ARTIST'S ARTICLE

Before Sexual Difference: The Art and Science of Genital Embryogenesis

Jack Butler

ABSTRACT

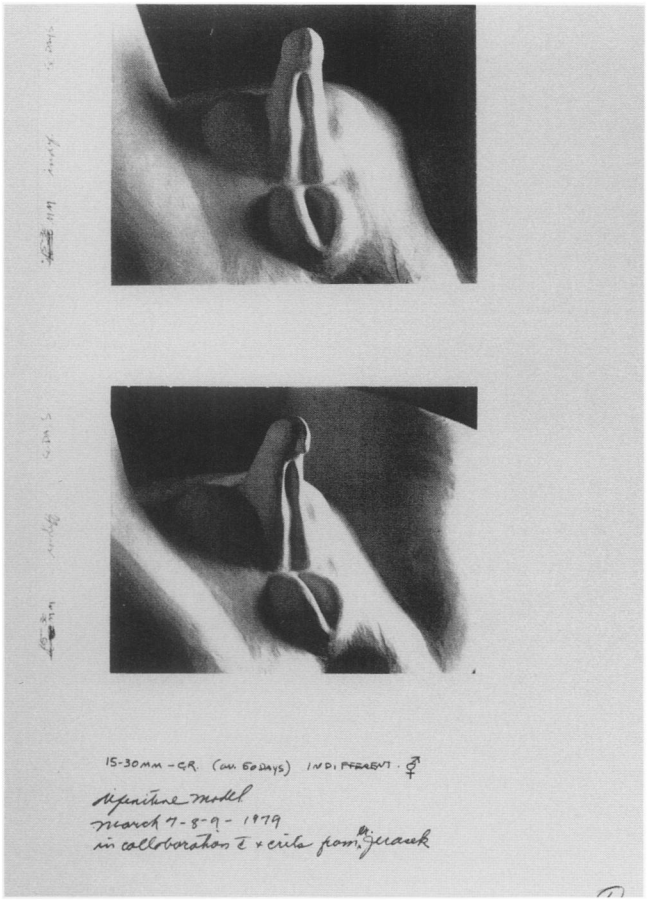
Does the embryological state of genital undifferentiation suggest the possibility of a collapse of gender from male and female singularities to a more complex, layered concept of sexuality where each of the sexes can be seen one within the other? Could the sexual body be represented as an ontologically transparent skin through which art and science are mutually visible? These questions are posed by the author in the form of cross-disciplinary works: original biological-visual research into the development of the genitals in the human embryo, 3D models, drawings, videos, paintings on the body and didactic lecture-performances. The works draw upon disparate fields of knowledge—linguistics, psychoanalysis, the histories of visual art and biological science, the subjectivity of the artist—to propose alternative terms for the construction of sex, sexuality and gender during this time of crisis in sexual difference as it stands at the intersection of feminism, science, art and politics.

In disavowing the difference, both sexes regain their "lost half" and the power that comes with it—providing the woman with the penis she lacks could also evoke the possibility of the pregnant man.

—Francette Pacteau [1].

Early in the ninth week of life in the womb, the human embryo develops a surprisingly large proto-clitoris/proto-penis genital structure technically designated as indifferent, neuter or undifferentiated genitalia. "Indifference" describes the stage when the tiny, incomplete body of the embryo is not yet mature enough to express the genetic sex that was encoded at the moment of conception [2]. The indifferent genitalia share both male and female characteristics. The phallic portion of the urogenital stalk suggests the future erectile penis, but on the ventral aspect it is deeply grooved in anticipation of the invagination of the female. The indifferent genital arises directly contiguous to the deeply rimmed anus and is capped with a glans clitoris/glans penis (Fig. 1) [3].

Fig 1. *Indifferent Genitalia*, 11 × 8½ in, 1979. Genital Embryogenesis research journal page with polaroid photographs of plasticine models of the genitalia before sexual differentiation has begun. (Photo: J. Mitchell)



An undifferentiated stage of genital development, common to both sexes, was a surprising personal discovery resulting from my research in the late 1970s. I was commissioned by the Children's Hospital of Winnipeg Research Foundation to conduct basic research into the normal development of the genitalia in the human embryo and to construct models representing the developmental changes that take place during normal maturation (genital morphogenesis). I began this work with a search for graphic evidence throughout the embryological literature. Although I was able to find schematic diagrams of theories concerning the development of the genitalia (often containing inaccuracies), there were almost no graphic or photographic representations of actual specimens. As a result of this lack of information, it became necessary for me to carry out original research myself. The Research Foundation assisted me financially so that I could develop technical skills in order to make it possible for me to engage in direct research with specimens [4].

The embryonic specimens were very tiny (less than 1 cm in length), since genital development is initiated very early in the growth of the embryo. It was necessary, therefore, to use a dissecting microscope to study the genitalia. The School of Medicine at the University of Manitoba and the Health Sciences Centre of Winnipeg arranged a position for me as Research Associate to study aborted fetuses and embryos.

Traditionally, two techniques are employed to express embryological research data dimensionally: the model and the reconstruction. The reconstruction is intended to literally rebuild an individual microscopic specimen in a larger scale by reconstructing the projected sections of the specimen in permanent materials. The reconstruction is intended to be a noninterpretive, purely technical procedure based on the three dimensions of mathematical measure (vectors).

Jack Butler (artist, embryological researcher, teacher, arts administrator), Art Studio, 107 Tunnel Mountain Drive, Banff, Alberta, T0L 0C0 Canada.

Received 10 May 1991.

The model, on the other hand, is produced by deliberately abstracting information from research in order to construct a selective visualization whose spatial dimensions are the product of the artist's knowledge of the objects described. The candid relationship between the abstract model and the theory that lies behind its creation is the source of the model's usefulness to science and its link with the visual arts [5].

