

Creative Metamorphoses:
Early Experimentation with Digital Technology in the Works
of Sarah Jackson and Elizabeth Vander Zaag

Katharine Stein

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By: Katharine Stein

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_____ **Chair**

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Dr. Johanne Sloan

_____ **Examiner**
Dr. Cynthia Hammond

_____ **Supervisor**
Dr. Kristina Huneault

Approved by:

_____ *Dr. Kristina Huneault, Graduate Program Director*

_____ *Rebecca Duclos, Dean of Faculty of Fine Arts*

Date: _____

ABSTRACT

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Katharine Stein

This thesis looks at key themes in the works of two Canadian artists, Elizabeth Vander Zaag and Sarah Jackson, who began experimenting with digital technologies beginning in the mid-1970s, before the advent of personal computing. Focusing on shared themes of development and transformation in their works, the author shows how their ideas reflect a particular attitude towards early digital media, as well as biological life more generally, that contradicts what was generally thought to be the trajectory and ethos of simulating technologies as they developed in academic environments in the 1960s and 70s and trickled out into the art world. Grounded in a methodology that considers feminist responses to the ideology put forward by the discourse of cybernetics that privileges the status of information, this thesis positions Jackson and Vander Zaag as significant figures in Canada's first wave of digital artists, centering critical issues of gender, literacy, and access as read through the context and content of each artist's practice. What the author finds is that the emphasis in digital media scholarship on programming as the site of critical interventions trivializes the other ways artists who were women were engaging with technology as it was emerging. Contrary to extant histories of Canadian media art that favour legible distinguishing features such as interactivity, early digital media makes its way into certain artistic practices as hybrids between digital and traditional media, as artists sought ways to translate its radical difference into vocabularies that were harmonious and accessible to existing practices in video, sculpture and drawing. Ultimately, Jackson and Vander Zaag's use of digital media as expressive tools gave them a vantage point from which to reflect on the medium without getting caught up in the technicalities of the coding process, and their work reflects a radical openness to its potentialities. The author argues for a feminist reading of this orientation that counteracts the tendency to locate agency in the act of programming at the expense of excluding other forms of engagement with digital media.

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Introduction

From the earliest experiments in digital graphics, the visual culture of early computing presented a view of the world as composed of information (fig. 1), borrowing from cybernetic discourses on the mathematical nature of biological life and human cognition.¹ Certain examples of early Canadian digital art complicate this worldview. These works, produced between the mid-seventies and late eighties, are remarkable because, besides being produced by Canadian women before the advent of personal computing made digital technologies accessible, they continually channel processes of development and transformation, depicting various stages of the human life cycle, as a way of thinking reflexively about the medium itself.² Focusing on Canadian artists Elizabeth Vander Zaag and Sarah Jackson, my thesis contrasts their work with the history and philosophy of early digital culture³ in order to show how their use of themes such as growth, change, and embodiment are markers of a specific orientation towards digital media. I argue that this orientation was influenced by both artists' conscious positioning as women experimenting in a new and unexplored aesthetic landscape. Equally, their work shows that they were thinking about nature and life in ways that challenge the presumptions of a digital ontology.

¹ See Zabet Patterson, *Peripheral Vision: Bell Labs, the S-C 4020, and the Origins of Computer Art* (Cambridge, MA.: MIT Press, 2015).

² Setting boundaries around the definition of digital media is a contentious practice. For the purposes of my thesis, I will use the definition Canadian media scholar Caroline Langill adopts from Christiane Paul's survey text *Digital Art*, which she uses in her dissertation on electronic media art in Canada to describe "all work produced with digital technologies since the commercial availability of the transistor in 1951." Caroline Seek Langill, *Shifting Polarities: Canadian Electronic Media Art and Institutional Space, 1970-1990*, PhD diss. (Trent University, 2008), 4. See also Christiane Paul, *Digital Art* (London: Thames and Hudson, 2003), 7.

³ A broad term denominating the culture that arises out of the development of computing as we know it today, which has roots in WWII-era defence technology and the cybernetic discourse of the decades that followed, which directly influenced the development of computer-mediated visualization. See Patterson, *Peripheral Vision*.

In her book on the cultural function of metamorphosis, Medieval scholar Caroline Walker Bynum writes that “we learn a good deal about any cultural moment by asking what conception of change, whether implicit or explicit, tends to dominate its various discourses.”⁴ From pioneering computer scientist Alan Turing’s fascination with morphogenesis in the early 1950s, to the pursuits of Artificial Life programs, change – and particularly the drive to quantify and therefore digitize and control processes of biological and personal transformation – has been digital culture’s most persistent and most elusive muse. As I argue below, quantifying change was and is still thought to be the final, legitimating ingredient of an ontology that treats numerical values as the underlying ordering principle of nature.⁵ Genealogically related to the universally quantifying and valourizing impetus of the capitalist worldview, digital ontology is a natural target for feminist artistic interventions. This is where I would like to situate the artworks discussed below.

Starting in the 1940s, as biological and information discourses became increasingly inflected through one another, new sets of metaphors generated new understandings of the nature of life in an increasingly digitally-oriented world.⁶ This was a common concern among media artists in Canada by the early nineties, as evidenced by the works of artists such as Nell Tenhaaf, and Catherine Richards,⁷ and by initiatives such as their 1991 Virtual Seminar on the

⁴ Caroline Walker Bynum, *Metamorphosis and Identity* (New York: Zone Books, 2001), 21.

⁵ See Sara Imari Walker and Paul C. W. Davies, “The Algorithmic Origins of Life,” *Journal of the Royal Society Interface* 10, no. 79 (6 February 2013): n.p., <https://doi.org/10.1098/rsif.2012.0869>; and Rodney Brooks, “The Relationship Between Matter and Life,” *Nature* 409 (18 January 2001): 409-11, <https://www.nature.com/articles/35053196>.

⁶ This topic is covered in depth in N. Katherine Hayles seminal book, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago and London: University of Chicago Press, 1999); and Seb Franklin, *Control: Digitality as Cultural Logic* (Cambridge, MA. and London: MIT Press, 2015).

⁷ See Langill, *Shifting Polarities*, 241-59.

Bioapparatus at the Banff Centre, a seminar and residency that brought artists, theorists and technologists together to discuss the interface between bodies and technology.⁸ Certain artists, however, are noteworthy for addressing these issues as early as the late seventies. Vander Zaag and Jackson were among the first to produce art using digital media in a Canadian context, and their approaches to the medium warrant attention. I want to argue that Vander Zaag and Jackson belong in this Canadian conversation about the intersection of media art and cultural reflections on life in the era of information.

The concept of information as a substrate of form is fundamental to a history of digital art. The earliest experiments in computer rendering involved breaking objects down into sets of polygons whose coordinates would then be translated into data inputs, effectively reconstituting them as sets of numerical equations (fig. 2). The predominant trajectory for this technique puts information to use by bringing digital representation as close as possible to an accurate depiction of the original object. As artist Cynthia Goodman writes in one of the first surveys published on digital art, “the common goal of much high-end [computer graphics] research is the simulation of reality through three-dimensional modelling techniques.”⁹ At roughly the same time, the field of bioinformatics was born, which uses biological data to develop algorithms that could simulate (and thus illuminate) the molecular process of DNA protein-binding (fig. 3).¹⁰ This followed a process by which the concept of information was mapped onto genetic material in order to frame

⁸ Catherine Richards, Mary Ann Moser and Nell Tenhaaf, eds., *Bioapparatus* (Banff: Banff Centre for the Arts, 1991).

⁹ Cynthia Goodman, *Digital Visions: Computers and Art* (New York: Harry N. Abrams, Inc., and Syracuse: Everson Museum of Art), 15.

¹⁰ See David B. Searls, “The Roots of Bioinformatics,” *PLoS Computational Biology* 6, no. 6 (June 2010): 1-7.

the narrative of complex living systems in computational terms.¹¹ In all of these cases there was a collapsing of digital and material worlds that naturalized the relationship between them.

My thesis looks at how Vander Zaag's and Jackson's work both arises from and challenges the informationist worldview, which manifested in specific ways in early digital culture as I discuss below, through personal reflections on the concepts of growth and development. Each woman's artistic practice contests the impulse to approach digital representation of the world with more and more fidelity, focusing instead on alternative narratives of life and alternative trajectories for the development of digital aesthetics. For an artist to take such a position is significant for two reasons: it highlights the privileging of a subset of programming skills among digital artists who were working in the days before the arrival of personal computing and software made digital art accessible to wider circles, and it resists the limitations such discourses, with their presumptions about the quantifiable nature of reality, place on how we can imagine ourselves as living beings interacting with a complex world.

I build my argument in four sections. The first section considers Vander Zaag's *Digit* series (1977-80) as a satirical answer to the question of what digital entities might be capable of if freed from the types of work computers were typically put in service of. It considers *Digit* as her own self-animator, both algorithm and effect of algorithm, contrasting this to the type of work computers were being used for, both at Simon Fraser University, where the *Digit* series

¹¹ Ibid., 4. See also Evelyn Fox Keller, *The Century of the Gene* (Cambridge, MA.: Harvard University Press, 2000); and Francois Jacob, *The Logic of Life: A History of Heredity*, trans. Betty E. Spillmann (New York: Pantheon, 1973).

was produced, as well as in experimental laboratories across the US, in the early years of digital graphics.¹²

Treating the Digit series as a jumping off point, in the second section I consider later works by both Jackson and Vander Zaag that take up the theme of development through portrayals of girlhood, connecting these representations to a larger tendency feminist tendency within digital culture to focus on the materiality of the body as a critique of the dematerializing discourse of information.

The third section skips forward to Vander Zaag's work *Baby Eyes* from 1983, after she acquired an Aniputer, a hands-on visual effects synthesizer developed by Japanese video artist Ko Nakajima that was less limiting than working with the mainframe at SFU. In this work, Vander Zaag conceptualizes the new abilities of the medium as an infant child's experience of the world. The video stars her own baby daughter and illustrates the developing infant's experience of vision, a process that she witnessed happening firsthand. I stress that the video's emphasis on interface as a crucial aspect of development challenges deterministic views about what sort of trajectories are possible for young people by calling attention to growth and change as a collaborative, open-ended and unpredictable process. The word "interface" here has a double meaning, functioning both as the point of contact between a baby and its surroundings, as well as the conventional computing sense of the term as the modality for the encounter between user and computer. The baby/computer is embraced for its incompleteness in this work, in which development is figured as a fruitful arena for experimentation and new ways of looking at the world.

¹² Goodman explains that at this period, "little distinction was made between graphics created by the pioneering artists who ventured into the technological domain in the mid-1960s and those of functional application made by scientists and mathematicians." *Digital Visions*, 20-21.

The final section pays closer attention to the work of Sarah Jackson, whose works I consider to express an overlapping set of themes. Jackson, who died in 2004, was based in Halifax for the majority of her career, where she raised her family. Though she is most recognized for her large public sculptures from the 1950s and her contributions to the correspondence art movement,¹³ her work spans multiple media, including sculpture, readymades, ink wash drawings, copy art, mail art, and computer art. I pay special attention to the way her works, like, Vander Zaag's, engage the theme of change and transformation, and read these manifestations through the lens of critical writing on digital culture that has emerged in the last three decades. Finally, I consider how feminist scholar Elizabeth Grosz's "feminist politics of transformation"¹⁴ might be useful to an appraisal of the legacy of these works, since her writing is engaged in the practice of elaborating counter-ontologies in response to dominant informational paradigms.

In essence, this thesis accomplishes two things. It addresses the gendered aspects of digital artmaking by placing Vander Zaag's and Jackson's work in conversation with dominant paradigms and presumptions of the time. As such, I take cues from a long line of feminist questioning that has centered female experience and embodiment as critical tools for reimagining the premises of digital culture that exclude or instrumentalize women. My thesis also begins to fill the gap in current scholarship on the early days of digital art in Canada.¹⁵ It is important to

¹³ See Emily Robertson, *Pushing the Envelope: The Evolution of Mail Art in Canada* (Master's Thesis, Concordia University, 2007), 62-73.

¹⁴ Elizabeth Grosz, *The Nick of Time: Politics, Evolution, and the Untimely* (Durham: Duke University Press, 2004), 73.

¹⁵ Caroline Langill writes that there is "a gap in both the archive and scholarship, evidenced by the dearth of literature documenting [digital] practices between 1970 and 1990," at which point digital works began to be widely collected by museums. While her dissertation seeks to survey Canadian electronic media art from this period and illuminate the reasons for its exclusion, its

stress the fact that these are some of Canada's first digital artists of any gender. It is not my wish to set them apart in a category of "female pioneers," nor is it my intent to argue that as women, Vander Zaag and Jackson were hardwired to create a certain type of work. Undoubtedly feminist in intent, their work speaks to the way dominant paradigms of digital culture interpellate human subjects and to the ways in which the vicissitudes of life can be inflected through art into something powerful.

Simulation and Satire: *Digit* and the Institutional Uses of the Mainframe Computer

The Summer 1978 issue of *Video Guide*, a quarterly magazine issued by artist-run centre and video-sharing network Satellite Video Exchange, features an article by Vander Zaag showcasing techniques for adding digital elements to video works (fig. 4).¹⁶ The short article is perhaps the most succinct record of Vander Zaag's unique position within artist-run culture in the late seventies. With one foot firmly planted within the video art circles that emerged in Vancouver in the seventies through ARCs such as Pumps Gallery, Video In, and Western Front, Vander Zaag also had one foot in the door of the academic milieu through her job at the video workshop at Simon Fraser university. There, she had access to a variety of terminals that ran off of the university's IBM mainframes, including the Kinesiology department's Evans & Sutherland Picture System as well as processing systems in the AV department and the Sonic Research Studio, then being run by Barry Truax.¹⁷ Her *Video Guide* article also illustrates Vander Zaag's

focus is on interactive media and therefore does not include "net-art, web-based works, single-channel digitally-edited video work, or computer art." *Shifting Polarities*, 25, 4n1.

¹⁶ Elizabeth Vander Zaag, "Digital Video Details," *Video Guide* 1, no. 3 (Summer 1978): 4.

¹⁷ Personal correspondence with the artist, June 16 2017, and Peter Van Epp and Bill Baines, "Dropping the Mainframe without Crushing the Users: Mainframe to Distributed UNIX in Nine Months," Simon Fraser University, LISA VI Conference (Long Beach, CA, October 19-23, 1992), 39.

curiosity about the potential applications of digital media to video art, which was matched by her resourcefulness in accessing the people and systems at SFU that would support her experimentation.

Vander Zaag's *Digit* series (1977-1980) is something of an anomaly within the Canadian cultural landscape of the late 1970s. Predating the widespread availability of personal computers by almost a decade, the *Digit* series was the fruit of Vander Zaag's immersion in both milieus simultaneously, combining the early digital animation techniques accessible at SFU with the reflexive thinking about technology that characterized the video networks in Vancouver and across Canada at the time.¹⁸ As such, the *Digit* series is worth investigating, as an artefact of Vander Zaag's attitude toward digital media from a position both inside and outside of its institutional framing. The *Digit* series also touches on themes of development that get picked up much more explicitly in later works addressed below.

The *Digit* series consisted of a number of animated shorts that aired on *The Gina Show*, a cable-access variety show run by Vancouver's PUMPS Gallery between 1978 and 1981.¹⁹ It stars a self-actualizing personification of 'the digital' who episodically reveals different quirky aspects of herself. As a purely digital entity, Digit is noteworthy for being capable not only of turning herself on, but of evolving through a life cycle: becoming responsive, developing preferences (sexual and otherwise), even acquiring legal personhood (fig. 5). Digit doesn't take any one form over the course of the series, and sometimes isn't pictured at all, depending on whether Vander Zaag had access to animation equipment on a given week. The illustrations for the *Digit Responds* segment could be the closest thing to a depiction of her likeness, represented as a

¹⁸ Langill, *Shifting Polarities*, 71-76.

¹⁹ Allison Collins, "The GINA Show Archives: Vancouver Video Memory in Motion," *The Gina Show, Or Gallery*, <http://www.theginashow.orgallery.org/essay/>.

crudely drawn set of features (eyes, eyebrows, lips, finger, upper torso, head) that expand and contract with the interpolation algorithm (discussed below) she used to animate them (fig. 6).

