose of this reality are implemented in order to "enable one or more people to experience some sensory-motor and cognitive activities in an artificial, digitally created world which may be imaginary, symbolic, or may simulate some aspects of the real world" [71].

Works like "The legible city" [72] and "Pissenlit" [73] are historical examples of this virtual reality. In the first example, viewers are involved without substitution in the action, sitting on a bike that allows them to feel closer to the reality of this virtual city, even though it is made up of words. In the second case, viewers' breath symbolizes the wind that puts the flower in motion on the screen. Since these pioneering works, several interfaces have associated immersion (sensing) and interaction (acting upon). They gave rise to varying degrees of motor skills, while interactive possibilities for telecommunications, then rapidly expanding, brought the notion of "dispositif" to the forefront.

Broad public acceptance of the computer as medium was nurtured by the dominance of computer graphics in film and television production, and the technology's role in creating digital art.

Towards Expansion

Nowadays, the greatest part of "the turnover of a number of French companies is obtained abroad, while many computer animators choose to work abroad" [74]. Where do these talents and skills derive from? The "French touch" has been exported since the 1990s, first as expertise in software [75]. Indeed, many ingenious pioneers strove to develop their own tools. In 1985, Pascal Terracol and Olivier Emery produced one of the first commercially available 3D animation software packages for the PC, Imagix-3D [76]. When it was lent to MacGuff, this software helped to initiate the company's activities [77]. The most striking example is the software Explore. In 1986, Jean-Charles Hourcade, along with Daniel Borestein and Alain Nicolas, merged the 3D studio Ina and Thomson CSF into the new company TDI [78], thereby laying the foundations of Explore, which became "the best-selling 3D software in 1991" [79]. It was sold in 1993 to Wavefront, and its bases can still be found today in Maya.

Then, creativity took over. Sogitec produced 80 commercials for the English market from 1984 onwards. When the company merged with TDI to become ExMachina, "it soon appear[ed] that the film market [was] not sufficient for the development of the company" [80]. It therefore branched out to produce films for theme parks and special events, especially in the US and Asia. ExMachina opened an office in Tokyo as early as 1992, partly in order to commercialize rides [81]. "Sub Oceanic shuttle" [82] was the first CG product of Iwerks Entertainment and was followed by many others. After the success of "La cité des enfants perdus" [83], the special effects supervisor of "Batman and Robin" used Buf compagnie "to work on 56 shots of the film" [84]. Buf later developed the visual effects in film after film in the U.S. [85].

Although directors have testified that exchanges between the French and Americans existed at the time—as the festival Imagina in Monte-Carlo, which encouraged the use of graphics work in Europe, illustrates—productions during these years were very different. "Maison vole" [86] was produced in late 1982, the very year "Tron" [87] was released. Three years later, Pixar produced "Luxo Jr." [88]. Was it simply that means and techniques were quite different? Or is it that these "nouvelles images" were regarded differently in the two countries? There were many French productions in those pioneering days, and today French expertise is still recognized. Should we go so far as to suggest that there is such a thing as a French school of computer graphics? Or did 3D productions develop uniformly on all continents? This research now deserves to be taken further: a thorough analysis of the productions, as well as a comparative historical approach of the three countries that evince outstanding creativity and imagination—the United States, Canada, and Japan—should be the next steps.

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