There is a mistaken idea that the construction of three-dimensional sculptural models of embryonic development is a trivial or illustrational task—the process, however, requires fundamental physical insight. What is unique about my contribution to embryological science is my use of practices from visual art, especially my use of sculptural modelling (lived, felt dimensions), as opposed to analytical and/or computer reconstructions. During this study I used sculptural modelling as the means to explore and to question existing theories of physical development as well as the means to demonstrate (publish) my conclusions [6].

I first developed a plasticine model of the initial, indifferent genital structure, which I then re-modelled to represent successive stages of maturation. At each stage of development the model was photographed. At the end of the process, the last state of the model survived for several months until the plasticine fell into pieces. I mounted the polaroid photographs in my working journal along with the original research drawings. It is this journal of the polaroids and drawings that still carries the urgency of the original research for me. They have become the link to my present deepening involvement with the genital embryogenesis material as it is being recontextualised as an extended visual-art text.

This extended text, which investigates genital differentiation before the psycho-social condition of sexual difference, is based on research enacted from the positions of both visual art and biology. It combines the vocabularies of medical, political, institutional, psychosexual and art discourses, along with my own subjective ideas, all framed within the same representation (Color Plate A No 3). This text does not attempt to be scientifically neutral or artistically auratic, since there is no neutral place to stand outside the chain of signification constructed by language and no objective position outside the field of representation.

MORPHOGENESIS OF THE EXTERNAL GENITALIA

My embryological/visual research concluded by demonstrating, in the form of models, that genital differentiation is based on an initial, indifferent, common genital structure. This structure responds to genetically encoded developmental strategies and is morphologically transformed by the plastic deployment of volume and voids (gastrulation, invagination) into sexually differentiated genitalia.

No language exists to describe genital development that is not inflected by social/political subtexts or agendas, such as the linguistic prejudices of patriarchy. I will mix two languages in order to achieve a description that fits as closely as possible my first-hand experience observing the morphogenesis process in embryos: the description of the Czech embryologist Jan Jirásek (an accepted authority) and my own descriptive language, a visual-art–inflected vocabulary.

External Genitalia

According to Jirásek, in the indifferent stage,

> the anogenital elevations are formed around a sagittally elongated cloacal membrane in 5–10 mm embryos, 30–35 days old, between the primitive umbilical cord and the tail. The genital tubercle appears in front of the membrane with cloacal folds on both its sides. As the cloacal membrane separates into an anal and a genital membrane, the cloacal folds divide into anal folds posteriorly and into genital (urethral) folds anteriorly. Two cutaneous elevations known as labioscrotal swellings appear laterally from the genital tubercle and folds. As the genital tubercle elongates and a distinct primordium of the glans can be recognized, the term phallus is used [7].

Feminization of the External Genitalia

According to Jirásek,

> Feminization begins in 40–50 mm fetuses and is complete in 250–300 mm fetuses. The anogenital distance (the primitive perineum) does not increase, and neither the labioscrotal swellings nor the urethral folds fuse. The phallus bends caudally. As the distance between the phallus and the dorsal commissure lengthens sagittally in female fetuses in the second half of pregnancy, the whole urogenital sinus transforms into the vaginal vestibule. The openings of the vagina and urethra become separated. After their separation the phallus is properly called a clitoris. The urethral folds become the labia minora and the labioscrotal swellings the labia majora [8].

Female Development

First, flexion (a curving downward and inward) occurs in female development, followed by invagination and, eventually, the enveloping or interiorisation of the entire genital structure by the growing body of the embryo (Fig. 2).

Masculinization of the External Genitalia

According to Jirásek,

> In normal male fetuses 40–45 mm long, masculinization begins with the lengthening of the anogenital distance. The labioscrotal swellings fuse in the midline forming the scrotum, and the rims of the urethral folds fuse forming the primordium of the cavernous urethra. The cavernous urethra enveloped by its own spongy body is completely closed in 90–120 mm fetuses (12–14 weeks old). Masculinization of the external genitalia may be regarded simply as the formation of the raphe scroti and the penis [9].

Male Development

First the erect posture of the initial indifferent phallic structure is maintained, followed by a "zipping-up" of the openings, creating the enclosed passages of the urethra. At first these open onto the surface of the perineum at the base of the penis. The zipping process literally starts at the bottom, close to the anus and moves upwards, first drawing together the folds that would become the labia majora in the female. As male maturation progresses, the enfolding of the urethral groove moves the orifice up the stalk of the penis until it eventually opens at the head of the glans. The dark streak, called the raphe, running from anus to glans on every male, remains as an artifact of the zipping-up process (Fig. 3).

This morphogenesis plot is dramatically reinforced by evidence from pathology. Even before my discovery of the common genital structures of the embryo, I had witnessed demonstrations of the malleability of the genitalia through my work with urological surgeon Alan Decter. Children born with anomalous genitalia, as in the case of congenital adrenal hyperplasia, can be surgically reconstructed, enabling them to become sexually functional, and can be assigned new roles consistent with the actual genetic sex of the infant. This initial medical art project, building models of surgical techniques, inspired my enquiry into normal genital embryogenesis.