It is interesting to contrast this crudeness with the dominant uses of computer visualization technology at the time. As innovations enabled the rendering of objects to evolve into smoother, more naturalistic simulations, the promise of digital graphics was thought by many to be one of greater and greater fidelity to life in the representation of natural phenomena. Take, for example, the seminal example of Nelson Max's *Carla's Island* (1981), an animated sequence created at the Lawrence Livermore National Laboratory, which features realistic renderings of the motion of waves and atmospheric changes based on an algorithm for emulating the laws of hydrodynamics (fig. 7).²⁰ Such early digital graphics experiments, which took place at laboratories across the US starting in the 1960s,²¹ were united in their quest to translate elements of the physical world into sets of numerical values that could be read by a computer. Especially useful in the domain of scientific visualization, these practices often mask the traces of their own authorship in order to present the algorithm as a fundamentally real and transferrable aspect of what it represents.²² New Media theorist Philip E. Agre has connected this drive to the US military, arguing that it "has heavily funded [simulation] research in support of its ambitious attempt to blur the distinction between real and simulated battlefields."²³ In the

²⁰ See Nelson L. Max, "Vectorized Procedural Models for Natural Terrain: Waves and Islands in the Sunset," *Computer Graphics* 15, no. 3 (August 1981): 317-24; and "Computer Animation in Mathematics, Science, and Art," *Computers and Mathematics* 125 (1990): 321-45.

²¹ See Frank Dietrich, "Visual Intelligence: The First Decade of Computer Art," *Leonardo* 19, no. 2 (1986): 159-60; Patterson, *Peripheral Vision*; and Wayne E. Carlson, *Computer Graphics and Computer Animation: A Retrospective Overview* (Columbus: Ohio State University Pressbooks, 2017), <https://ohiostate.pressbooks.pub/graphicshistory/>.

²² Patterson, *Peripheral Vision*, 3.

²³ Philip E. Agre, "Beyond the Mirror World: Privacy and the Representational Practices of Computing," in *Technology and Privacy: The New Landscape*, 47.

kinesiology and computer science departments at SFU, similar efforts were directed toward the so-called “duplication of human function” for a variety of clinical and research uses, but with a technically-constrained graphics interface, their efforts placed “more emphasis on accuracy and less on the reality of the illusion.”²⁴ The sophistication of the graphic terminals’ ability to convincingly simulate that movement was lagging, but this was thought to be a result of the relative newness of the technology, rather than any obstacles inherent to the goal of simulating reality.²⁵ The ‘reality’ in question – human movement – had already been captured in discrete data sets. The program’s visual awkwardness was seen as an attribute of incipient (albeit rapidly developing) modes of display. The team at SFU was one of the first to use computers to develop innovative motion capture technologies that addressed the problem of representing human movement accurately/realistically.²⁶

Against the backdrop of this academic fixation with (and confidence in) the accuracy or truthfulness of simulated forms, we can position the strategies at play in Vander Zaag’s work of this period. One of her earliest digital experiments was with keyframe interpolation, an early method of computer animation that involves setting up still images that serve as reference points between which the computer interpolates transitions. Although the interpolation program could only draw lines and simple shapes and set them on a path that appeared as a raster-scanned image on a CRT monitor, there are early traces of the narrative qualities of the *Digit* series present in *Not Fiction* (1976), a work from this period.²⁷ *Not Fiction* is composed of a frenetic

²⁴ Tom Calvert, J. Chapman, and A. Patla, “The Simulation of Human Movement,” *Graphics Interface '82* (1982): 227.

²⁵ *Ibid.*

²⁶ David J. Sturman, “A Brief History of Motion Capture for Computer Character Animation,” *SIGGRAPH 94*, course 9 (1994), n.p. https://www.siggraph.org/education/materials/HyperGraph/animation/character_animation/motion_capture/history1.htm.

²⁷ Phone conversation with the artist, 2 March 2017.

dance of linear forms that deploy pattern and rhythm in order to convey a sense of affective ebb and flow within the rigid parameters of what the interpolation program could achieve (fig. 8).²⁸ This was done by taking simple shapes and lines (triangles, circles, x's) and setting them in motion to a calamitous soundtrack – produced using a computer program written by Barry Truax²⁹ – modulating details such as the size or density of the forms that appear on screen, and the speed of their movement, in synchrony with the soundtrack. The effect of such an arrangement gives a sense of trajectory, as well as of an emotional pull. Especially when seen in comparison with the other kinds of academic work that was being done on the same systems, the emotional, narrative quality of Vander Zaag's work is achieved precisely because it dispenses with the scientific objectivity dictating what was possible to express. In a sense, the title of *Not Fiction* functions to convey a Magritte-style disavowal of the impulse to convey a sense of action that is so clearly unfolding on screen. Because what we see is actually pure fiction; with so little in the way of expressive tools, Vander Zaag relies on sound, rhythm and pattern to flavour the interpolation algorithm with expression. It is a work of pure imagination. The method of keyframe interpolation used in *Not Fiction* is itself associated with a tension between the project of presenting a realistic vision of the world and the inherent “lack of gravity”³⁰ that is an effect of the interpolation algorithm. With *Not Fiction*, like simulation techniques themselves, the artist blurs the line between what is and what is not real, but hers is not the technique of simulation – where the goal is to convince with visuals that approach the ‘real thing.’ Instead of this, Vander Zaag uses a contrast between word and image to draw our attention to the discrepancy between

²⁸ Ibid.

²⁹ Email correspondence with the artist, 27 August 2019.

³⁰ Peng-yi Tai, “The Aesthetics of Keyframe Animation: Labor, Early Development, and Peter Foldes, *animation: an interdisciplinary journal* 8, no. 2 (2013): 112.

the truth promised by the title and the actual content, which is pure artistic expression. Whereas simulation functions by suppressing awareness of the authorial presence of the programmer, the conceptual play elicited by Vander Zaag's title draws attention to her own role as arbiter of what counts as truth.

While *Not Fiction* pokes fun at the fidelity with which it fails to represent itself, the *Digit* series completely undermines the mimetic drives that are a salient feature of the visual culture of early computing. It is interesting to note that the *Digit* series was created using a program developed by Jerry Barenholtz, a programmer working in the kinesiology department at SFU, using the same graphics terminal that was used to create their data bank of simulated human movement that would serve scientific and clinical research communities.³¹ But the two programs were put to very different ends. While the goal of the SFU system was to capture motion data and input it into the system in order to approach as accurate as possible a description of the activity being recorded, *Digit* is radically different for having no real-world counterpart of which to serve as a simulation. Instead, she is a born-digital entity who appears to live inside the hardware of a computer: in *Digit Does the Dishes*, Digit cleans the wafers that house the circuits embedded in the mainframe (“Brush scrubbing is better for cleaning gross particulate matter,” she says. “High-pressure scrubbing is better for getting down into the fine geometry of wafers”). As with many of the shorts in the *Digit* series, aspects of the real world such as ‘doing the dishes’ are inserted, tongue-in-cheek, in order to furnish an imaginary world unique to Digit and the digital space she occupies. Indeed, the minimalism of *Digit Goes to Hawaii* (fig. 9), which features a set of squiggly lines moving against one another coupled with a soundtrack to suggest

³¹ Correspondence with the artist; and Calvert, Chapman, and Patla, “The Simulation of Human Movement.”

the movement of waves, can be taken as the Dadaist counterpart to Max's *Carla's Island*, which seems almost diametrically opposed in intention (see fig. 7). Whereas Max's waves required painstaking mathematics in order to render a visual product as scientifically accurate and true-to-life as possible, the simplicity of Vander Zaag's squiggly lines is deployed in a manner cheekily suggestive not only of waves but of an entire narrative in which the protagonist vacations in Hawaii.

Two related themes are emerging here. The first is Vander Zaag's rejection of the dominant model of using data to provide an increasingly realistic digital representation of life. The second is her play around notions of authorial power as a means to bring that rejection home. Artist and scholar Frank Dietrich writes, the interests of early computer artists were "fueled by other [than expressive or painterly] capabilities of the computer, for instance its ability to allow the artist to be an omnipotent creator of a new universe with its own physical laws."³² A crucial aspect of the programmer's power to create these worlds lies in the wholesale attribution of that power to the algorithms themselves, thereby masking the maker's own creative role in the generation of digital forms. With *Digit*, Vander Zaag at first appears to be using this same strategy by scripting *Digit* as a self-actualizing, independent entity. But because elements of Vander Zaag's own artistic interventions are hinted at throughout, we never actually forget who the series' creator really is. As with *Not Fiction*, Vander Zaag places a subtle emphasis on her own role as mediator of her artworks' reality, for instance by merging her and Digit's identities, whether by using her own silhouette-portrait as Digit's in *Digit Reproduces* (fig. 10), or by using her own voice to give expression to Digit. By bringing herself and Digit into relationship, Vander Zaag is drawing out the nuances of the act of creating with computers,

³² Frank Dietrich, "Visual Intelligence," 161.

which is neither based on extreme control on the part of the artist, nor on the independent conjurings of the algorithm. Rather, it is located at the interface between user and machine. My thesis will address this last concept in section two by looking at *Baby Eyes*, in which the interface is foregrounded both narratively and in terms of the creative process: as the meeting point between child and world, where Vander Zaag situates her concept of development, and as the interaction between maker and tool that is the fruitful site of unforeseen creative leaps.

Digit is a send-up of the type of simulation work that was being done with computers in the academic milieu around the same time – an effect which Vander Zaag achieves by crafting a satirical account of a self-actualizing digital entity. In doing so, Vander Zaag challenges an entire enterprise that privileges the self-styled omnipotence of creative programming by circumventing the quest for algorithmic accuracy that formed her immediate surroundings, instead creating space for a different type of trajectory for digital lifeforms. With *Digit*, this trajectory takes the form of girlhood; the name *Digit* was a tongue-in-cheek play on the *Gidget* franchise of the late-50s and 60s about the adventures of a teenaged girl named Gidget, played by Sandra Dee. To embody the figure of a teenage girl is to hold a set of principles – rebelliousness, opacity, freedom – that undermine the way data was channelled by first-generation programmer-artists. And yet, even as Vander Zaag presents this version of *Digit*, she adds complexity to the clichés of girlhood by presenting someone who enjoys housework.

The dominant goals of early computer visualization reflect the hubris of the belief that life could be perfectly translated into an algorithm, not least because in information-era discourses such as molecular biology, form is attributed to underlying genetic ‘codes’. This view has led to the privileging of those fluent in programming languages in histories of early digital

art, locating the creative act there, rather than in those who simply use them. One result of this is that often more work by women gets excluded from narratives of invention and discovery.

By including Vander Zaag in this conversation around computational creativity, I want to stress that there was interesting art happening in the early days of digital art that didn't follow the dominant informational ontology and had goals other than to simulate reality. This is significant because it helps to counteract a bias within the history of computational arts. When we value the contributions of code-literate artists over others because of a privileging of a certain trajectory towards stronger and better algorithms, we repeat the exclusions of the field itself, leaving most women outside of narratives of innovation that are, in this instance, based on a lack of access to technical skills. But their position outside of this structure gave women like Vander Zaag the critical distance needed to assess the paradigm itself, showing up its limitations in a way that now enables us to critique the history of digital art -- both the conceptual trajectories it has chosen to valorise and the exclusions that have accompanied that trend.

Girlhood and Embodiment in Digital Culture

With *Digit*, Vander Zaag drew on themes of development that she explicitly coded female. Outside of the institutional frame, Vander Zaag would return to similar thematic content in her later piece, *Hot Chicks on TV* (1986), in which she used digitally-processed video to depict the internal process of female puberty (see figs. 25-28). Vander Zaag's recurrent focus on the transformative state of girlhood is worth exploring, especially in connection to similarities her work shares with the Canadian artist Sarah Jackson.

Sarah Jackson's career is another example of the oblique ways in which artists connected with digital technologies before PCs came on the market. The trajectory of her career shows an

increasing interest in the creative potential of digital media: in the early to mid-1970s she was making wax sculptures and humorously graphic assemblages of readymade objects (figs. 11 and 12); by the late seventies she she had begun experimenting with the presets on digital photocopy machines (earning her a stint as artist-in-residence with Xerox Canada in 1978), a process which would preoccupy her until at least the mid-1990s.³³ She switched to PCs in the late-1990s (fig. 13).³⁴

It is important to clarify why Jackson's work should be considered under the umbrella term 'digital art' (see note 2). Jackson first began using thermo-process photocopiers as a method for reproducing her drawings that was similar to but cheaper than offset lithography (provided one was able to access them, as she was through her connections to Xerox and the Technical University of Nova Scotia).³⁵ She quickly realized that the machine itself was becoming a vital agent in her creative process, as it allowed her to modify her drawings as she printed: "What I have is an initial image and I'm moving it around. The shape is evolving all the time..."³⁶ She began experimenting with various techniques, and by 1977 she was travelling regularly to

³³ The works she made during this residency are now in the collection of the Smithsonian American Art Museum: <https://americanart.si.edu/artist/sarah-jackson-2422>. Sarah Jackson, "Reflections Behind the Mirror," *YLEM Newsletter* 15, no. 1 (January 1995): 2.

³⁴ My timeline of her work comes thanks in large part to the extensive archive of her work uploaded to Wikimedia Commons by a user named Zelechin, who turns out to have been her husband, the architectural historian Anthony Jackson (who passed away in 2015). See "*Canadian Architect* announces the passing of former editor Anthony Jackson," 24 July 2015, <https://www.canadianarchitect.com/architecture/canadian-architect-announces-the-passing-of-former-editor-anthony-jackson/1003727680/>.

³⁵ Elizabeth Pacey, "The Artist and the Machine," *Atlantic Advocate* 9, no. 67 (May 1977), 62-5; and Karl McKeeman, "Printmaking in Nova Scotia," *Art Magazine* 8, no. 31-2 (March-April 1977), 19.

³⁶ Pacey, "The Artist and the Machine," 64.

Toronto to use a full-colour Xerox with digital presets, which gave her unparalleled control over the printed outcome.³⁷

Sonia Landy Sheridan, an artist who pioneered the use of photocopiers, situates the development of these machines within the information revolution, calling them “commercial marketing applications of the still-imaging aspect of the computer-video-Hi-Fi revolution.”³⁸ While it is unclear whether Jackson and Sheridan ever interacted, Jackson’s work fits comfortably within the definition Sheridan gives of Generative Systems, a research program she developed at the School of the Art Institute of Chicago in the seventies, which she distinguishes from its more commercially-driven ‘copy art’ offshoot: “We adopted the term ... to satisfy our need to describe an area which, while dealing with contemporary technology, would emphasize the generative process of creation and its evolutionary nature.”³⁹ Sheridan also situates the medium alongside newer time-based media such as video and computer works, arguing that it was natural for artists working in these areas to want to explore questions related to time.⁴⁰

A preoccupation with time in Sarah Jackson’s work appears repeatedly through motifs that channel the machine’s capacity to register movement, for example the generation of new life (fig. 14). These themes are part of a larger interest on Jackson’s part in natural cycles of growth, death, and rebirth. In a 1985 article on Jackson for *Atlantis*, Kathleen Tudor hints at the process by which the copy machine “record[s] change as it is taking place.”⁴¹ For Jackson, this typically involved dragging an image, a folded piece of paper, or bits of lace across the scanner surface as

³⁷ Ibid., 65.

³⁸ Sonia Landy Sheridan, “Generative Systems versus Copy Art: A Clarification of Terms and Ideas,” *Leonardo* 16, no. 2 (Spring 1983): 103-104.

³⁹ Ibid., 103.

⁴⁰ Ibid., 105.

⁴¹ Kathleen Tudor, “Sarah Jackson: Art and Community,” *Atlantis* 11, no. 1 (Fall 1985): 134.

the scanning was taking place. The resulting image was a record of the entire process, in which parts of the master copy image are stretched and warped (fig. 15). This aesthetic is a common feature of copy art, for instance in Sigmar Polke's *Daphne* project, a giant book of copy art, which connects the metamorphosis implied by its title to hundreds of serially distorted images, individually hand-printed by the artist (fig. 16).

