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## Codes of conflux: Collaborations between human and computer in MoMA's Thinking Machines

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There is an eerie familiarity visible in the photographs of office workers' faces installed in the middle of *Thinking Machines: Art and Design in the Computer Age, 1959-1989*, an exhibition that was presented at the Museum of Modern Art in New York City this past winter. It is a mix of strange affects we might describe as avid distraction, mild alarm, or rapt disinterest. It is clear, looking at this series of mid-1980s Lee Friedlander photographs from the vantage point of 2018, that these people are looking at computer monitors. Capturing these images at the Massachusetts Institute of Technology in Boston in 1985 and 1986, Friedlander also seems to have documented the beginnings of a strange epochal shift in the history of affect: one in which the interpassive lure of the screen would take hold on our waking lives – at work, at home, and, later, everywhere in between.

Retracing this history through animated films, videos, machine and human drawing, kinetic sculptures, music and musical scores, poetry, photographs, printing, and graphic, urban, and industrial design, *Thinking Machines* follows the complex intersections of art, design, technologies, and the information economy from the middle to the end of the 20<sup>th</sup> century. Curated by Sean Anderson and Giampaolo Bianconi, and arrayed across the Philip Johnson Galleries on MoMA's third floor, the exhibition also draws on the museum's own large collection of computer-generated (and often simply-related) works, gesturing toward the museum's substantial history of new media exhibitions since the late 1960s: *The Machine as Seen at the End of the Mechanical Age*, 1968; *Information*, 1970; and *Information Art: Diagramming Microchips*, 1990.



In this way, the show makes a strong case both for the rapid integration of computers into the processes of art-making and life in general, but also for the museum's perspicacity in following these trends through its collection practices. Thanks to these efforts, and to the show's deft mix of artist's works and those designed and manufactured in or in collaboration with technology industries, the exhibition suggests the computer's complex formal transformation from an industrial machine to intelligent and abstract black box – a shift from the computer as object to digitality as a way of living and thinking.

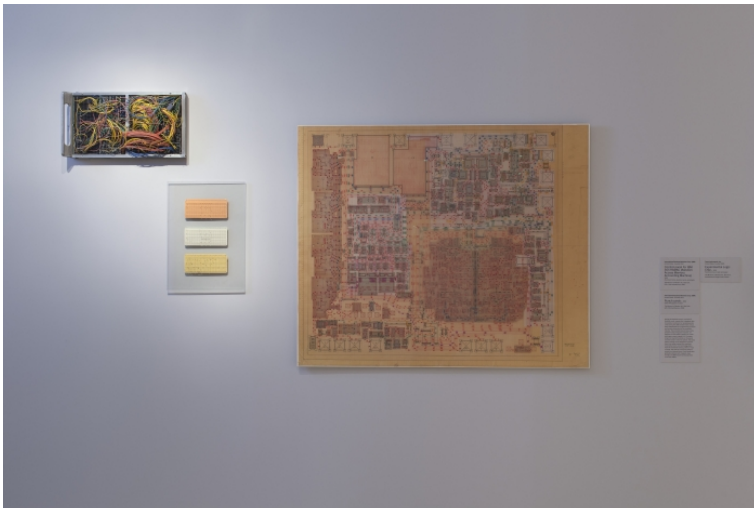
To see this transformation concretely represented in objects from a brief thirty-year period, beginning at the exhibition's entrance with an early 1950s IBM control panel and pre-magnetic tape Hollerith cards and extending to a portable ThinkPad computer near the show's conclusion, is quite remarkable, but so is the exhibition's geographical spread. While there is considerable focus on works created within the United States (by artists associated with groups like Fluxus and Radical Software, by companies including Bell Laboratories/IBM, and at universities such as MIT), the exhibition is nevertheless laudably international in scope, with featured pieces from Italy, Yugoslavia, Japan, the UK, Brazil, Croatia, Germany, and – via Ernő Rubik's notorious cube – Hungary. The exhibition is thus a useful addition to an ever-expanding map of the spread of computer technologies in scholarly research and popular historiography alike.[1]