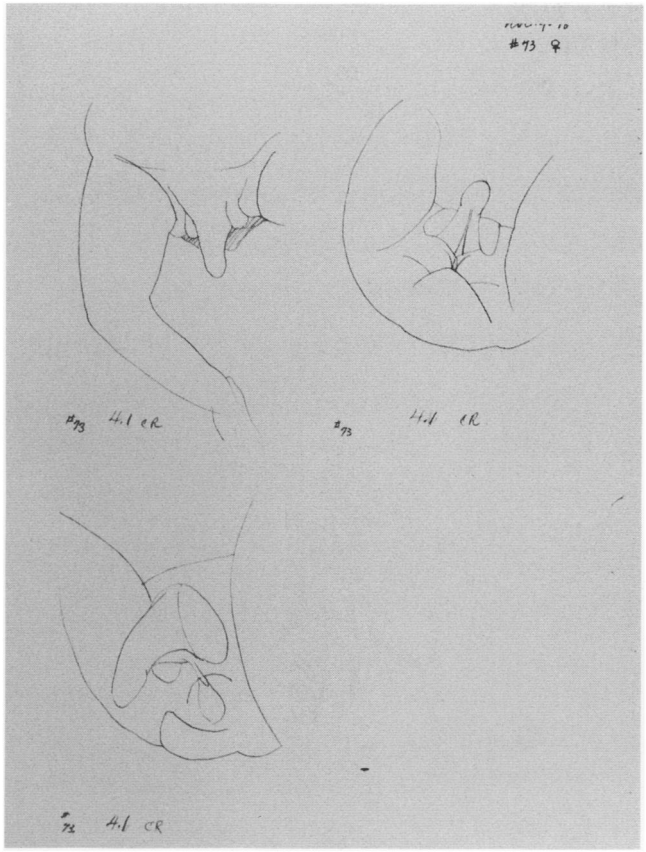


Fig. 2. ***Feminization,*** **11 × 8½ in, 1978. Genital Embryogenesis research journal page of pencil drawings made from direct observation of an embryonic specimen observed through a dissecting microscope. The drawings describe the first moments of feminization of the genitalia. (Photo: J. Mitchell)**

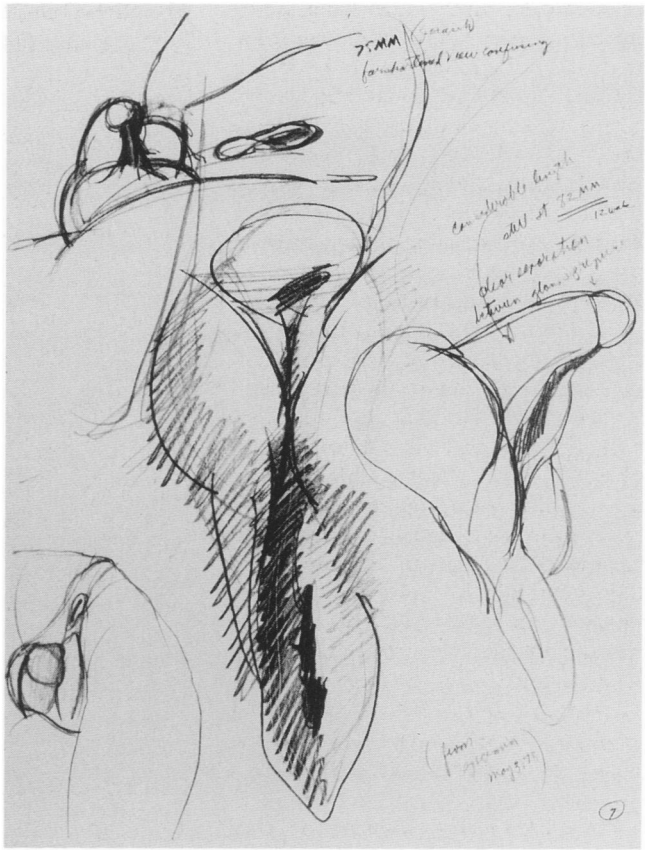


Fig. 3. ***Masculinization,*** **11 × 8½ in, 1978. Genital Embryogenesis research journal page of pencil drawings made from direct observation of three specimens seen through a dissecting microscope. All four specimens are male with differing degrees of genital masculinization. (Photo: J. Mitchell)**

Congenital anomalies and malformations of the genitalia at birth often seem to result from arrested embryological development or incomplete morphogenesis. The project in pathology is linked to the embryological research, since demonstration of the appearance of normal embryonic genitalia permits identification of the developmental timetable and therefore the larger set of circumstances that may contribute to malformation.

SEX/POLITICS—FEMALE/MALE—ART/POLITICS—ART/SCIENCE

Beyond a few, select areas of embryology and medicine, there is little awareness of this information. Yet, this news seems to be pregnant with significance during this time of crisis in sexual difference as it stands at the intersection of feminism, science, art and politics. Certain questions can be addressed.

Sex/Politics

Does the contemporary psycho-sexual position of woman simply replace the old biological determinism with a linguistic determinism?

In a review of the politics of sexualization, it seems evident that the genitals, as defined by biological science (a binary dichotomy, Male and Not-Male, an inherently nonreversible, nonreciprocal hierarchy, a system of domination), cannot support the burden of socialization perpetuated by the phallocentric order. For example, as a part of the current manipulation of theoretical surfaces, a shift is taking place from the paradigm of biological determinism, where women are "proven" to be biologically inferior (Freud), to an equally regressive and dehumanizing linguistic determinism where woman is defined within the construction of language (which is male) as "exclusion" and as "lack" (Lacan) [10]. Neither Freud's intuitive and totally unscientific definitions of "natural" sexuality nor Lacan's rereading of Freud in the terms of linguistic structure addresses the political nature of the sex/gender construction.

A sexist bias has deeply coloured the history of reproductive theory [11], and power relations are at the base of the hierarchy within the scientific method that distinguishes between the hard sciences (rigorously experimental) and the soft sciences (merely descriptive) [12]. Gender dominance has dramatically influenced the history of Western visual art. It is common knowledge that women artists have not been recorded in the history of Western art for its entire 2,000-year history until the close of late modernism in the 1960s.