For Jackson, this aesthetic was one way of narrating processes of growth and change. For example, in *Exercises for the Growing Girl* (1985), Jackson took an article from an early-20th century women's periodical extolling the importance of an active lifestyle in developing women, reproducing – ironically, to be sure – a portion of the archaic-sounding text in full. The book unfolds into a series of prints in which Jackson has comically expanded an image from the article of a young woman stretching (fig. 17). Here, as with Vander Zaag's *Digit* series and *Hot Chicks*, development is personified in the figure of the girl.

What is noteworthy about these works is not just that they position girlhood as a symbol for development and transformation more generally, themes which appear again and again over the course of each artists' career. Also striking is the fact that their focus on the processes of girlhood point to a centering of the body in its material processes (here, in its processes of change) – a practice widely adopted as a feminist intervention by artists and writers on digital culture. A major proponent of this line of critique is N. Katherine Hayles, who in 1999 published a sweeping study of cybernetic ideas and their cultural impact in the latter half of the twentieth century, arguing that cybernetic discourses perform an “erasure of embodiment” by their widespread privileging of information over materiality.⁴² Engaging the materiality of the body thus becomes “radical” within the context of discourses of information that ignore how the

⁴² Hayles, *How We Became Posthuman*, xi.

embodied subject interacts with information through its material valences, for instance in medical imaging technology.⁴³ In a special 1996 issue of the feminist journal *Women and Performance*, archivist Sharon Lehner relates her experience of meeting her baby for the first and only time during an ultrasound; she would go on to learn that it had genetic anomalies and would not survive. Lehner's essay shows how women's relationships with crude, technologically-mediated representations cannot be detached from physical and emotional experience, ultimately challenging the idea that simulation is necessarily non-visceral or purely visual.⁴⁴

In *Exercises for the Growing Girl*, Jackson channels the potentiality embodied in the figure of the labile young subject through literally stretching her image across the page using the copy machine. Media theorist Heather Warren-Crow has shown that plasticity – the ability to alter an image in virtually any way imaginable at the pixel-level – is one of the central features of the digital image, and that it is the figure of the girl that is most often deployed as a symbol of the plasticity of digital media. Quoting Catherine Driscoll, she writes of girlhood as evoking “an idea of mobility preceding the fixity of womanhood and implying an unfinished process of personal development.”⁴⁵ Girlhood in these artists' work is thus an appropriate lens through which to consider the way they related to their instruments. In *Digit Reproduces*, Vander Zaag muses, “Digit is a woman; of that we are becoming quite certain.” Details like this point to the convergence of Vander Zaag's own process of getting to know the equipment and the still-early

⁴³ Ibid., 244, 196.

⁴⁴ See Sharon Lehner, “My Womb, the Mosh Pit,” *Women and Performance: A Journal of Feminist Theory* 9, no. 1 (1996): 179-85.

⁴⁵ Catherine Driscoll, *Girls: Feminine Adolescence in Popular Culture and Cultural Theory* (New York: Columbia University Press, 2002), 47, quoted in Heather Warren-Crow, *Girlhood and the Plastic Image* (Hanover, New Hampshire: Dartmouth College Press, 2014), 9.

stages of digital graphics themselves: for Vander Zaag, somewhat against the institutional consensus discussed above, it was impossible to say where the technology would lead, or what would be aesthetically possible as new programs and interfaces emerged. This trajectory is especially mystified when it is personified as an entity who is herself in development, learning, as we do, her own capabilities and preferences. This sense of excitement with the medium itself appears even more concretely in *Baby Eyes*, in which the sense of limitless potentiality is personified much more explicitly in the figure of an infant.

Image Processing as Sensory Development: Early Digital Aesthetics in *Baby Eyes*

The first ever digitally scanned image is of baby Walden Kirsch, son of Russell A. Kirsch, who designed and programmed a rotating-drum scanner to copy the small photograph that infant Kirsch carried around in his wallet (fig. 18). Kirsch invented the machine in response to a question he posed to his research team at the U.S. National Bureau of Standards: “what would happen if computers could look at the world?”⁴⁶ In this section I will unpack the concept of infancy, and specifically infant vision, as a metaphor for cutting edge digital imaging techniques as seen in Vander Zaag’s *Baby Eyes* video from 1983.

Vander Zaag stopped producing works with the systems at SFU around 1980, transitioning to a series of hybrid digital/video works.⁴⁷ *Baby Eyes*, the first of such works, picks up the developmental narrative thread from the *Digit* series – but while the latter tracks the emergence of a digital life form through deceptively simple-looking animated vignettes, *Baby*

⁴⁶ Steve Woodward, “Russell Kirsch: The man who taught computers to see,” *The Oregonian*, 11 May 2007. Last accessed 27 September 2018, https://www.oregonlive.com/living/index.ssf/2007/05/russell_kirsch_the_man_who_tau.html.

⁴⁷ They are, in chronological order, the following: *Baby Eyes* (1983), *TLC* (1985), *Red Notion* (1985), *Hearts Beat* (1985), *Hot Chicks on TV* (1986), and *Farm Fantasy* (1989).

Eyes is more complex. It is an attempt, through heavily processed audio and visual material, to depict the perspective of a baby learning to see. The resulting artwork is a meditation, equal parts touching and unsettling, on sensory development, digital aesthetics, and the conceptual overlaps between these two categories.

Baby Eyes developed out of footage Vander Zaag shot during her pregnancy and after the birth of her daughter. She had been thinking about the solipsistic mode in which infants perceive the world when, while participating in the production of Paul Wong's *Confused: Sexual Views*,⁴⁸ the camera captured her daughter being captivated by her own image in the video monitor (fig. 19). As Vander Zaag explains, she started thinking about making a video about the early perceptual experience of infancy as an analogy for the early stages of digital aesthetics.⁴⁹

The three-minute video combines footage shot around Vander Zaag's home (the baby's room, the entryway, the lapped siding of an exterior corner) with processed visuals that convey a space internal to the baby's experience. Vander Zaag has said that digital technology makes it possible to create a vocabulary that gives voice to subjective, internal states, something that scholars and artists alike have also remarked upon.⁵⁰ Media scholar Nicholas Lambert, for example, has argued that the abstract mathematical space presented in a computer monitor holds the potential to depict virtually any form, and in that sense functions in a similar way to the mind's eye.⁵¹ In *Baby Eyes*, Vander Zaag used a device, the Aniputer, that enabled an early form

⁴⁸ A video which, along with the controversy surrounding its censorship by the Vancouver Art Gallery, is well known in Canadian media art history. See Jennifer Abbott, "Contested Relations: Playing Back Video In," in *Making Video "In": The Contested Ground of Alternative Video on the West Coast* (Vancouver: Video In, 2000), 29.

⁴⁹ Personal email correspondence with artist, 30 October 2017.

⁵⁰ Ibid.; Nick Lambert, "From Imaginal to Digital: Mental Imagery and the Computer Image Space," *Leonardo* 44, no. 5 (2011): 439-43.

⁵¹ Lambert, "From Imaginal to Digital."

of digital manipulation of video footage to convey the live sense of a baby's process of seeing as literal image processing: honing in on contours, experimenting with textures, making out her mother's face from muddled, indistinct surroundings (fig. 20).

This feature of Vander Zaag's work from this period – her active exploration of and metacommentary on the aesthetic and philosophical implications of digital technology – sets her production apart from that of other artists working with analog video in Vancouver, even as her work shares certain qualities with this milieu. Indeed, Vander Zaag was operating in artist-run circles in Vancouver during this period and belonged to a network of artists who took an active interest in video technology and in cultivating the promise it presented for an alternative, global countercultural network. Initiatives like Video In and the Satellite Video Exchange Society fostered exchange between artistic communities as far away as Japan (fig. 21). It was this mandate of fostering networks of exchange that created the context for Japanese artist Ko Nakajima's tours of Canadian artist-run centres to introduce the Aniputer (figs. 22-23), his JVC-backed invention that allowed for a variety of rudimentary digital effects to be added to video:

The ANIPUTER has the ability to quickly create imaginative animation, but also incorporates many effects available only in much more expensive processors. It can draw images, mix with a video input, and actually manipulate camera imagery. Obviously, picture resolution does not match broadcast TV effects (1 pixel is 8 bytes); but the output signal can be broadcast, or recorded on home-video.⁵²

⁵² Michael Goldberg, quoted in the textual descriptions of the archival page for *Baby Eyes*, Crista Dahl Media Archive: Preserving Vancouver's Video Art Legacy, VIVO Media Arts Centre, http://www.virtualmuseum.ca/sgc-cms/histoires_de_chez_nous-community_stories/pm_v2.php?id=search_record_detail&fl=0&lg=English&ex=00000854&rd=262415&sy=vid&st=&ci=#.

The Aniputer marked the beginning of processed video in Canada, before the introduction of the Amiga system in the late 1980s.⁵³

Vander Zaag's use of the Aniputer is unique in that she used it to develop a theme that she had been exploring in her earlier *Digit* series: the concept of technology having something like a life cycle, whose maturation process can be narrativized. This motif reflects the excitement Vander Zaag felt at the aesthetic possibilities that were opened up with digital systems, whose coded nature opened a world of aesthetic possibilities, in which "you can combine anything any which way."⁵⁴ Because the Aniputer was the first system that made it possible to run a video feed through a computer, infancy proved an effective metaphor for the rudimentary, rapidly-changing, and promise-filled nature of digital aesthetics at that moment.

Baby Eyes, as with *Digit*, involves a personalization of the technology itself, although the effect of this personalization becomes much more radical by way of a switch from third- to first-person perspective. Here the standalone quality of Vander Zaag's use of the Aniputer comes into sharper focus as a tool to distinguish depictions of external and internal realities. Playing off video's faithful depiction of the world as it appears to us, the Aniputer graphics create a sharp relief for showing non-objective space. Vander Zaag routinely makes use of this contrast, playing the flat, pixelated forms and the video footage off of one another in a variety of ways suggestive of interior space (figs. 24-25). Vander Zaag used the digital equipment at Western Front – a Cubicomp Picture Maker⁵⁵ – in a similar way to make *Hot Chicks on TV* – a work that

⁵³ Sara Diamond, "Action Agenda: Vancouver's Prescient Media Arts," International Symposium on Electronic Art (Vancouver, August 14-19, 2015), n.p., <http://isea2015.org/wp-content/uploads/2014/03/S.Diamond-revised-v1-s.pdf>.

⁵⁴ Personal correspondence with the artist, 30 October 2017.

⁵⁵ My thanks to Vander Zaag for the clarification. Personal correspondence with the artist, 18 July 2019.

thematically connects to *Baby Eyes* in more ways than one. In *Hot Chicks*, the pixelated shapes and patterns illustrate the explosive coming-of-age and sexual awakening of two pubescent girls, and appear as physical relics of suppressed feelings later in life. In a somewhat tongue-in-cheek manner, Vander Zaag even merges digital and mental space with the realistic space of the filmed footage in a sequence where one of the now much older girls (played by Sidney Shadbolt, artist Kate Craig's mother and beloved member of the Vancouver arts community), explains the origin of the "debris" in her garden to a toddler:

Child: What's that?

Woman: Oh, that's debris. An emotion I couldn't control when I was younger, so I buried it in the garden. I'll just get rid of it right now, for good. Watch this.⁵⁶

The woman then makes a motion to kick the pixelated shape away, and it disappears (fig. 26).

In *Baby Eyes*, Vander Zaag mobilizes the aesthetic of the Aniputer in order to depict the internal viewpoint of an infant, making an explicit analogy between developmental aspects of infant perception and the maturation of computer processing tools. The significant discursive interpenetration of these two areas is worth exploring.

The link between vision, neuro-behavioral development and computers comes from cybernetic discourse of the 1940s and '50s. As N. Katherine Hayles has shown, cybernetic discourse is responsible for the development of mathematician Claude Shannon's initial theory of information (defined in functional communication theory as "a choice of one message from a range of possible messages")⁵⁷ into a universal category, especially through the Macy Foundation's Cybernetics Conferences, an interdisciplinary series of meetings that took place

⁵⁶ Elizabeth Vander Zaag, *Hot Chicks on TV* (digitally-processed colour video with sound, 06:30, 1986).

⁵⁷ N. Katherine Hayles, *How We Became Posthuman*, 52.

between 1946 and 1953. The Macy Conferences did much to produce “the construction of information as a theoretical entity ... the construction of the (human) neural structures so that they were seen as flows of information ... [and] the construction of artifacts that translated information flows into observable operations, thereby making the flows ‘real.’”⁵⁸ In other words, the decontextualization of information from its origins in mathematics led to its proliferation as a concept in theories of mind. Among the areas where this was picked up were those theories of vision that drew heavily “from the vocabulary of computer science ... Perhaps the most significant concept is that of information processing, which refers to the logical operations performed by a machine like a computer.”⁵⁹ In particular, theories of vision put forth by David Marr in his 1982 book *Vision: A Computational Investigation into the Human Representation and Processing of Visual Information* have influenced the field of perception studies as well as the branch of artificial intelligence concerned with machine vision.⁶⁰

As evidenced by work such as *Vision*, the computer is a useful analogy for explaining how the raw elements and physical processes of eyesight are translated into the experience of vision through the intermediary of the brain. In recent neuroscientific terms, the brain “learns” to see by forging neural pathways – in other words, the learning process itself corresponds to physical changes in the brain. For cultural theorist Sadie Plant, the newfound material underpinnings of the learning process signal the dissolution of boundaries in digital culture between

⁵⁸ Ibid., 2-3, 50.

⁵⁹ Nicholas Wade and Mike Swanson, *Visual Perception: An Introduction*, vol. 3 (London: Psychology Press, 2013), 6-7.

⁶⁰ Ibid., 7; see David Marr, *Vision: a computational investigation into the human representation and processing of visual information* (Cambridge, MA.: MIT Press, 2010, originally published 1982).

mind and body, the mental and the physical, artifice and nature, human and machine. It can either be said that “natural” human intelligence is “artificial” and constructed in the sense that its apparatus mutates as it learns, grows and explores its own potentiality; or that “artificial” intelligence is “natural” insofar as it pursues the processes at work in the brain and effectively learns as it grows.⁶¹

Plant argues that it is the physical processes happening in the brain that connect brain and computer and break down clearly bounded definitions of life. The porosity between biological and mediated ontologies can also be seen in neurobehavioral discourses in which “axons ... are said to be like electrical wiring” and “function, such as vision, physical movement, learning and emotion, is materially constituted by the flow of electrical impulses through the cellular circuitry composed of axons, dendrites, and synapses.”⁶²

The construction of this analogy – between the electrical impulses of the brain and the live signals of video technology – influenced early new media discourse on the specificities of video. Art historian Ina Blom notes that “early video discourse is brimming with ideas about the continuity between biological and technical modes of being, as well as nascent ideas about artificial life.”⁶³ In early video, these connections were repeatedly animated through the theme of vision – and video itself is etymologically linked to the first-person conjugation of the Latin verb *videre*, to see: “video, it appears, is ontologically tied to the first person perspective of an individual subject.”⁶⁴ The most striking example Blom cites is Peter Campus’s *Double Vision*

⁶¹ Sadie Plant, *Zeros + Ones: digital women + the new technoculture* (London: Fourth Estate, 1997), 169.

⁶² Claudia Castañeda, “Flexible Child Bodies,” in *Figurations: Childs, Bodies, Worlds* (Durham: Duke University Press, 2002), 53.

⁶³ Ina Blom, *Autobiography of Video: The Life and Times of a Memory Technology* (Berlin: Sternberg Press, 2016), 18.

⁶⁴ *Ibid.*, 38.

from 1971, which combines footage shot with two video cameras in order to mimic, in the first-person, the perception of various entities, including the Copilia, a marine animal with one single light receptor which is constantly scanning and which has been compared to the scanning mechanism of a TV monitor. One of the video's chapters in particular, "Impulse," uses an oscilloscope to advance an idea of the experience of machine vision.

What does digitality add to this analogy? When speaking of Vander Zaag's work, the difference between analog and digital video is best articulated by returning to Hayles' assertion of the plasticity of the digital: because digital images are comprised of binary code, which can be altered to enact almost any visual change imaginable, they are "as fluid and changeable as water."⁶⁵ For Vander Zaag, this gave her a vocabulary not only for showing the process of viewing the world, but for animating that process with a virtually infinite palette. "The new technology was no longer looking at the external world but could convey an internal world ... with digital video there is no more video it's just 0's and 1's, so you can combine anything any which way."⁶⁶

The flexibility of digital media is at the center of its easy comparability with the workings of the brain, with neuroplasticity (the brain's ability to forge new neural pathways in response to functional needs presented by the environment) often functioning as the barometer for "normal" development (for instance, neuroplasticity is used to delimit definitions of ocular disability).⁶⁷ And the developing brain of the infant is an especially suitable analogue for the fluid, plastic qualities of art made digitally: as Claudia Castañeda shows, children are often figured as

⁶⁵ Hayles, *How We Became Posthuman*, 26.