From DIY to corporate commission to commercial work, *Thinking Machines* documents not only a subtle interplay of art and technology but also a complex exchange between artists, designers, and tech company executives. Also at the exhibition's entrance, Charles Csuri's landmark computer-graphics film *Hummingbird* (1967), made with his Ohio State University colleague James Shaffer, represents one of the first computer-generated artworks the museum acquired. A direct antecedent of Pixar's mega-hits, Csuri's video does not so much depict avian flight as atomise a single drawing of a hummingbird into dozens of lines which explode, sprawl, swirl, and then reconvene into the original image via a FORTRAN-based program. The work is perhaps technically primitive by comparison with today's computer animation, but it is no less mesmerising in its elegant movement and its play with abstraction and representation.

Anticipating the future of computer graphics in a somewhat distinct way are the computer films of Stan VanDerBeek, represented here by an installation of his film *Poemfield No. 1* (1967) on the far wall of first gallery (the film was originally made on 16 mm but was projected here on video). VanDerBeek made eight films in this series between 1966 and 1971, first at Bell Laboratories in Murray Hill, New Jersey and then at MIT's Center for Advanced Visual Studies, writing out a set of instructions in BEFLIX (or 'Bell Flicks'), a programming language written by his collaborator, the programmer and physicist Ken Knowlton (*Thinking Machines* displays code printouts for the first, second, and third *Poemfield* films). These instructions would then be fed into

an IBM 7094 interfaced with a microfilm recorder, which would film a black-and-white image that would later be edited, colourised, superimposed, or otherwise manipulated. This complex mixture of textual, computer, and photochemical media attests to the hybrid nature of computer art in this era, further suggested by the Fluxus artist Alison Knowles' contemporaneous project *House of Dust* (1968), which she created with the assistance of the composer James Tenney. Using a Siemens 4004 computer and the FORTRAN IV language, the poem was generated randomly by the computer using a pre-determined vocabulary.



*House of Dust* was exhibited here in the form of a print-out, although one can find it in many forms, such as its online version, 'reimplemented' by the poet and new media artist Nick Montfort.[2] But the sheer bulkiness of many of the objects on display here points to the ways in which our machines have largely receded from sight, slipping unnoticed into the fabric of everyday life. By contrast, works like Gianni Colombo's kinetic sculpture *Pulsating Structur-alization* (1959), commissioned by the Olivetti Company, are conspicuous for their machinic presence, as is Thinking Machines Corporation's *CM-2 Super-computer* (1987), an enormous 150-square centimeter black steel and plexiglass cube, which dominates the second gallery, blinking with red lights like one of the central organs of HAL from the film *2001*. Similarly, objects like the TCV 250 Video Display Terminal, designed by Mario Bellini in 1966, lend the exhibition just the right amount of well-contextualised retro chic.

More elegantly balancing the material and immaterial dimensions of computing is the centerpiece of the first gallery: Beryl Korot's installation

*Text and Commentary* (1976-1977), which draws linkages between an array of modular artworks including videos, pictographic musical scores, and tapestries. Computer programs assisted in the making of each component of the piece: they enabled the design of the tapestries, which were then manufactured on a Jacquard Loom, a process then documented by Korot on video, and distributed into a five-channel video installation, the editing of which was determined by computer program. Finally, a computer-assisted score marries these elements in a nook in the center of the main gallery. More importantly, Korot's work represents an early effort to underscore the particular role of women in the history of computing, drawing out a historical thread that aligns computers, at once, with weaving, needlework, and textile manufacture and with the women who primarily worked in these areas. In aligning the work of computer programming with 'women's work' – both because early computer programmers were women, and because of a shared lineage between this occupation and that of weaving, needlework, and textile manufacture – Korot's piece anticipates the work of scholars like Sadie Plant and Wendy Hui Kyong Chun, who have argued for the role of women as active agents in the development of computation and not merely laboring automatons implementing the directives of their (invariably male) overseers.[3]