Crossing the boundaries between isolated disciplines may expose systems of domination. Could the genders renegotiate their relationship with the symbolic (the psycho-social influences of the structure of language over every aspect of life) (Lacan) and with the semiotic (the pre-symbolic order, the sources of art) (Kristeva)?

Female/Male

Does the embryological state of undifferentiation suggest the possibility of a collapse of gender into a bisexual or androgynous model?

Within the codes of visual art it is possible to construct a paradox, an oxymoron—multiple layers of meanings simultaneously available, transparent signifiers—presenting contradictory aspects. Visual art's equivocal nature can be used to question the space between art and science, focusing on another "space between," the space between the "sexes" (read: genders). Visual paradoxes such as the seemingly paradoxical indifferent genitalia gain direct access through formations of fantasy to play with the "real."

A state and a time of sexual undifferentiation, approached through art or biology, suggests a memory of wholeness, a pre-oedipal union with the phallic mother. In this fantastical, pre-language state, it is possible to imagine alternatives to oedipal determination, to imagine a state where the "real" eludes the "symbolic," where the indifferent genitals can serve as a metaphor for a collapse of gender from male and female singularities to a more complex, layered concept of sexuality where the sexes become transparent. This sexual transparency produces an androgynous model [13] that references the theory of a pre-oedipal undifferentiated sexuality, common to the history of every individual, and the precursor of the bi-sexuality that "in the psychoanalytic view, is not the outrageous behavioral attribute of the few, but the psychic condition of us all" [14].

> The androgyne would represent [through both visual and psycho-social construction (JB)] the possession of both "maternal and paternal" phallus; in disavowing the difference, both sexes regain their "lost half" and the power that comes with it—providing the woman with the penis she lacks could also evoke the possibility of the pregnant man [15].

ART/POLITICS AND CONTROVERSY

A small group of individual artists, medical researchers and educators, most of them young, many oriented towards feminism and interested in cultural theory, support my cross-disciplinary research. Resistance has come from individuals in many quarters, both the politics of the left and the right, from anti-abortion and pro-choice, from pro-gay and homophobic, feminist and anti-feminist positions, and those who believe that any reference to sexuality amounts to pornography. But the most vehement objections have been based on religious grounds and a resistance to the blurring of the boundaries between traditional disciplines.

Shortly after I had begun my research from aborted human embryos, all research on abortices at the Health Sciences Centre in Winnipeg was discontinued as the result of pressure from religious groups. I based subsequent research on three alternative sources: a collection of preserved specimens at the Medical School (the collection was destroyed soon after), a collaboration with Jan Jirásek from Prague (a skilled photographer visiting Winnipeg who was conducting research in genital embryogenesis and who worked on my clay models with me) and, finally, with histological slides of embryonic tissue at the Carnegie Collection at the University of California at Davis.

In addition to objections based on religion, there has also been objection to challenging the traditional boundaries that separate intellectual disciplines. Since the tradition of fragmentation of knowledge is the very area of cultural values that I seek to subvert, I am not surprised when my grant proposals to arts-funding agencies are rejected on the grounds that my work is not art, or when the science-granting agencies find that my work cannot be classified as objective science. So it is the cross-disciplinary nature of this work that has attracted the most antagonism and disbelief.

I attempt to avoid censorship by steering a carefully chosen course between political positions, working in the margins of society, away from large art centres and the attention of the art market, exhibiting mainly in university galleries and artist-run centres, publishing in technical journals whose readers are committed to cross-, multi- and interdisciplinary enquiry.

Art/Science

Could the body stand in the place of the limen between two historically defined solitudes? Can the body be represented as an ontologically transparent layer through which art and science are mutually visible?

Since my first major public exhibition in New York in 1969 I have been concentrating on the representation of the sexual body through visual-art production. H.W. Janson published a lithograph from that first exhibition in his *History of Art* editions from 1969 to 1985 [16]. The print represented a human torso defined by the tactile image of the skin. In appearance it was suspended between the look of a photographic negative, an X ray and a body-transfer print. My use of indexical as opposed to formal means allied my work with the development of the conceptual-art movement. Engaging the representation of human sexuality from a conceptual base permitted me to extend my visual-art practice to include scientific contents. The attention given my work by Janson's publication, together with the interest surrounding the development of conceptual art and its implications for postmodern theories, has contributed to a growing audience for my work through continued publication and exhibition in Canada and in Europe.

THE THEORY OF SKIN EGO

I have theorized the association between visual art and embryological science in my work by reference to the psychoanalytic theory of the "Skin Ego" [17]. In 1989, French psychoanalyst Didier Anzieu suggested that the ego can be identified with the body and can be experienced in terms of the skin, relating these notions to fantasy body representations [18].

Anzieu's theory is based on a body-centered definition of the self, developed from four sets of data: ethological data, group psychotherapy, dermatological data and projective tests such as Rorshach tests. In response to Rorshach ink-blot tests Fisher and Cleveland in 1958 identified two new variables, "Barrier" and "Penetration of the Boundary."

> Every response implying a protective surface, membrane, shell or skin, which could be symbolically related to the perception of the boundaries of the body image (clothing, animal skins where the emphasis is on the textured, fuzzy, mottled or striped character of the surface . . .) is scored as a "Barrier" variable. The "Penetration of Boundary" variable is the opposite of this, in that it relates to anything that may be the symbolic expression of a subjective feeling that the body has only a weak protective value and can be easily penetrated . . . disruption of a bodily surface; modes or channels for getting inside a thing or of expelling something from inside to the outside (an open mouth, an orifice of the body . . . X-ray pictures or cross-sections of organs showing their interiors; representation of the surface of a thing as permeable and fragile, something insubstantial or soft, without clear boundaries) [19].