⁶⁶ Personal email correspondence with artist, 30 October 2017.

⁶⁷ Janette Atkinson, *The Developing Visual Brain* (Oxford: Oxford University Press, 2002), n.p.

dynamic, flexible beings-in-process precisely because of the heightened neuroplasticity of their brains, which the world both imprints upon and helps sculpt:

The child ... is figured as a more dynamic body than its adult counterpart. It is a body whose very materiality, both the synapses and the bodily functions (vision, touch, etc.) they underlie, is uniquely generated through the interaction between body and world precisely because this body is so plastic. The developmental process involves ‘sculpting’ synaptic connections into a more precise form that underlies a more precise functional body.⁶⁸

To return to *Baby Eyes*, I think Vander Zaag plays on the notion that subjectivity emerges out of the interface between infant and world precisely because it functions so well to personalize digital aesthetics, itself considered to be in its infancy. If we look at the specificities of the Aniputer, especially compared to the restrictive method of collaborating with computer scientists to write basic animation programs for the *Digit* series, it was a remarkably responsive and versatile tool: years before the marketing of actual digital video, it was able not only to digitally process video recordings – opening them up to the expansive possibilities afforded by working with binary code – it was also packaged in a format (joystick-controlled tablet, see fig. 22) whose interface was more intuitive and responsive, closer to the physical act of making work in traditional media.

To return to *Hot Chicks on TV*, it is worth restating that Vander Zaag used digital imagery to illustrate the very process of ‘becoming-woman’ that Warren-Crow later shows has been such a diffuse metaphor for the digital image.⁶⁹ The video depicts two young girls in the

⁶⁸ Castañeda, “Flexible Child-Bodies,” 56.

⁶⁹ See Warren-Crow, *Girlhood and the Plastic Image*.

process of developing from children into adults. Crucially, before they appear as grown-ups, Vander Zaag features a sequence entirely animated with shapes (many vulva-like) to suggest the explosive sexual awakening that occurs as girls come of age (figs. 27-28, see also fig. 25). What this tells us is that Vander Zaag used digital imagery to repeatedly depict motifs dealing with the “invisible” (read: subjectively experienced) aspects of transformation and development. As early as *Digit*, the link between digitality and girlhood is there; the fact that Vander Zaag applies this motif to the developing perceptual experience of infancy, and makes a direct connection between that kind of development and the development of digital media itself, shows us that she was using the flexibility of the medium itself to repeatedly explore the concept of development.

Why?

I believe that the motif of development (read: transformation) is a way of thinking about modes of digital creativity that are emergent and intuitive rather than scripted and highly controlled, as well as a way of positioning selfhood as an open-ended and transformative, rather than fixed, process. Digitality is often characterized by the script: everything that occurs on the computer monitor is the result of a set of commands. What Vander Zaag shows is that while binary code is certainly the underlying mode of existence of digital objects, the medium itself transforms in response to the needs of the external world, which is much more unpredictable. Like human development, be that passing from girlhood to womanhood or developing the neural pathways associated with functional sight, creativity tied to digital media can be emergent, unpredictable, and tied to explosive potentiality. Castañeda points out that the figure of the child as flexible provides a way for scientists to conceive of development in non-determinist terms:

At the centre of the nature versus nurture debate, in which biological determinism sided with nature, was the figure of the child. Theorizing the child in nondeterministic terms

became part of the project of rejecting biological determinism ... the new neurobehavioral sciences maintain this figuration of the child, and the nondeterministic version of the human that it figures in turn.⁷⁰

Castañeda is critical of the tendency to figure children in terms of what they can offer adult self-concept: “It could be said, in fact, that the trope of development ensures this secondary status of the child as compared to the adult.”⁷¹ However, she argues that her “own reading of the child in the neurobehavioral sciences also suggests that the child’s figuration as the more flexible body than the adult simultaneously establishes this flexibility as a value.”⁷² In *Baby Eyes*, the child and computer are embraced for their incompleteness and for the space they open up for new ways of looking at the world. “Just looking at the world,” Vander Zaag thinks aloud in the only spoken lines in *Baby Eyes*: “seeing it in a way that you’ve never seen it before.”

Virtuality as Radical Process in the Copy Artwork of Sarah Jackson

Castañeda talks about “the child’s figuration as a body in which the developmental process can be observed,” especially through EEGs which track the electrical patterns of the human brain as it develops.⁷³ In *Baby Eyes*, Vander Zaag weaves ideas about nascent computer aesthetics through her depiction of development in the baby who is beginning to perceptually take in the world. Similarly, her earlier *Digit* series depicts the inception of a digital entity through signifiers of feminine development. These tropes return in Vander Zaag’s *Hot Chicks on TV*, for which Vander Zaag used the Cupicomp at Western Front to visualize the explosive changes of puberty

⁷⁰ Castañeda, “Flexible Child-Bodies,” 51.

⁷¹ *Ibid.*, 72.

⁷² *Ibid.*

⁷³ Castañeda, “Flexible Child-Bodies,” 66-7

and sexual awakening in two young girls, as well as in Jackson's *Exercises for the Growing Girl* – part of a larger interest on her part with depicting natural cycles of evolution and transformation, both human and non-human.

Over the duration of her career, Jackson's work exhibits a sustained interest in feminist expression, the impact of technology on artistic practice, and experimentation with the topography of the body.⁷⁴ In an article published in *YLEM Newsletter*⁷⁵ in 1995, Jackson writes about her process of creating works with the copy machine:

Creating with this medium as an immediate physical involvement obsesses me. From the intimacy of small formats to enlarged murals, pixel-built color tones, transformations of forms and tonalities, shifts of revelations by deconstructing images and, finally, modeling the color process within a *spatial continuum*, I invent and discover.⁷⁶

Note the traces here, in her discussion of the expanded palette of digital media, of Vander Zaag's excitement with the new freedom granted by the Aniputer. What excited Jackson about digital photocopiers is precisely what was so promising to Vander Zaag about digital-processing tools: Each device allowed an unparalleled degree of flexibility that supported the material aims of the artist and acted as a support for experimentation. For Jackson, the digital presets on copy machines acted not only as extensions of traditional media, enabling her to intuitively adjust form and tone the way a sculptor or painter might – they also added something unforeseen, something “revelatory” to the process.

⁷⁴ Sarah Jackson, “One Artist and Her Philosophy,” *Atlantis* 13, no. 2 (Spring 1988): 118.

⁷⁵ *YLEM Newsletter*, named after the Greek word for matter as well as the name given to matter in its state immediately following the Big Bang, was a Bay Area publication that focused on “artists using science and technology,” and featured a lot of early digital artwork. See Trudy Myrrh Reaghan, “YLEM: Serving Artists using Science and Technology, 1981-2009,” *Leonardo* 51, no. 1 (2018): 48-52.

⁷⁶ Jackson, “Reflections Behind the Mirror,” 2.

The work of these artists shares an important set of themes; both artists use/d the expanded palette of digital media to create narrative works, approaching digital artmaking through processes that engage with the plasticity of digital media as an extension of traditional media – one that permitted a much wider range of expression. This sets them apart from traditional ‘pioneers’ of digital art, who typically made work that directly engaged with the coding process and to which narrative was largely secondary or incidental.⁷⁷ Both artists explore the concept of transformation as both grounded in the materiality of the body and as an outcome of the porosity between embodied self and external world – Jackson was particularly fond of using ink wash to give such an effect (fig. 29). In Sarah Jackson’s work, transformation is visually indexed in various ways in the repeated motif of anthropomorphic shapes, which she narrates using titles and poetry. Writing in the journal *Atlantis* in 1985, Kathleen Tudor declares that:

If there is a single motif that dominates Sarah Jackson’s art it is change – the way things change, things in the process of changing, the significance of change, the whole gamut. There must be few readers of *Atlantis* unfamiliar with her copier art, those memorable products of her collaboration with the copying machine that both records change as it is taking place and the final emerged form. The process is not unlike that which occurs in living organisms and in fact is a metaphor that Sarah Jackson feels comfortable with.⁷⁸

The overlap between artists lends itself to a reading of them as part of the same critical undercurrent within early digital culture. In order to illustrate why these artists’ works occupy such a space, it is important to briefly outline major critical approaches to digital culture that

⁷⁷ See Dietrich, “Visual Intelligence.”

⁷⁸ Kathleen Tudor, “Sarah Jackson: Art and Community,” *Atlantis* 11, no. 1 (Fall 1985): 134.

have come out of the past three decades, as they apply to an understanding of the works in question.

One approach to have emerged in this time period addresses dominant metaphors within digital culture and how they tend to affect our self-image as well as the way we approach organic life and biological processes more generally. Along this line of critique is Deleuze's short essay, "Postscript on Societies of Control," published in *October* in 1992, in which he outlines the features of a new paradigm replacing Foucault's earlier disciplinary societies and oriented around a new logic that emerges within digital culture.⁷⁹ Like disciplinary societies, control societies are involved in shaping or reconfiguring the individual, only now the structure of how this happens has changed. Whereas the former spoke an 'analogical' language and 'modeled' citizens, control uses a numerical language or 'code' to 'modulate' them.⁸⁰ The factory – in fact all the old self-enclosed institutions – is replaced by the model of the corporation, which is dispersed and dematerialized: he calls it a "spirit" or a "gas" rather than an enclosure.⁸¹ Whereas the factory unified bodies "to the mutual advantage of the boss ... and the unions," corporations divide workers by promoting competitiveness.⁸²

Marxist new media scholar Seb Franklin has recently expanded Deleuze's argument into a book-length study of the specific ways this logic can be seen to function in society, and his reading of Deleuze's concept of the "dividual" is useful here. The dividual refers to the phenomenon within societies of control in which features previously thought unquantifiable and therefore integrated within a unified subject are suddenly given quantifiable values, typically in

⁷⁹ Gilles Deleuze, "Postscript on the Societies of Control." *October* 59 (Winter 1992): 3-7

⁸⁰ *Ibid.*, 4.

⁸¹ *Ibid.*

⁸² *Ibid.*, 4-5.

service of algorithms that track different aspects of individual behaviour in order to furnish demographic studies for the uses of corporate capital. For Franklin, the individual is “‘the subject’ once it has been divided within itself, broken down into discrete parts that are each representable as symbolic tokens and capturable as labor” including “productivity, appearance, genetic traits, lifestyle preferences, and cultural and creative faculties.”⁸³

Another writer following this line of thought is N. Katherine Hayles, whose sweeping study of cybernetic ideas and their cultural impact laid the groundwork for critiques of the various ways in which metaphors established within cybernetic discourse have become generalized and circulate within broader culture. Hayles argues that the concept of information has become removed from its context within early cybernetic discourse and normalized as a substrate underlying material form, to the extent that physical, material existence has become secondary in importance to the codes and numerical operations thought to underlie existence.⁸⁴ Thus, as with Deleuze/Franklin’s characterization of control societies, Hayles targets the representational primacy afforded to the postdigital restructuring of the world that simply excludes things that are difficult or inconvenient to acknowledge within those paradigms. For Hayles, this is the body, or embodiment more generally – the material embeddedness that is the baseline condition of existence for any informational pattern.⁸⁵ For Franklin, this concerns everything that cannot be “represent[ed] as digital systems (and thus as forms of value-producing labor).”⁸⁶

⁸³ Franklin, *Control*, n.p.

⁸⁴ Hayles, *How We Became Posthuman*, 2-3.

⁸⁵ *Ibid.*, 5.

⁸⁶ Franklin, n.p.

This line of questioning has formed the terrain of many feminist critiques of digital representational paradigms that privilege information as a structuring principle of the world. Written works such as Donna Haraway's "Cyborg Manifesto" and Sadie Plant's *Zeros + Ones* have seized on some of the metaphors circulating in digital culture in order to subvert them, articulating a space for (gendered) difference.⁸⁷ Indeed, the important takeaway from the writing discussed above is not simply that these representational structures are in place, but rather that there is space for art (or literature) to contest them.

In the Canadian context, one of the most prolific voices to address digital culture from a feminist perspective has been that of artist Nell Tenhaaf, whose practice has addressed the intersection of gender and representation in media culture since the early 1980s. In her 1992 *Parallogramme* article, she argues that the new media landscape both disperses and systematizes subjectivity, and calls for feminist artistic interventions in which "women speak from an interior knowing to arrive at a transformative language that opens up possibilities for operating within the technological."⁸⁸ She lists Vander Zaag's *Hot Chicks on TV* as an example of such an intervention, with its computer animated vulvic shapes (see fig. 27), which "paralle[l] ... our own complex interior knowing through our bodies."⁸⁹

I think this is perhaps too simplistic an analysis of the work Vander Zaag's video is doing. When viewed in relation to her other works, it is clear that transformation itself is a powerful theme, especially as depicted through the natural cycles of birth, development, maturation and death. In Jackson's work, too, there is an emphasis on broader organic processes

⁸⁷ Donna Haraway, "A manifesto for cyborgs: Science, technology, and socialist feminism in the 1980s," *Feminism/postmodernism* (1990): 190-233; and Plant, *Zeros + Ones*.

⁸⁸ Nell Tenhaaf, "Of Monitors and Men and other Unsolved Feminist Mysteries: Video Technologies and the Feminine," *Parallogramme* 16, no. 3 (1992): 30. 34.

⁸⁹ *Ibid*, 24.

alongside a focus on human development. *Will to Life*, another bookwork of copy art dedicated “to our ancestors and descendants,” includes a poem by Jackson’s friend, the writer Margaret Harry. In the poem, Harry writes about planting onion bulbs in the springtime:

We eye them trying to foretell
 the future life force that will awaken
 slowly underground. ...
 Ends of stalks transform into buds ...
 thousands of years
 have created the miracle ...⁹⁰

The accompanying prints by Jackson illustrate this process using a motif that recurs many times in Jackson’s copy work: a crumpled piece of paper, here given extensions resembling topographical illustrations to make the paper seem more plant-like (fig. 30). This recurrent metaphor of unfolding in her work illustrates processes of growth and change and is mirrored in the format of many of her bookworks, which are designed to unfold like accordions (figs. 31-32). Vander Zaag’s and Jackson’s works belie a curiosity about the mechanism of life in a way that opens it up rather than closes it off to possibilities not accounted for within digital ontology. They reflect the very human desire to understand these major processes, but from a diaristic, first person perspective. They touch on the fascination within digital culture with understanding these processes of transformation, but the narratives they weave out of it emphasize the personal, mystifying, emotional aspects of change.

⁹⁰ Sarah Jackson, *Will to Life* (Halifax: Tech Press, 1987), with poetry by Margaret Harry and Jackson, n.p.

In light of these aspects of Vander Zaag's and Jackson's works, it would be useful to recall another aspect of digital culture, both more pervasive and more insidious than the algorithmic modulation of human behaviour and self-image, which Hayles calls the "computational universe ... in which everything is reducible, at *some* level, to information."⁹¹ Hayles argues that, parallel to the configuration of the human "as an informational-material entity," is "a corresponding reinterpretation of the deep structures of the physical world."⁹² Indeed, the desire to see a continuity between the processes that give shape to organic life and the coded structure of computational forms is a current that runs through the history of cybernetics, which has always depended for its legitimacy on connections to processes in the physical world. One of the most remarkable examples of this is pioneering computer scientist Alan Turing's paper, published in 1952,⁹³ which sought a mathematical explanation for the phenomenon of morphogenesis – a biological process which governs the development of living forms. His ideas are of particular interest to biologists and computer scientists looking to simulate natural patterns.⁹⁴

Perhaps the most striking instance of the determination within factions of digital culture to uncover the hidden algorithmic nature of biological processes is the domain of Artificial Life (or A-Life). The principles and perceived shortcomings thereof make an interesting point of contrast for considering the current running through Vander Zaag's and Jackson's works. A-Life

⁹¹ Hayles, *How We Became Posthuman*, 241.

⁹² *Ibid*, 11.