Somewhat surprising, given the lineage on view, is that the military and the state make little overt appearance in the works represented. Norbert Wiener and Claude Elwood Shannon's seminal studies on information theory and cybernetics had emerged from American military ballistics research during the Second World War, and indeed it was the Boeing Aircraft Company, working in the early 1960s, that developed the first wireframe 3D graphics for their cockpit simulators. ARPANET, the early proto-internet, was installed in American research universities working under military contract in 1969 as a means of connecting their mainframes to the Department of Defense, the National Science Foundation, NASA, and the Federal Reserve Board.

In *Thinking Machines* this legacy is only dimly visible: in the Hollerith cards, designed to facilitate the tabulation of the 1890 United States census, that open the exhibition; and in the Olivetti Programma 101, which was later used by NASA in the 1969 Apollo 11 mission. Conspicuously, the military and the state appear as structuring absences in the exhibition – possibly a consequence of the museum's collectors attempting to distance the aesthetic standards of their acquisition policies from any air of bureaucracy or control. Nevertheless, we get a glimpse of this world in the second gallery via the Brazilian

computer artist Waldemar Cordeiro's *Gente Ampli\*2* (1972) which utilises a computer to 'redraw' a photograph of a protest in São Paulo against Brazil's military dictatorship. The image serves as a disquieting premonition of an era in which crowds, especially those assembled in protest, are surveilled, imaged, and analysed by the state, and it also looks ahead to the precarious conditions of democracy in present-day Brazil.

Cordeiro's work is only one of many such premonitions throughout the exhibition that force us to rethink the place of computers in our hypernetworked contemporary environments. For example, there is a glimmer at the emoji lexicon that defines much present-day mobile messaging in Susan Kare's amusing undated pen-and-ink sketches for graphic icons representing a cowboy boot, a foot fleeing through an open door, a fly swatter, and a baby doing a handstand. The emergence of today's vast home gaming industry, meanwhile, is effectively acknowledged through only one work, exhibited in a hallway just beyond the second gallery's exit: Dave Theurer's maddeningly addictive 1981 video game *Tempest*, with the artful simplicity of its crisp, colourful vector graphics. Alongside that, playing on a monitor at the exhibition's conclusion, is an episode of the half-forgotten British-Canadian sci-fi comedy *The Max Headroom Show* (1985), whose glitchy, wisecracking protagonist might offer a vision of humanity's cyborg-like absorption in the realms of electronic media – or just remind us of the stuttering images in a bad Skype connection.

Nevertheless, the interpenetration of the human and computer worlds – much worried over in dystopian science fiction – is for the most part presented here as a complex and harmonious co-evolution. Indeed, while the computer is represented throughout as industrial machinery, space-age kitsch object, home appliance, control device, or distraction machine, it also appears more evanescently as a conceptual model that precedes its actual physical presence as a tool and an object. Nowhere is this more clear than in the work of French-Hungarian artist Vera Molnár, whose interest in the computer's technical precision and formal rigor led her to create work with what she called her '*machine imaginaire*' before she had access to a '*machine réelle*'. Molnár's exquisite pair of abstract 1971 pieces titled *A la recherche de Paul Klee* consists of one handmade drawing and another by an ink-jet plotter – the origins of their craft largely indistinguishable from one another.

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## Notes

- [1] See particularly the recent work on computation in Latin America, including Medina 2011 and Medina & da Costa Marques & Holmes 2014.
- [2] See [https://nickm.com/memslam/a\\_house\\_of\\_dust.html](https://nickm.com/memslam/a_house_of_dust.html).
- [3] See Plant 1998 and Chun 2005. For more on the relationship between computers, craftwork, and gender see Bratich 2010 and Monteiro 2017.