I am using Anzieu's theory as a metaphor in the analysis of my own visual art/science work. It is that shifting zone between the bodily and psychic skins—the boundary/barrier that is at once permeable and a containing envelope [20]—that is most alive as a metaphor for me in my play between art and

science. I invest that zone with shifting meanings from all of the "areas between," vivid with the potential for pre-analytic vision. By the use of the protecting bodily ego, it is possible to support the horror and feeling of indecency provoked by dissecting a beautiful, glass-clear, recently dead and mutilated fetus, almost a child, with tiny perfect fingernails and toe nails, and covered with a fine down of fetal hairs.

Both the random traumas associated with medical research and the psychological instabilities essential to artistic exploration must be contained, owned, exchanged for significance, beauty, meaning. Intellect, ratiocination, cannot perform that transformation. That ecstatic change is an operation of the body-as-mind, the mind-as-body, expressed here in the codes of the skin.

At the site of the skin ego, the locus of that liminal stroke (/) that both joins and separates the barrier/boundary, I incorporate art and science into one practice, one text in the form of allegorical woodcuts, paradoxical images of the androgyne painted on the body, photographs, laser prints, videos, installations and didactic lecture-performances.

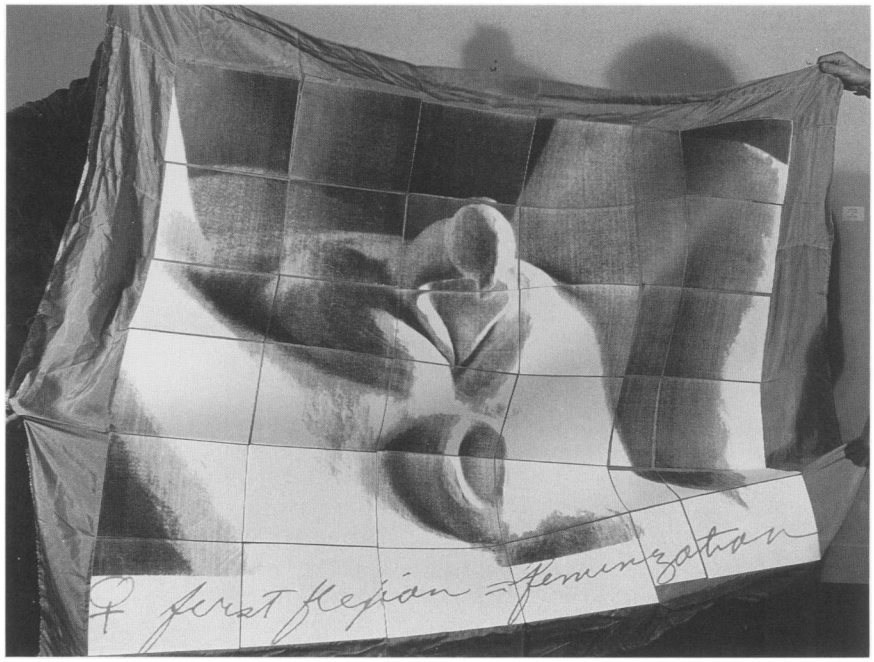


Fig. 4. ***First Flexion = Feminization,*** **72 × 84 in, 1990. A colour laser-print multiple-page enlargement mounted on silk. The print was made from a 1978 polaroid photograph of my plasticine model of genital feminization. The large laser print is unfolded during performance-lectures in a gesture mimetic of the unfolding and presentation of human sexual differentiation in the embryo and the psycho-social construction of sexual difference in the child. (Photo: I.G. McRae)**

ARTWORKS

Colour Laser Prints

After 10 years of heavy use, my deteriorating original genital-embryogenesis research journal was in need of cleaning and repair. I photocopied the journal pages prior to cleaning and re-binding the journal. I explored the potential for the mediation of the original pages using the colour laser-print process. The first step was to replicate the graphic qualities of the aging drawings and polaroids. I found that the original creamy page colour was lost in order to gain adequate black-and-white contrast in the mounted photographs. I increased the amount of yellow over the copier's assessment for yellow. The result did not replicate the original page colour. It was a sour kind of yellow, a urine yellow that heightened the bodily associations with the sensory and sensuous-erotic element in the polaroids.

Concerning that erotic, bodily associative element of the work, I felt from the very beginning of the drawing and modelling work that I had become involved in a conflict between the proscription (my own internalized taboo) against an interest in infant's genitals and the commission to construct (handle) a representation of genital development. I found a partial solution to the dilemma by constructing the models at about twice adult life-size. This was a perfect size for the effective management of the plasticine and easy to photograph. It also eliminated the identification with infants' genitals at the emotional level. But the enlarged size of the genital models encouraged just those erotic fantasies proscribed by scientific research and social taboo. I have come to accept this conflict as making a valid contribution to my personal position concerning this work: all meaning is the product of a passionate "living-in" the material and the theory, in science and in art (Fig. 4).

The *Gorilla* Performance Work

Six artists, including myself, collaborated to create and perform *Gorilla.* My role in *Gorilla* was as the producer for the performances as well as the costume builder, set designer/fabricator and one of the performers. Poetic texts (D. Melnyk), original music (J. McCulloch) performed by C. Nosaty, staging (M. Nagle), and performances by A. Butler, have been combined in 43 performances in such disparate venues as the Paddle Wheel Queen River Boat on the Red River at Winnipeg, the Gilded Balloon Theatre at the Edinburgh Fringe Festival in Scotland, and the Inter-Variety Club, a private theatre at Covent Garden, London.