⁹³ Alan Turing, "The Chemical Basis of Morphogenesis," *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, 237, no. 641. (Aug. 14, 1952): 37-72.

⁹⁴ Thomas E. Wooley, Ruth Baker and Philip K. Maini, "Turing's Theory of Morphogenesis: Where We Started, Where We Are and Where We Want to Go," in *The Incomputable: Journeys Beyond the Turing Barrier*, eds. S. Barry Cooper and Mariya I. Soskova (Cham: Springer, 2017), n.p.

is among other things illustrative of the extent to which processes of transformation that occur in the physical world – be they on a molecular level in the generation of organisms or at an evolutionary scale – are considered barometers for the legitimacy of the claims post-cybernetic culture makes about the power of the algorithm. First developed in the mid-1980s, A-Life models use algorithms to create populations of digital entities that are said to have the capacity to evolve. This behaviour, called emergence, is considered a staple of complex living systems and is used as a benchmark for evaluating whether or not these systems actually exhibit something like a rudimentary form of lifelike behaviour.

A-Life's early claims about the computer's ability to simulate an evolutionary course has been criticized by, among others, Hayles, Tenhaaf and philosopher Elizabeth Grosz. Hayles cautions against taking these claims literally, arguing that A-Life relies on a "system of metaphoric and material relays" in which emergence programs are mapped onto evolutionary narratives.⁹⁵ Rather than promoting a paradigm in which complexity (the unpredictability of lifeforms that display emergent behaviour) unseats the reductionism of the computational universe, Hayles argues that "[A-Life] reinscribes ... the mainstream assumption that simple rules and forms give rise to phenomenal complexity."⁹⁶ Tenhaaf similarly writes that the techniques of A-Life remain fundamentally reductive and metaphor-driven, noting the large discrepancy between "the 'life-as-it-could-be' features of simulation [and] messy, fragile life-as-it-is-lived."⁹⁷ Its status as a fiction that draws liberally on ill-fitting analogies with biological processes, she argues, makes A-Life more interesting to us culturally than scientifically.

⁹⁵ Hayles, *How We Became Posthuman*, 224.

⁹⁶ *Ibid.*, 231-2

⁹⁷ Nell Tenhaaf, "As Art is Lifelike: Evolution, Art, and the Readymade," *Leonardo* 31, no. 5 (1998): 399.

For Grosz, there is radical potential in the *temporal* features of life that digital phenomena, by their very nature, cannot incorporate. A-Life therefore ignores a crucial ingredient of life, since temporality for a program is of incidental importance.⁹⁸ Drawing on the philosophies of Darwin, Nietzsche and Bergson, Grosz conceives of time as a force whose singularity comes from its continuity. Life's "creative immersion in duration," she argues, is negated each time it is separated into discrete parts in order to be studied.⁹⁹ Digital ontologies such as those underlying the premise of early A-Life programs are an extreme example of this, as they project a worldview in which life functions from the bottom up through code, thus naturalizing the extreme fragmentation of binary code as a condition underlying living forms.

What is lost in the algorithm's translation of life, Grosz says, is the creative – and political – sense of potential that comes from occupying the present:

The future emerges from the interplay of a repetition of cultural/biological factors and the emergence of new conditions of existence: it must be connected, genealogically related, to what currently exists, but is capable of a wide range of possible variation or development of current existence."¹⁰⁰

Thus the condition of being embedded in the temporal flow of events is something that is not translatable into a digital worldview.

Grosz draws on Bergson's ideas about the virtual/actual as "terms that generate the unexpected" in order to underscore their political importance over "the planned or prepared for."¹⁰¹ The type of change that is executed in A-Life programs, as well as that envisioned by any

⁹⁸ Elizabeth Grosz, *Nick of Time*, 242-3.

⁹⁹ *Ibid.*, 192-3.

¹⁰⁰ *Ibid.*, 90-91.

¹⁰¹ *Ibid.*, 186.

ontology privileging information or intellect over embodied existence, is different in kind from the change visible in organic life processes, which is the actualization of the virtual.¹⁰²

Individuation, she says, is an example of this: “actualization is individuation, the creation of singularity (whether physical, psychical, or social), insofar as the processes of individuation predate the individual yet the individual is a somehow open-ended consequence of these processes.”¹⁰³

To return to the artists in question, I believe that their preoccupation with themes of life and change emerge out of an orientation towards these processes as actualizations. This is what makes development such a radical theme for working through the specificities of a medium that was itself still in its infancy: by personalizing her equipment as a baby, Vander Zaag is emphasizing the horizon of potential that lay ahead for artists using digital media, without actually trying to predict how that future will take shape. For Jackson, change, pictorialized through narratives of unfolding and metamorphosis, was a fitting metaphor for the process of creating works on the copy machine.¹⁰⁴ In a rare introductory preface to Jackson’s *Personae* series, Kathleen Tudor writes that “the life force is toward change, toward the fulfilment of the potential for change within oneself rather than toward the suppression of that potential and the clinging to outmoded forms of our being.”¹⁰⁵ Especially when foregrounded by the reductive

¹⁰² Ibid., 197.

¹⁰³ Ibid., 189.

¹⁰⁴ Tudor, “Sarah Jackson: Art and Community,” 134. Joan Truckenbrod is another pioneering digital media artist who argues that natural processes are excellent models for interacting with computers. See Truckenbrod, “Women and the Social Construction of Computing Culture: Evolving New Forms of Computing,” *AI & Society* 7 (1993): 354.

¹⁰⁵ Kathleen Tudor, “Making Fun,” in Sarah Jackson, *Personae* (Halifax: Sarah Jackson, 1984), n.p.

discourse surrounding digital objects outlined above, this conceptualization of digital media, and by extension of life itself, is fundamentally radical. Grosz writes,

Perhaps the openendedness of the concept of the virtual may prove central in reinvigorating a politics embracing a future by refusing to tie it to the realization of possibilities (the following of a plan, a present political agenda, a set of political values or goals given in advance or in universal terms) and linking it to the unpredictable, uncertain actualization of virtualities... Bergson's understanding of the unpredictable impetus of the virtual, its potential for eruption and change in the present and future, may serve as a surprising source for feminist and antiracist conceptions of struggle and transformation.¹⁰⁶

In other words, virtuality is a powerful counter-force – both as a model for political struggles as well as a way of conceptualizing emerging media without limiting the forms their trajectories may take.

Conclusion

I would like to orient my conclusion around a return to the question of gender in the works of Jackson and Vander Zaag. The spectre of femininity is writ large in revisionist accounts of the history of computing. Both Plant and Wendy Chun have argued that programming is essentially women's work.¹⁰⁷ In appraisals of digital art by women, there is a sense that in order to be critical the artist must be equipped to intervene directly in its coded structure: writing on a 2009 installation by Tenhaaf, Cadence Kinsey argues that “critical art practice ... [should] engender an

¹⁰⁶ Grosz, *Nick of Time*, 190.

¹⁰⁷ See Plant, *Zeros + Ones*, 26-7; and Wendy Hui Kyong Chun, “On software, or the persistence of visual knowledge,” *grey room* (2005): 33-36. See also Truckenbrod, “Evolving New Forms.”

alternative history in which women actually develop and access technology in sophisticated ways, as programmers, hackers, and software developers.”¹⁰⁸ This is certainly true, but an emphasis on programming as the site of critical interventions trivializes the other ways artists who were women were engaging with technology as it was emerging. In her pioneering account of human-computer interaction, Sherry Turkle distinguishes between two key modes of interacting with computers: whereas hard mastery (masculine) “is the imposition of will over the machine through the implementation of a plan,” soft mastery (feminine) is more tentative and experimental.¹⁰⁹ A key facet of a “soft” orientation is the degree of closeness to the computer that is not part of the means-end tactics of “hards.” As with gender, Turkle explicitly connects this proximity to classical artistic materials: a soft master is “like a painter who stands back between brushstrokes, looks at the canvas, and only from this contemplation decides what to do next.”¹¹⁰ This type of process resembles Sarah Jackson’s approach to creating copy art on a digital machine as “comparable to bronze casting from a maquette.”¹¹¹

Because Turkle considers soft mastery to be the culturally-sanctioned model for girls interacting with computers it is easy to see the immediate feminist appeal of those artists who crossover into “hard” territory.¹¹² But the emphasis on this type of creativity simply reinforces what artist Joan Truckenbrod argues is a masculinist double standard:

[The perspective] that an artist only creates viable artwork through the construction of one’s own computer program ... contends that if an artist uses existing programs, they

¹⁰⁸ Cadence Kinsey, “Matrices of Embodiment: Rethinking Binary and the Politics of Digital Representation,” *Signs: Journal of Women and Culture in Society* 39, no. 4 (2014): 908.

¹⁰⁹ Sherry Turkle, *The Second Self: Computers and the Human Spirit*, 20th anniversary edn. (Cambridge, MA.: MIT Press, 2005/1984), 101.

¹¹⁰ *Ibid.*

¹¹¹ Jackson, “Reflections Behind the Mirror,” 2.

¹¹² Turkle, *Second Self*, 113.

are not creating art. Original art can only be created if you have written your own program. ... An analogy for this view in the arts would require every painter to make their own paint brushes, perhaps weave their own canvas. ... This view attempts to marginalize the artwork of women creating visual images using existing software.¹¹³

To further complicate this worldview, Vander Zaag's own experience of the gender divide in the technological environments in which she was immersed (which included a job as a digital character generator for CBC) was that men preferred analog equipment because they "wanted to be hauling stuff around."¹¹⁴

Ultimately, Jackson and Vander Zaag's use of digital media as expressive tools gave them a vantage point from which to reflect on the medium without getting caught up in the technicalities of the coding process. Each artist's engagement with processes of change reflected their rejection of what Kinsey calls the "teleological assumption that the purpose of technology is to reproduce with ever-increasing fidelity,"¹¹⁵ a preoccupation that in turn reconceptualises the world as digital.¹¹⁶ Their work is thus doubly subversive because it challenges the values underlying the artistic field as well as those underlying a more general digital worldview. Thus in *Baby Eyes*, the baby-computer is fundamentally unpredictable and in-process, reflecting an ontology that embraces the trajectory of digital art as well as of young life as virtualities. As with Jackson's works, which are the product of the artist's intuitive collaboration with – rather than power over – the machine, Vander Zaag's art values the

¹¹³ Truckenbrod, "Evolving New Forms," 348-9.

¹¹⁴ Phone conversation with the artist, 3 March 2017.

¹¹⁵ Kinsey, "Matrices of Embodiment," 912.

¹¹⁶ See Peter Weibel, "On the History and Aesthetics of the Digital Image," *Ars Electronica: Facing the Future*, eds. Timothy Druckrey with Ars Electronica (Boston, MA: MIT Press, 1999), 51–65.

emergent potential of digital technology over its powers to quantify, capture, or predict behaviour. The freedom of Digit, who is comprised of code and yet personified as a woman whose self-actualization is entirely in her own hands, is all the more radical given the institutional context in which computers were largely being used at that time. Jackson's insistence on repeatedly using imagery in her work that draws upon metamorphosis and natural cycles reflects a creative orientation that is radically open and intuitive – what she has called “a mysterious nimbus of creativity” – involving a relinquishment of control that challenges common characterizations of what digital creativity entails.¹¹⁷ What the works of both artists convey with their focus on processes of transformation is a sense of the actual limits of what the digital paradigm claims to be able to represent with numbers – the limits to the claim that such an abstracted concept as an algorithm can account for personal and biological processes of change.

¹¹⁷ Jackson, “One Artist and her Philosophy,” 118.

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Illustrations

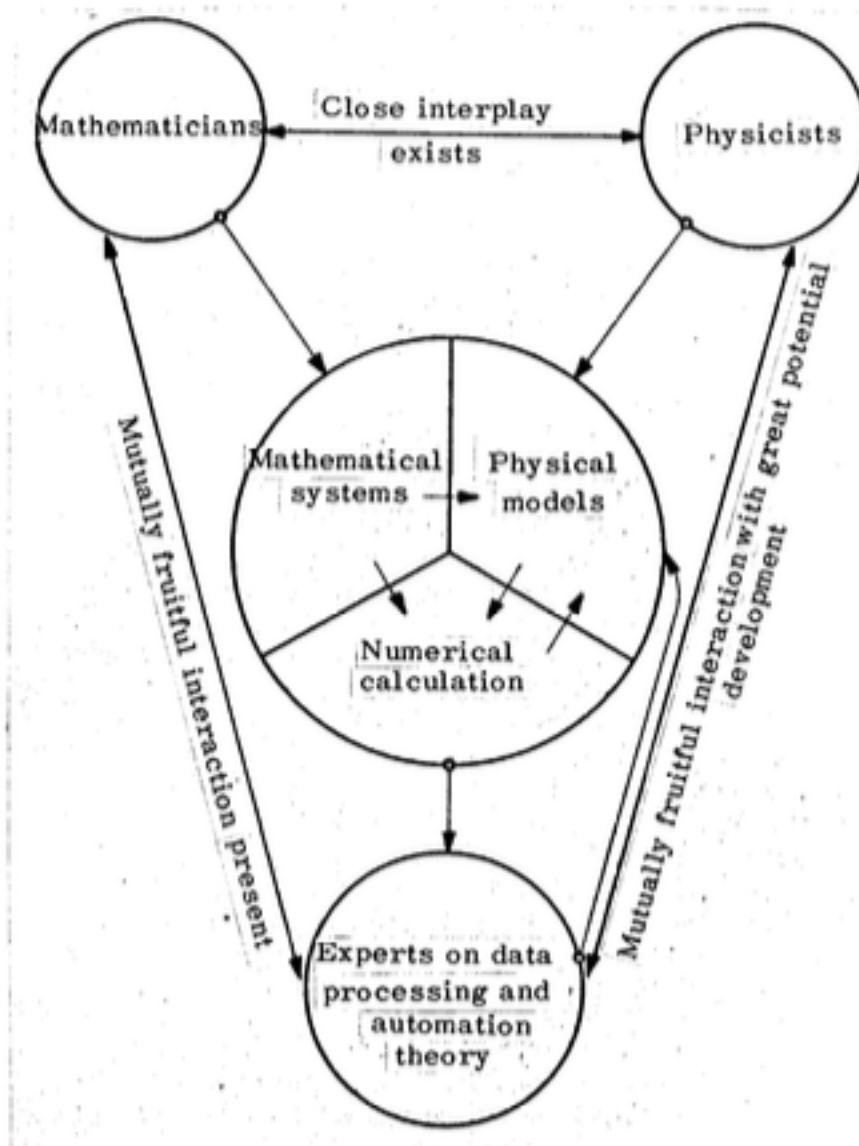


Figure 1. Konrad Zuse, diagram from *Calculating Space* (1969); English translation published by MIT Press in 1970).

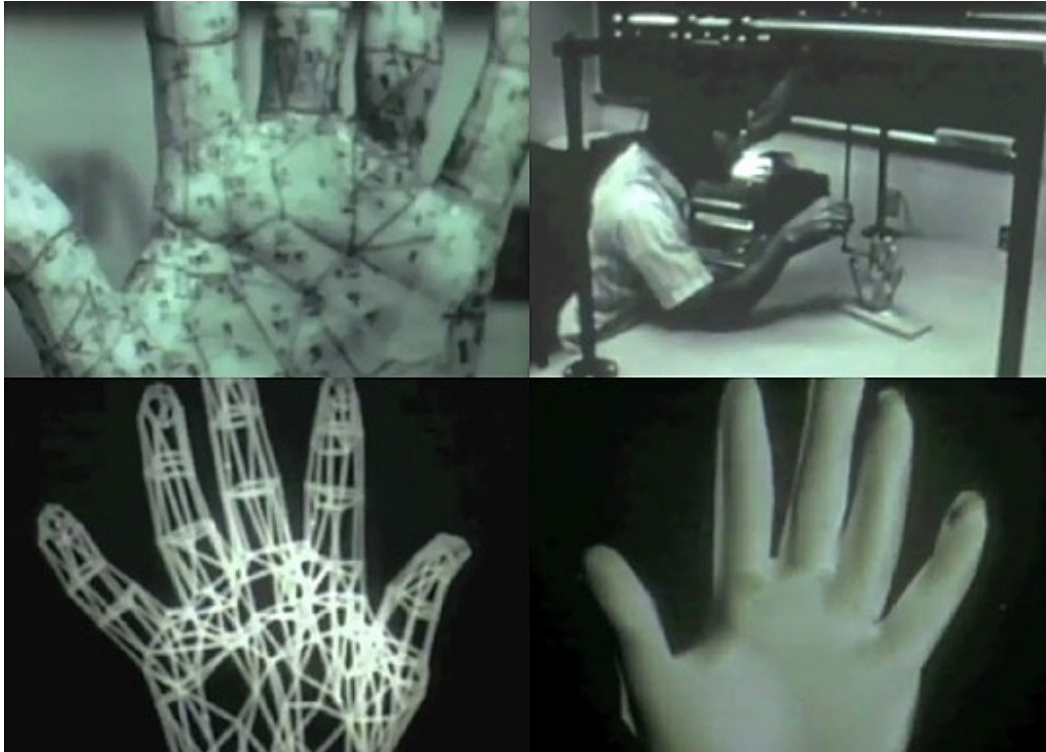


Figure 2. Edwin Catmull and Fred Parke, *A Computer Animated Hand*, 1972, computer-animated film, 1 minute. Image source: Wayne Carlson, *Computer Graphics and Computer Animation: A Retrospective Overview*, "CG Historical Timeline." Accessed 7 March 2019. <https://ohiostate.pressbooks.pub/graphicshistory/back-matter/cg-historical-timeline/>.