I built the costume for the gorilla based on a compression of the Hollywood image of King Kong, along with the beautiful and moving appearance of a real mountain gorilla. Repeatedly during the performance the female actor must publicly clothe herself in the gorilla costume. Clothed in the animal costume she becomes visible, natural. Out of the costume, undressed, she is so clothed in social construction that she has become completely invisible, the presence of absence.

The performance work *Gorilla* is a metaphor for "the other," the feminine, the "spaces between" in the social contract. The gorilla him/herself renders concrete the unspeakable spaces between culture and the natural world.

The *Gorilla* performances seem an incongruous subject in the context of the embryological material, but the parallel between the miraculous growth of the embryo and the processes of art that use costumes to transform a clothed female actor into an enormous synthetic male gorilla plays upon the exposition of morphogenesis as humorous, irrational, natural and artificial, all at once. The artist-actress slips in and out, in and out of the huge, furry, phallic costume (fur condom?) resonating with the meanings of the Skin Ego, locating the significance of the act of gender-reversal in the skins

Fig. 5. ***Gorilla Striptease, Put It On! Put It On!*****, performance at the Gilded Balloon Theatre, Edinburgh Fringe Festival, Scotland, 1989. "Gorilla" is a metaphor for the other, the feminine, the spaces between in the social contract. The gorilla him/herself renders concrete the unspeakable spaces between culture and the natural world. Clothed in the animal costume, she/he becomes visible, natural. Out of the costume, undressed, she is so clothed in social construction that she has become completely invisible, the presence of absence. (Photo: L. Glawson)**

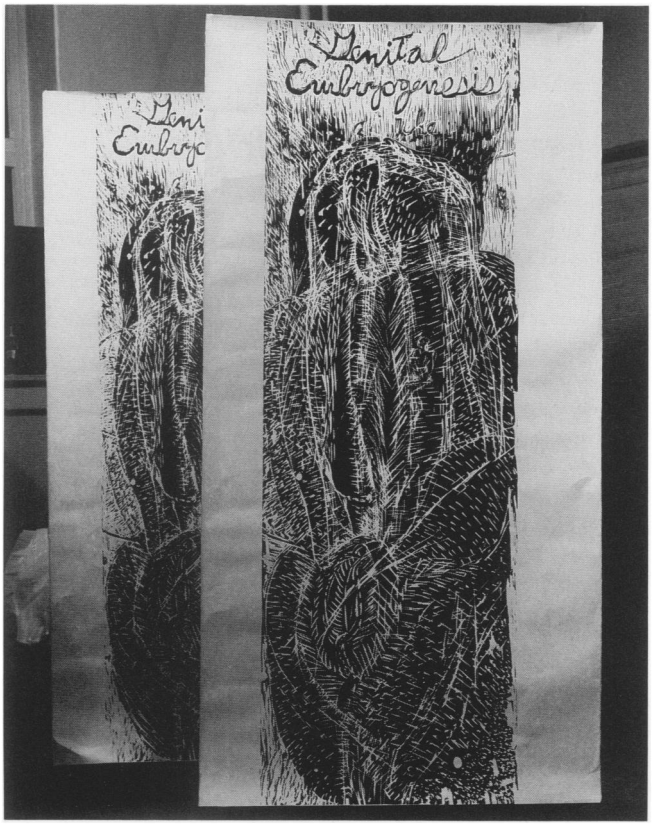


Fig. 6. ***Male Genital Embryogenesis*****, 72 × 30 × 480 in, 1990. Two suspended woodcut prints on rice paper, from an installation of eight progressive developmental states of one image representing penile maturation: the prints are suspended from the ceiling like large skins. Inscribed with the story of genital maturation, they construct a metanarrative for the crisis of my sex. (Photo: L. Glawson)**

(surfaces, costumes, images) of the actor, "modes or channels for getting inside a thing or of expelling something from inside to the outside." There is in my *body-mind* a continuum connecting the genital morphogenesis of the embryo (as imaged by science) with the shape-changing gorilla/actor (as imaged through performance art) as a shared sexual idea-skin—a genesis (Fig. 5).

Woodcuts

My *Male Genital Embryogenesis* woodcut installation started out as a straight-forward hand-cut woodcut print representing the earliest stages of male genital differentiation. It was derived from an ambiguous polaroid photograph of a plasticine scientific model. The first states of the print looked somewhat like a vulva and somewhat like a penis, but not really like either—is it not human? another species? malformed? As a very large woodcut (6 ft by 3 ft), the image looked threatening, animated and energized by cultural values that proscribe the depiction of the sacred phallus.

As I continued to work on the print, inking and printing each new state, I switched my creative agenda from a simple depiction to an emphasis on developmental shape-changing, by superimposing successive images of the stages of penile maturation. I suspended eight progressive developmental states of the large rice-paper prints from the ceiling. They felt like large skins arranged in a sequence, inscribed with the story of progressive male genital maturation, a metanarrative for the crisis of my sex (Fig. 6).

Lecture-Performances

The lecture-performances are a condensation into a metaphor of fragments of scientific theory, artistic images, theatrical performance and didactic lecture techniques.

In three public lectures given at the Muttart Art Gallery in Calgary, in the context of an exhibition of works from my Genital Embryogenesis extended text and using live performance techniques, I drew with theatrical make-up sticks on my own torso and on the back of an artist collaborator (Dennis Wilkie). The drawings described genital morphogenesis by superimposing three layered images in three contrasting colours. I accompanied the drawing performances with didactic description of the embryonic developmental process using both technical and colloquial vocabularies (Fig. 7).

By drawing directly on the naked skin, I am attempting to engage a sensuously

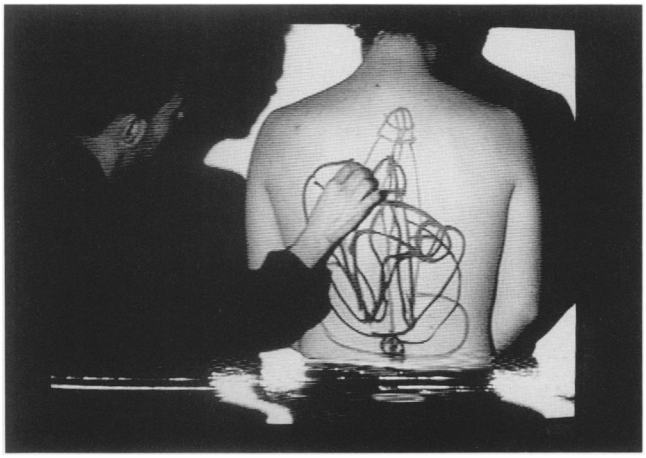


Fig. 7. ***The Art and Science of Genital Embryogenesis,*** **unedited ¾-in video/audio recording documenting a didactic lecture-performance held in the exhibition Genital Embryogenesis and the Skin Ego at the Muttart Public Art Gallery, Calgary, 1991. Employing theatrical make-up sticks, I present a theory of genital morphogenesis by drawing on the skin of an artist-collaborator (D. Wilkie). The performance emphasises the association between scientific theory, artistic practice, subjectivity and the body. (Video producer: S. Tivy. Photo: J. Mitchell.)**

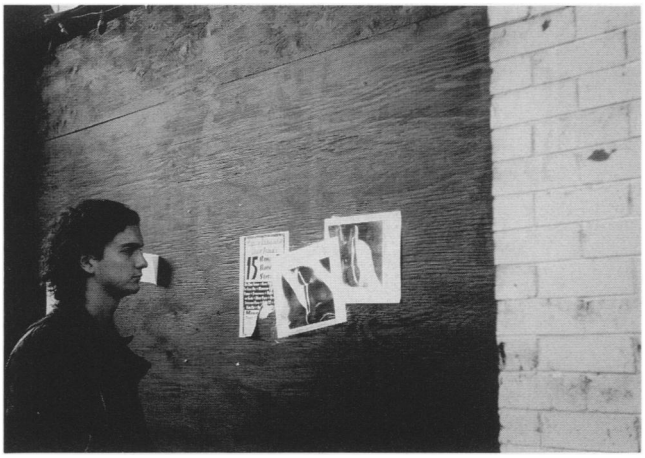


Fig. 8. ***Before Sexual Difference,*** **9½ × 11, 1991. Photocopy poster version of a polaroid photograph of my plasticine model of the indifferent stage of genital development in the embryo. Nine hundred copies of the image were "postered" in public places in Calgary in July and August 1991 by T. Andriuk. Andriuk's personal stamp, which reads "House of Pleasant Thoughts," appears on each poster, claiming responsibility for the social gesture of "postering" while exposing this visual news about genital development to an audience beyond the academic and cultural institution. (Photo: T. Andriuk)**

grounded antitheoretical subjectivity that remains as a fact of personal experience underlying the psycho-social construction of sexuality and theories of sexual development.

The public lecture-performances suggested to me that the traditional social context for my work could be expanded beyond academic and cultural settings. As a result, I have initiated a project to integrate the biological information and art/science crossover research principles into grade-school curricula so that children and adolescents could gain access to an alternative understanding of sexual difference.

A student at the Alberta College of Art, Tom Andriuk, responded to my plea for direct, public access for my genital embryogenesis imagery with the original and ambitious proposal that he "poster" the city of Calgary with photocopies of one of the seminal images of the indifferent stage of genital development. He put his personal stamp in red on each copy (it reads, The House of Pleasant Thoughts) and mounted 900 prints in public places throughout the city. Seven out of every 10 prints were destroyed within the first day, but many remained for weeks. The artistic significance of Andriuk's gesture is in the social act itself.

On encountering my embryogenesis image on telephone poles and billboards, completely disconnected from the traditional, "neutral" contexts of studio and gallery, I gained a fresh view of the image. The latent suggestion of pornography, which had originally troubled me about this entire body of work, returned. In fact, several other artists had explained to me that this quality of the images stopped them from becoming engaged in the larger meanings of my research.

In an effort to uncover the causes for the implications of pornography, I stumbled first upon a solution to the problem and then was able to formulate an analysis of the problem.

If the images are inverted, literally reversing the position of the genitals within the photographic frame, much of the suggestion of a pornographic reference seems to me to leave the image. This orientation of the genitals implies a new content for me; a sense of the holistic context for the observation and understanding of genital morphogenesis that places genital development in continuity with the whole of embryonic bodily development, including the amniotic sac, placenta, womb and the nurturing mother. This simple reversal of the image places the genitals in a more characteristic position within the womb than the position used in virtually every embryology text or article that I have ever seen. The customary embryo "on its back" displays the genitalia in a position that I associate with adult pornography, a position of powerlessness, of objectification, open to control and fetishisation. I find that there is a tacit iconography at work in the history of imaging of embryological science that must be taken into account as my own research proceeds as both criticism and as an exposition of art/science crossover research (Fig. 8).

References and Notes

1. Francette Pacteau, "The Impossible Referent: Representations of the Androgyne," in *Formations of Fantasy,* Victor Burgin, James Donald and Cora Kaplan, eds. (London: Methuen, 1986) p. 63.