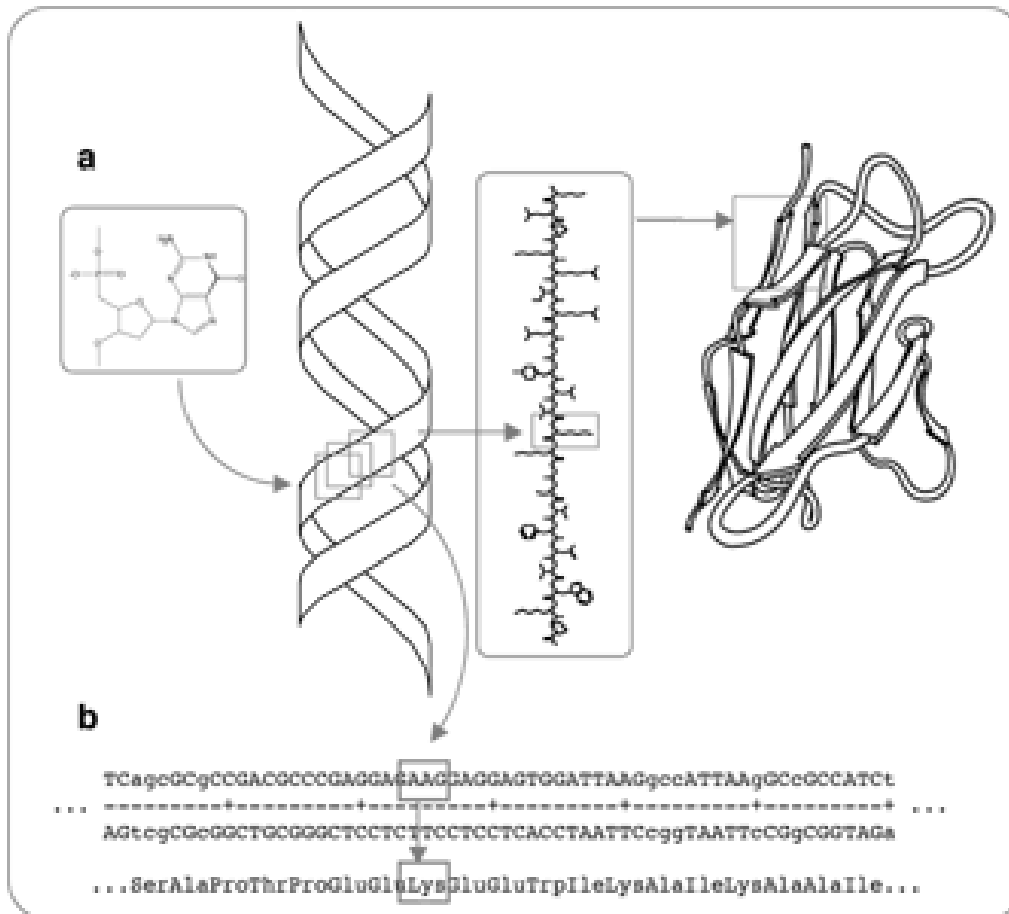


Figure 3. “Molecule and Information: DNA is a chemical substance that directs the synthesis of polypeptides; these spontaneously self-organize to the molecular machines that make life possible. The sequence of DNA defines the synthesis, just as letters in this text carry its meaning.” Source: University of Toronto, Bioinformatics and Computational Biology program description. Accessed 7 March 2019. <http://bcb.biochemistry.utoronto.ca/>.

DIGITAL VIDEO DETAILS by LIZ VANDERZAG

When a computer image is interfaced with raster scan screen and video tape image the crispness of the computer animation will contrast with the video images. Keying the computer image with a sync generator onto a video camera image results in a direct method of montaging computer images onto video tape. The keyed computer lines could accentuate the video image and could be used to supply detail to a composite picture.

Computer animations or interpolated drawings can also be transcribed to videotape as a succinct form in itself. Transferring such drawings to video can add colour and a slowing down of the rate of animation.

The resulting video product would be a simple or complex line image moving through a series of colours at a pre-programmed or joy stick-controlled rate of change. One consistent factor in the creation of video image through the computer as animations of your

drawings is the nature of the drawing. Fortunately, serious drafting can be done at the drawing board and transferred to tape via computer display terminal and a light pen tracing of the original two dimensional still.

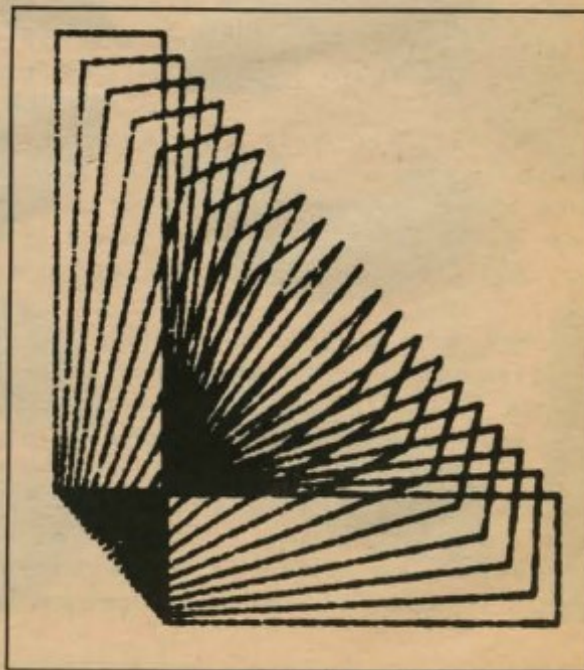


Figure 4. Elizabeth Vander Zaag, "Digital Video Details," *Video Guide* 1, no. 3 (Summer 1978), 4. Source: VIVO Media Arts, "Video Guide Online." Accessed 7 March 2019. vivomediaarts.com/category/video-guide.



Figure 5. Elizabeth Vander Zaag, *Digit Recalls the Future*, 1979, computer-animated video, 3 minutes. From *Digit Retro: The Videotapes of Elizabeth Vander Zaag (1976-1980)*, 1991, 55 minutes. Source: V-Tape, Toronto.



Figure 6. Elizabeth Vander Zaag, *Digit Responds*, 1979, computer-animated video, 1 minute 50 seconds. From *Digit Retro: The Videotapes of Elizabeth Vander Zaag (1976-1980)*, 1991, 55 minutes. Source: V-Tape, Toronto, 001.11.



Figure 7. Nelson Max working on *Carla's Island* at the Lawrence Livermore National Laboratories, 1981, computer animated video, 4 minutes 51 seconds. Image source: Wayne Carlson, CG Historical Timeline, *Computer Graphics and Computer Animation: A Retrospective Overview*, "4.3 Bell Labs and Lawrence Livermore." Accessed 7 March 2019. <https://ohiostate.pressbooks.pub/graphicshistory/chapter/4-2-bell-labs-and-lawrence-livermore/>.

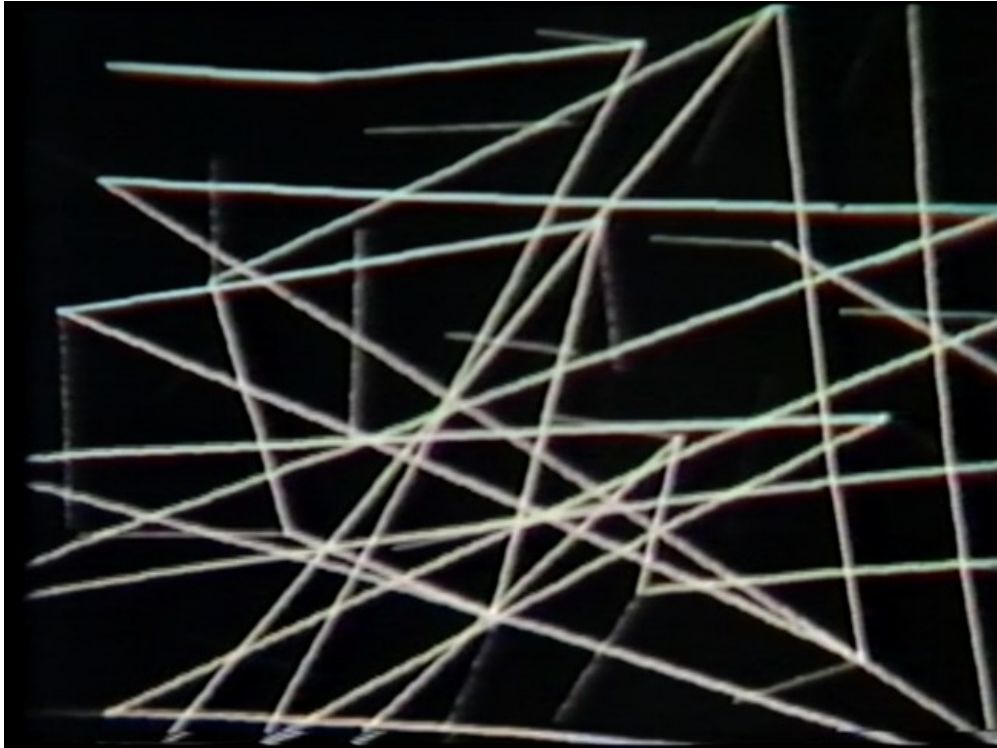


Figure 8. Elizabeth Vander Zaag, *Not Fiction*, 1976, computer animated video, 3 minutes 49 seconds. From *Digit Retro: The Videotapes of Elizabeth Vander Zaag (1976-1980)*, 1991, 55 minutes. Source: V-Tape, Toronto, 001.11.

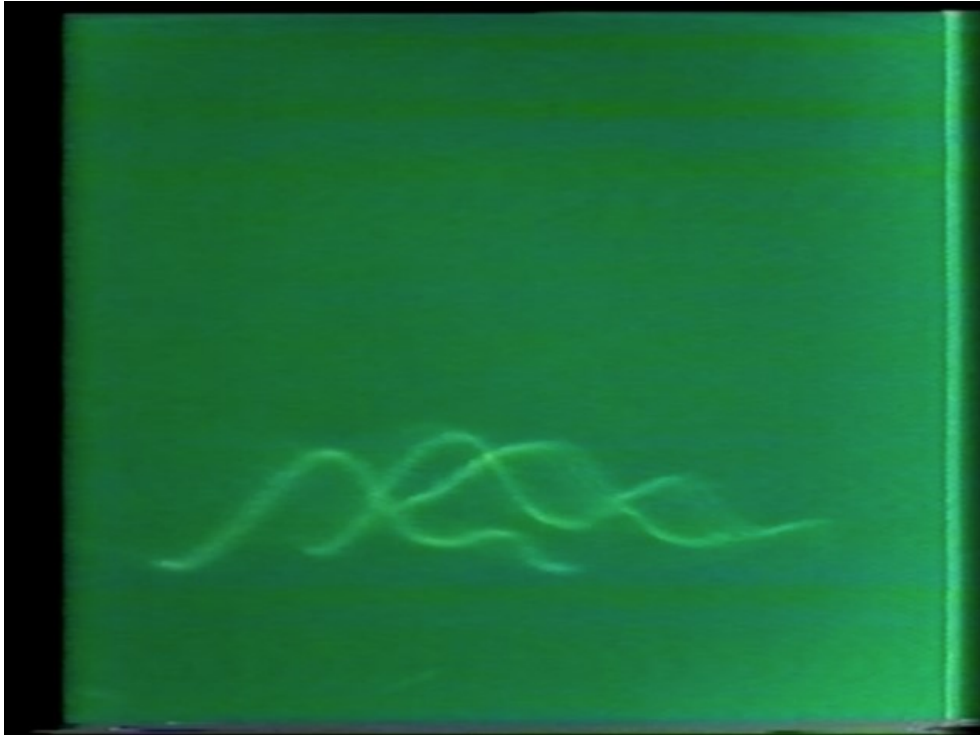


Figure 9. Elizabeth Vander Zaag, *Digit Goes to Hawaii*, 1978, computer animated video, 25 seconds. From *Digit Retro: The Videotapes of Elizabeth Vander Zaag (1976-1980)*, 1991, 55 minutes. Source: V-Tape, Toronto, 001.11.



Figure 10. Elizabeth Vander Zaag, *Digit Reproduces*, 1978, computer animated video, 2 minutes. From *Digit Retro: The Videotapes of Elizabeth Vander Zaag (1976-1980)*, 1991, 55 minutes. Source: V-Tape, Toronto, 001.11.



Figure 11. Sarah Jackson in her studio with *Mythological Figure II*, 1972, black and white photograph. Source: Wikimedia Commons.

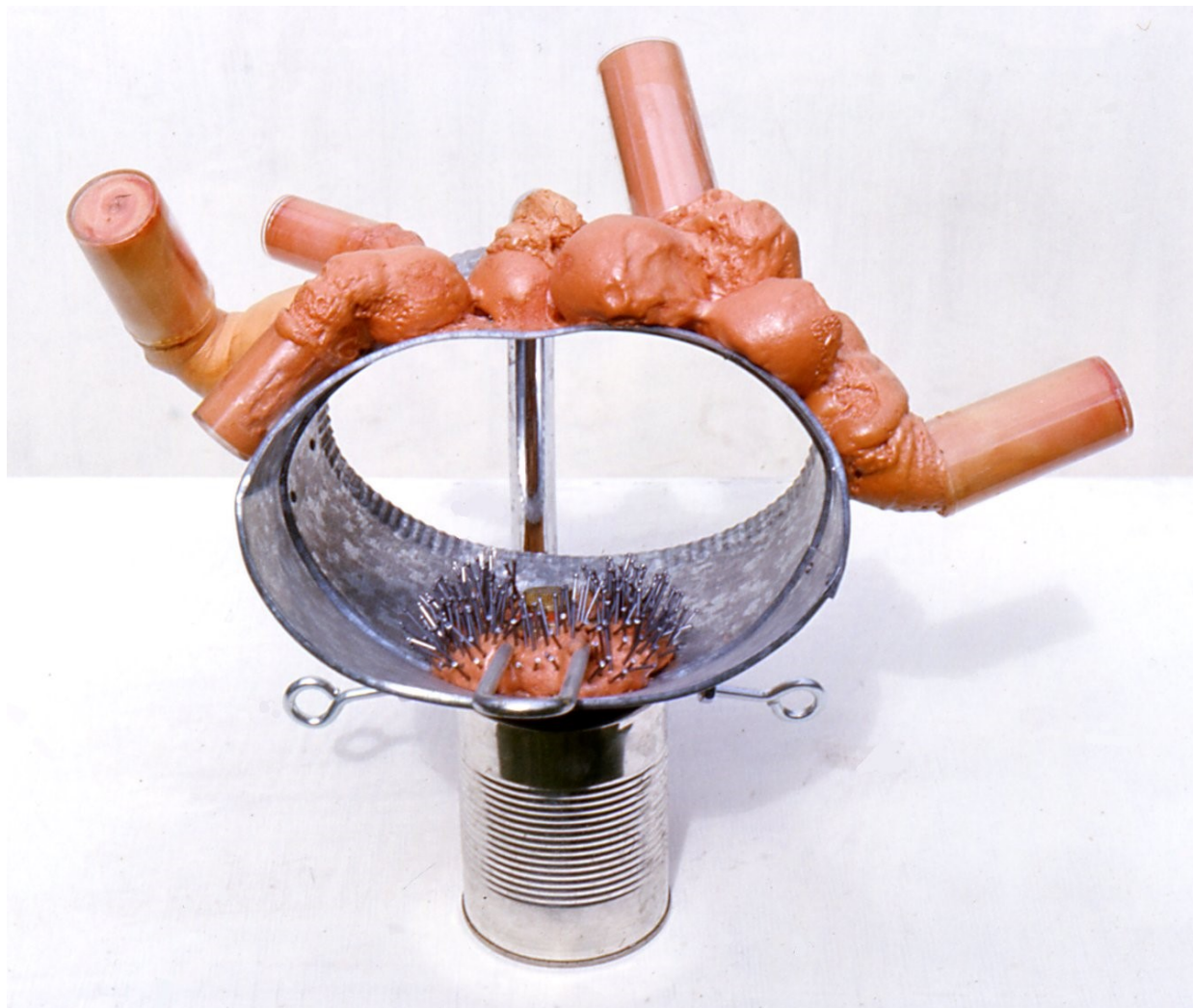


Figure 12. Sarah Jackson, *Chastity Belt*, 1973, mixed media, dimensions unknown.
Source: Wikimedia Commons.

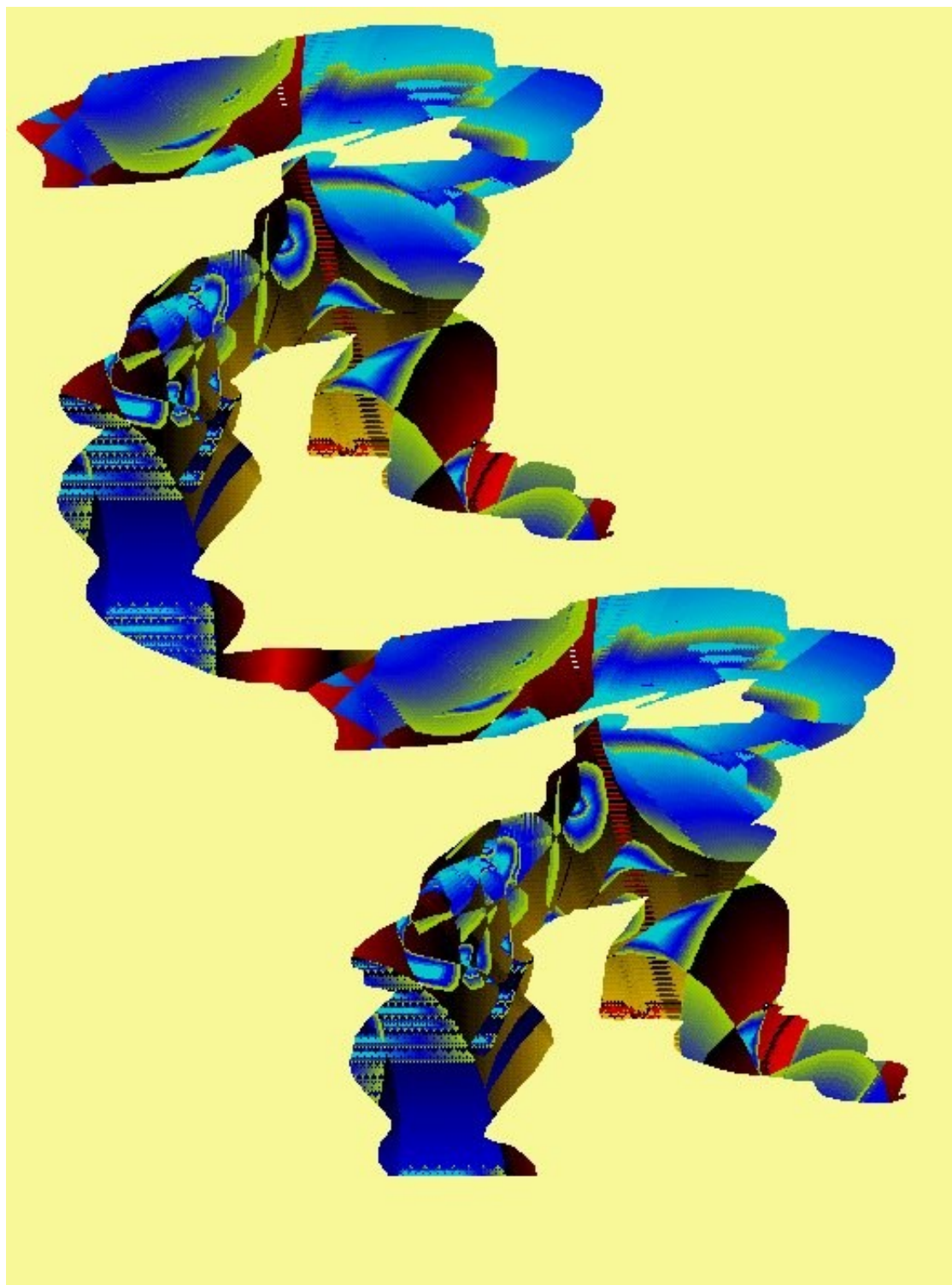


Figure 13. Sarah Jackson, *Hip Hop*, 2011, digital painting. Source: Wikimedia Commons.



Figure 14. Sarah Jackson, *Generations*, 1982, photocopied print with ink wash, 22 x 32 cm. From *Particles: Phase I*. Source: Vanier Library Special Collections, NC 143 J32A4X 1982.

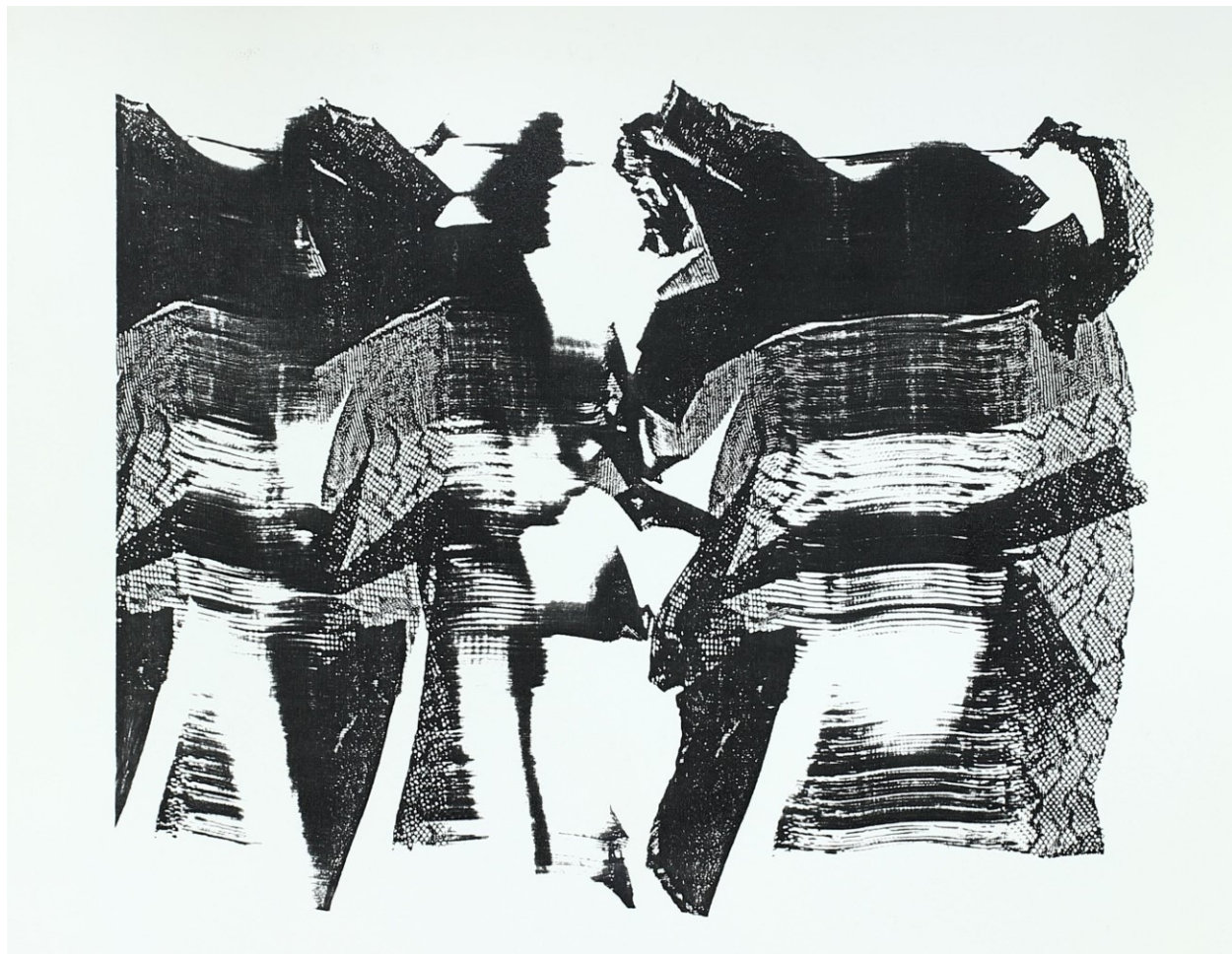


Figure 15. Sarah Jackson, untitled, 1985, photocopied print with lace, 22 x 28 cm, from *Sheba Recalled: A Triptych Book*. Source: Vanier Library Special Collections, NE 543 J322A4 1985b.

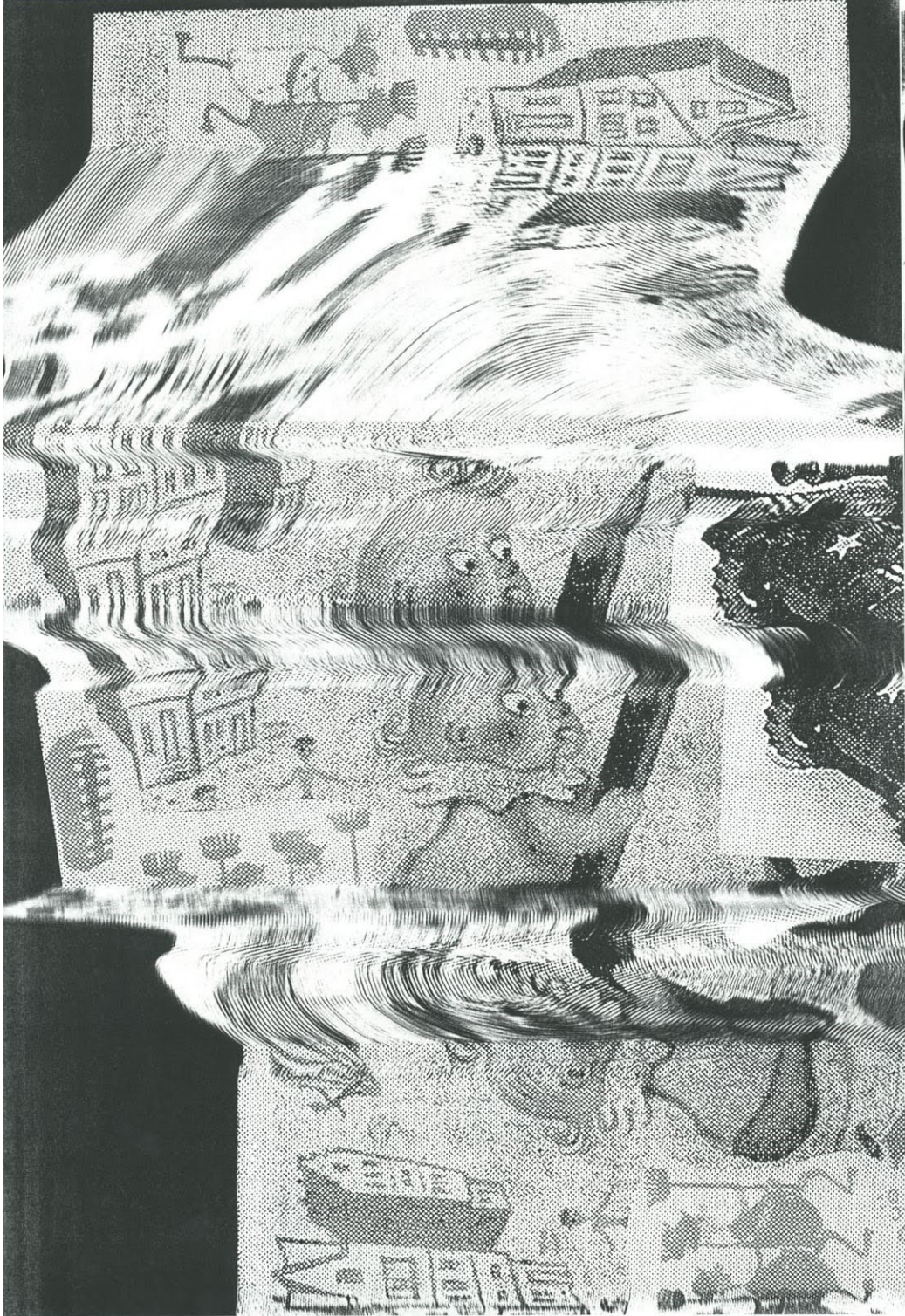


Figure 16. Sigmar Polke, page from *Daphne*, 2004. Source: Stopping Off Place, accessed 8 March 2019. <http://stoppingoffplace.blogspot.com/2010/06/sigmar-polke-daphne.html>.

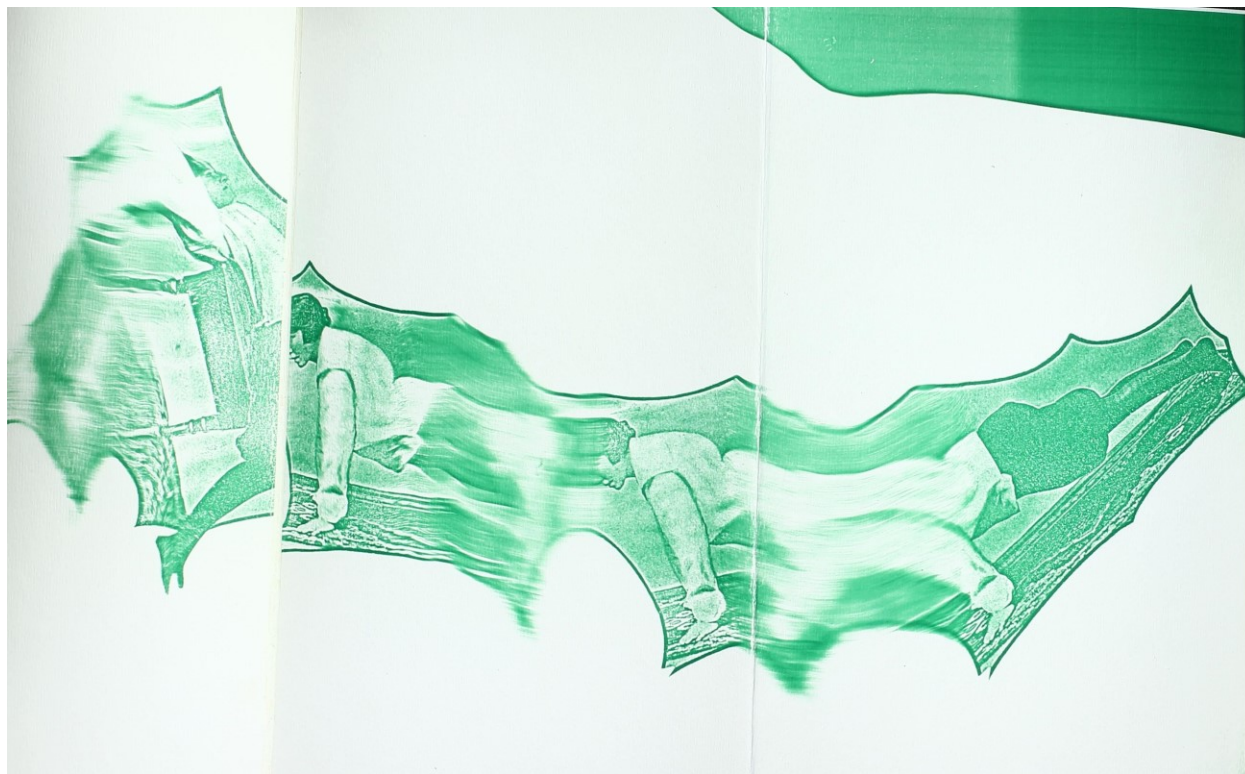


Figure 17. Sarah Jackson, untitled, 1985, photocopied colour print, 22 cm, from *Votes for Women; Exercises for the Growing Girl*. Source: Vanier Library Special Collections, NE 543 J322A4 1985.



Figure 18. Russel A. Kirsch, *Walden Kirsch*, 1957, inkjet print, 23 x 18 cm. Source: Portland Art Museum, 2003.54.1, accessed 8 March 2019. <http://portlandartmuseum.us/mwebcgi/mweb.exe?request=record;id=5273;type=101>.



Figure 19. Elizabeth Vander Zaag, *Baby Eyes*, 1983, digitally-processed colour video, 2 minutes 57 seconds. From *Digit Retro: The Videotapes of Elizabeth Vander Zaag (1976-1980)*, 1991, 55 minutes. Source: V-Tape, Toronto, 001.11.



Figure 20. Elizabeth Vander Zaag, *Baby Eyes*, 1983, digitally-processed colour video, 2 minutes 57 seconds. From *Digit Retro: The Videotapes of Elizabeth Vander Zaag (1976-1980)*, 1991, 55 minutes. Source: V-Tape, Toronto, 001.11.

11 VIDEO TAPES FROM CANADA

カナダからの11のビデオ作品

EARLY AND CURRENT WORKS SELECTED BY MICHAEL GOLDBERG FROM THE VIDEO INN LIBRARY (SATELLITE VIDEO EXCHANGE) — CONCEPTUAL, MUSIC, DANCE, THEATRE, ELECTRONIC, POLITICAL, _____

* マイケル・ゴールドバーグ氏がビデオ・インのビデオ・ライブラリーより選んだ初期及び最近の作品 (サテライト・ビデオイクステンジ) — コンセプチュアル、音楽、ダンス、演劇、電子、政治、_____

EXHIBITION	東京・TOKYO	名古屋・NAGOYA	福井・FUKUI	宮崎・MIYAZAKI
	・ 駒井画廊 GALLERY KOMAI	・ ギャラリーU GALLERY U	・ ギャラリー汎 GALLERY HAN	・ フォト・スタジオ・クリエイ PHOTO STUDIO CREATE
	・ 2.18 ▶ 2.24 A.M. 11:00 ▶ P.M. 7:00	・ 3.3 ▶ 3.8 P.M. 9:00 ▶ P.M. 7:00	・ 3.11 ▶ 3.16 A.M. 11:00 ▶ P.M. 7:00	・ 3.20 ▶ 3.25 P.M. 9:00 ▶ P.M. 8:00
	・ 中央区日本橋室町3-1 駒井ビル ☎03-270-3066	・ 名古屋市中区栄3-2-113 ☎052-241-4604	・ 福井市中央1-9-30 ☎0776-231-1573	・ 宮崎志摩通り高3丁目 竹原ビル7F ☎0985-291-2710
PROMOTER	・ ビデオ・イン+駒井画廊+ギャラリーU+A.C.A. (芸術コミュニケーション研究部)+宮崎大学映像を考える会+フォト・スタジオ・クリエイ VIDEO INN + GALLERY KOMAI + GALLERY U + A. C. A. + MIYAZAKI UNIVERSITY GROUP CONTEMPORARY ART + PHOTO STUDIO CREATE ・ 発 行: カナダ大使館 THE EMBASSY OF CANADA ・ 協 賛: 日本ビクター株式会社・ビクター・JVC ・ ORGANIZED BY KEIGO YAMAMOTO + KATSUHIRO YAMAGUCHI			



THEATRE (演劇)

LE TEMPS D'UNE PRIÈRE

BY JACQUES BENOIT AND JEAN-CLAUDE GERMAIN
C/O LE VIDEOPHAPHE
1604 RUE ST-DENIS
MONTREAL
QUÉBEC
CANADA
32 MIN., B&W, 1973

僧の折り

- ・ ジャック・ベノワット + ジャン・クロード・ジェルマン
- ・ 僧侶の団体がビデオのために特別に創られたもので、教会や家庭や学校などでのケベックの社会的な生活様式をバロデ化したもの

SYMPOSIUM VIDEO: CROSS-CULTURAL COMMUNICATION

シンポジウム 『ビデオ：文化の出会い』

・ MASS-COMMI TV MAY BE MUCH THE SAME AROUND THE WORLD — BUT DOES IT HELP US UNDERSTAND EACH OTHER? EXPRESSION BY VIDEO ARTIST IS VERY PERSONAL — PERHAPS IT CAN COMMUNICATE ACROSS CULTURAL GAPS.

「マスコミ・テレビは世界中を同質にしているけれども、果してわれわれ人間相互の理解に役立っているのでしょうか? ビデオ作家の大量パーソナルな表現こそ、多分お互いの文化ギャップをこえたものを伝え合うであろう。」

東京・TOKYO	名古屋・NAGOYA	福井・FUKUI	宮崎・MIYAZAKI
・ 駒井画廊	・ ギャラリーU	・ ギャラリー汎	・ フォト・スタジオ・クリエイ
・ マイケル・ゴールドバーグ + 山口勝弘 + 山岸信樹 MICHAEL GOLDBERG KATSUHIRO YAMAGUCHI NOBUO YAMAGISHI	・ マイケル・ゴールドバーグ + 中村英樹 MICHAEL GOLDBERG HIDEKI NAKAMURA	・ マイケル・ゴールドバーグ + 山本圭吾 + 五十嵐進晴 MICHAEL GOLDBERG KEIGO YAMAMOTO YOSHIMARU IGARASHI	・ マイケル・ゴールドバーグ + 桑田和善 + 吉崎 健 MICHAEL GOLDBERG KAZUTOYO SHIBATA TAKESHI YOSHIZUMI
2.24 日 展 3:00 ▶ 5:00	3.8 土 展 3:00 ▶ 5:00	3.15 土 展 3:00 ▶ 5:00	3.23 日 展 3:00 ▶ 5:00

Figure 21. Japanese exhibition poster showcasing tapes from Video Inn Library, selected by Michael Goldberg and curated by Keigo Yamamoto and Katsuhiko Yamaguchi, 1980.

Source: Christa Dahl Media Library & Archive, accessed 8 March 2019.
http://www.virtualmuseum.ca/sgc-cms/histoires_de_chez_nous-community_stories/pm_v2.php?id=exhibit_home&fl=0&lg=English&ex=00000854&pg=1



Figure 22. George Lessard demonstrating the Aniputer for CBC's Switchback, 7 February 1989. Source: George Lessard Vimeo, last accessed 8 March 2019. <https://vimeo.com/150093923>.



Figure 23. George Lessard, Poster for Aniputer Workshop held at Trinity Square Video, September 1982. Source: George Lessard Flickr, last accessed 8 March 2019. <https://www.flickr.com/photos/george-lessard/22634469127>.



Figure 24. Elizabeth Vander Zaag, *Baby Eyes*, 1983, digitally-processed colour video, 2 minutes 57 seconds. From *Digit Retro: The Videotapes of Elizabeth Vander Zaag (1976-1980)*, 1991, 55 minutes. Source: V-Tape, Toronto, 001.11.



Figure 25. Elizabeth Vander Zaag, *Hot Chicks on TV*, 1986, digitally-processed colour video, 6 minutes 30 seconds. From *Digit Retro: The Videotapes of Elizabeth Vander Zaag (1976-1980)*, 1991, 55 minutes. Source: V-Tape, Toronto, 001.11.



Figure 26. Elizabeth Vander Zaag, *Hot Chicks on TV*, 1986, digitally-processed colour video, 6 minutes 30 seconds. From *Digit Retro: The Videotapes of Elizabeth Vander Zaag (1976-1980)*, 1991, 55 minutes. Source: V-Tape, Toronto, 001.11.



Figure 27. Elizabeth Vander Zaag, *Hot Chicks on TV*, 1986, digitally-processed colour video, 6 minutes 30 seconds. From *Digit Retro: The Videotapes of Elizabeth Vander Zaag (1976-1980)*, 1991, 55 minutes. Source: V-Tape, Toronto, 001.11.



Figure 28. Elizabeth Vander Zaag, *Hot Chicks on TV*, 1986, digitally-processed colour video, 6 minutes 30 seconds. From *Digit Retro: The Videotapes of Elizabeth Vander Zaag (1976-1980)*, 1991, 55 minutes. Source: V-Tape, Toronto, 001.11.

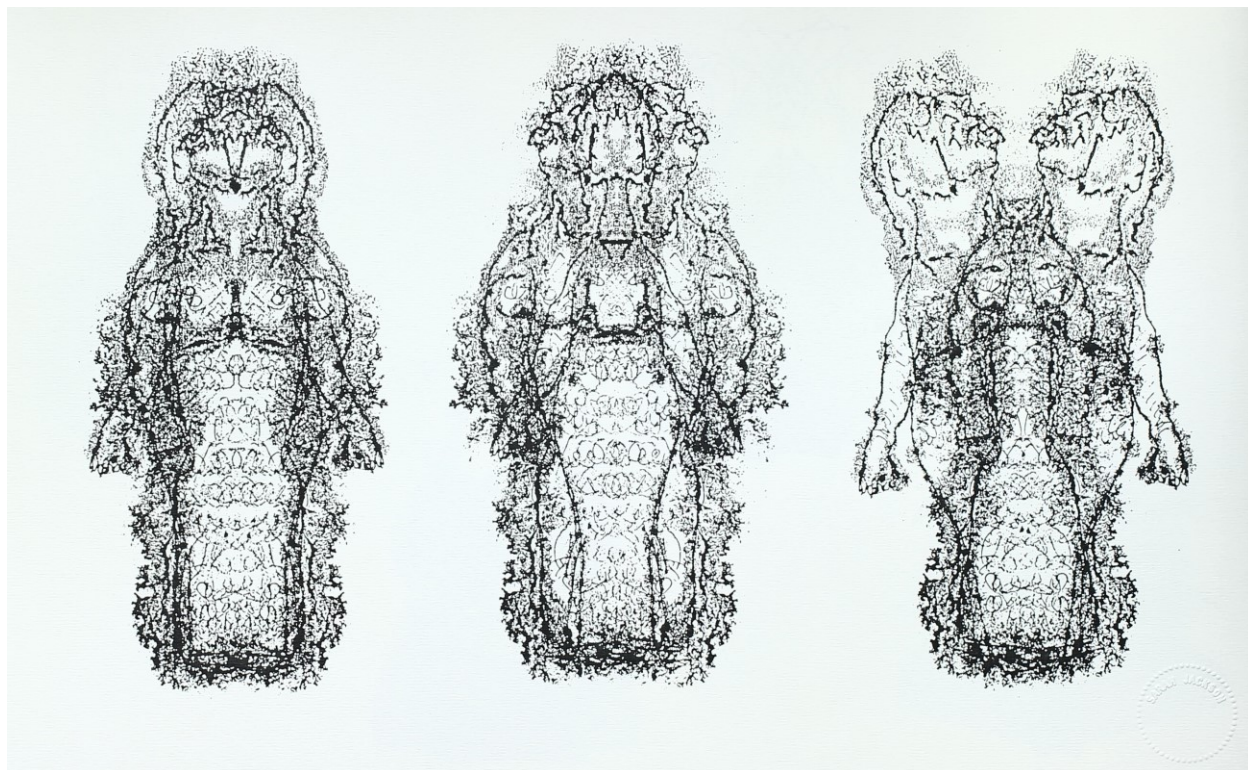


Figure 29. Sarah Jackson, untitled, 1984, photocopied ink wash print, 22 x 37 cm, from *Personae*. Source: Vanier Library Special Collections, NE 543 J322A4 1984.



Figure 30. Sarah Jackson, untitled, 1987, photocopied print with ink, 22 cm, from *Will to Life*. Source: Vanier Library Special Collections, NE 543 J322A4 1987.

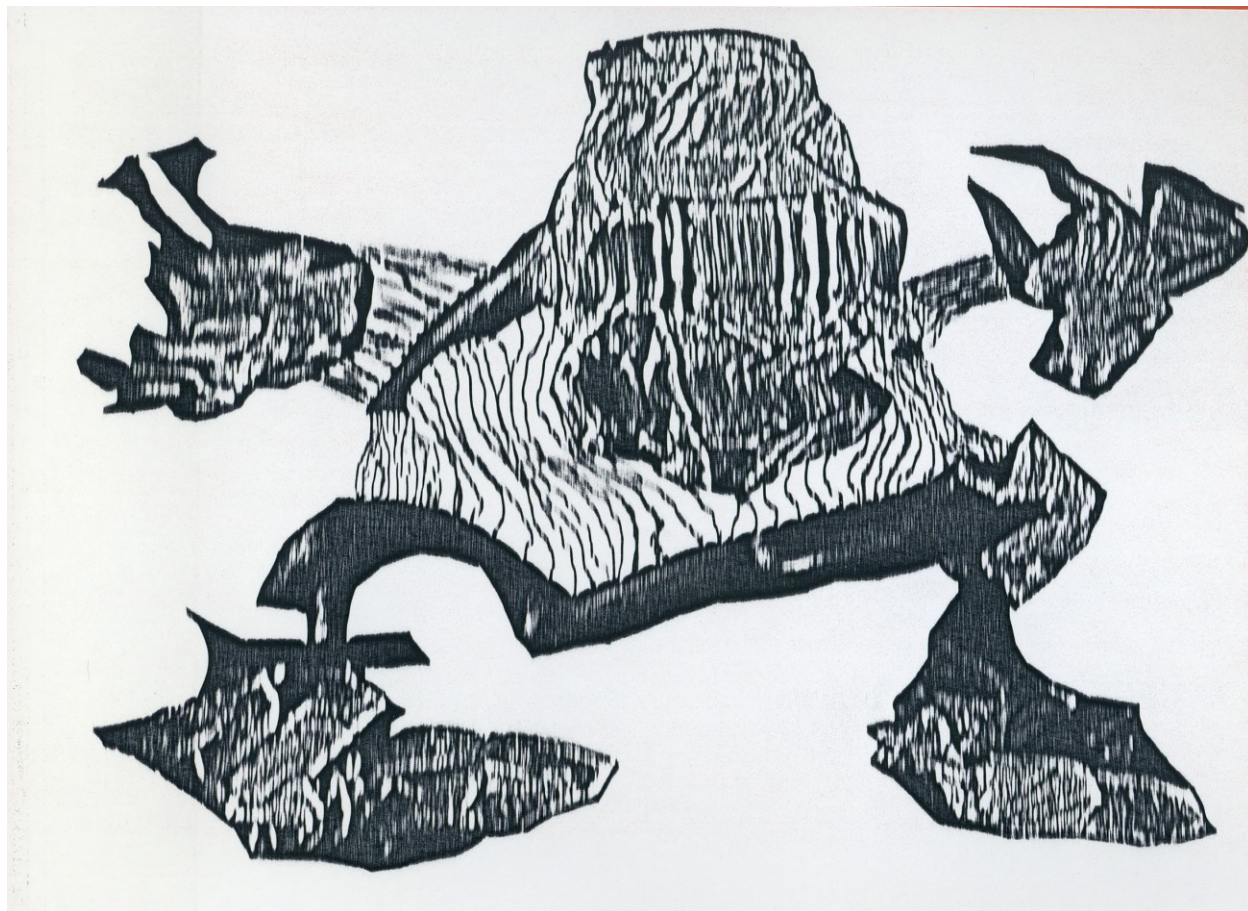


Figure 31. Sarah Jackson, untitled, 1987, photocopied print, 14 x 25 cm, from *Energy Vibrations: Flutterbook*. Source: Vanier Library Special Collections, NE 543 J322A4 1987c.



Figure 32. Sarah Jackson, *13 Duos: A Flutterbook*, 1987, copy art bookword, 22 x 32 cm.
Source: Vanier Library Special Collections, NE 543 J322A4 1987b, and the author.