2. In the classic textbook by W.J. Hamilton, J.D. Boyde and H.W. Mossman, *Human Embryology,* 4th Ed. (Baltimore, MD: Williams and Wilkins, 1978), the authors articulate three distinct classes of sexual development: genetic (chromosomal) sex, gonadal sex and genital sex. They introduce the terms "indifferent" and "neuter" to designate the two somatic states of sexual development (p. 412 and p. 423). In the section of the text titled "External Genitalia and the Phallic Portion of the Definitive Urogenital Sinus," they state "Though basically their history is identical in male and female embryos, marked sexual differences become apparent as development proceeds" (p. 413); and, "It should be noted, however, that, up to about the 50-mm C.R. length stage, the external genitalia in the two sexes are essentially similar" (p. 415).

3. Keith L. Moore, *The Developing Human, Clinically Oriented Embryology,* 2nd Ed. (Toronto: W.B. Saunders, 1977) p. 231: "Thus the type of sex chromosome complex established at fertilization determines the type of gonad that develops from the indifferent gonad. The gonads then determine the type of sexual differentiation that occurs in the genital ducts and external genitalia"; p. 240: "The external genitalia also pass through a stage that is not distinguishable as male or female."

4. The living embryo, within the womb, continuous with the life and body of the mother, can only be viewed by intrusive intra-uterine photography. The undifferentiated genitals are too small and the movement of the embryo does not permit viewing through ultrasound, X ray or computer-aided visualizations. Echo-planar magnetic resonance imaging is approaching a level of technical refinement that may allow adequate imaging of living embryos.

5. I published an article on the subject of the model and the reconstruction. See Jack Butler, Robert N.

Vincent, Martin Reed and George Collins, "Cardiac Embryogenesis: A Three-Dimensional Approach," *Canadian Journal of Cardiology* **3**, No. 3, 111–117, 1987.

6. I published this research in the film, *The Child with Congenital Adrenal Hyperplasia,* in 1980. The film describes the genetically transmitted disease C.A.H., its effects on the development of the genitalia, the clinical management of the disease and the surgical reconstruction of the anomalous genitals of afflicted infants. The film was developed between 1976 and 1980 in collaboration with J. Winter, endocrinologist, A. Decter, urological surgeon, and consultants in pediatrics, neonatology and embryology.

7. Jan E. Jirásek, "Morphogenesis of the Genital System," in *Morphogenesis and Malformation of the Genital System,* Richard J. Blandan, Daniel Bergsmid, eds. (New York: Alan R. Liss, 1977) p. 32.

8. See Jirásek [7] p. 34.

9. See Jirásek [7] p. 33.

10. Jane Gallop, *The Daughter's Seduction: Feminism and Psychoanalysis* (Ithaca, NY: Cornell Univ. Press, 1981) p. 22.

11. Nancy Tuana, "The Weaker Seed: The Sexist Bias of Reproductive Theory," in *Feminism and Science,* Nancy Tuana, ed. (Bloomington, IN: Indiana Univ. Press, 1989) p. 147.

12. Stephen Jay Gould, *Wonderful Life: The Burgess Shale and the Nature of History* (New York: W.W. Norton, 1989) p. 278.

13. See Pacteau [1] p. 64: "Androgyny can be said to belong to the domain of the imaginary, where desire is unobstructed; gender identity to that of the symbolic, the Law. . . . The androgynous looking figure presents me with an impossibility, that of the exposure of difference, the very difference which constructs me as a subject."

14. See Pacteau [1] p. 70.

15. See Pacteau [1] p. 71.

16. H.W. Janson, *History of Art* (New York: Abrams, 1969) p. 543.

17. Didier Anzieu, *The Skin Ego: A Psychoanalytic Approach to the Self* (New Haven, CT: Yale Univ. Press, 1989).

18. See Anzieu [17] p. 21. Anzieu theorized a body-centered definition of the self, based on evidence from four sets of data: ethological data (the science of character, the portrayal of character by mimicry), such as the phenomenon of imprinting investigated by Conrad Lorenz; group psychotherapy where personal histories reveal a connection between the patient's image of her/his own body envelope and childhood trauma; dermatological data from accidents, such as the association between the medical techniques used to heal the skin of severe burn victims and the mental images used in their psychological healing; and from psychosomatic diseases of the skin, such as disfiguring rashes.

19. See Anzieu [17] p. 31.

20. See Anzieu [17] p. 63. In describing the development of the "Skin Ego" in the neonate, Anzieu identifies the fantasy of a common skin shared between baby and mother where the baby/mother interface permits exchanges to take place in bodily communication. It prefigures the development of an independent ego in the child. The model of the skin as the site for meanings to be exchanged remains operative in the adult individual.

Glossary

auratic—(visual art, theorized by Walter Benjamin in reference to Modernist painting and photography) the authority of the work of art based in the singularity, uniqueness or aura of the work. The auratic "presence" of the work of art has been directly associated with its potential value as commodity.

cloacal—(embryology) the early embryonic membrane from which most genital structures derive.

difference/dichotomy—(feminism, linguistics) "Where dichotomy defines a pair of terms by a relation of presence and absence, or affirmation and denial, difference implies that each of the two (or more) terms has an existence autonomous from the other. The concept of difference in the context of Saussurian linguistics refers to the fact that no sign has any positive characteristics in and of itself. Each sign can only be defined in terms of what it is not. This concept of linguistic difference has served as a useful metaphor for defining the relations between the sexes without privileging one sex and defining the other as its opposite. Moreover, unlike binary oppositions, terms related by difference can admit a third, fourth, etc. term. Where dichotomies take on the A/not-A form, differences take the form of A/B relations" (from E. Grosz, *Sexual Subversion* [Sydney, Allen & Unwin, 1989] p. xvii.)

differentiation—(embryology) increase in complexity and organization.

gastrulation—(embryology) the movement of cells within the embryonic disc that establishes the three primary germ cell layers, thus bringing the presumptive organs of the embryo into the positions in which they will undergo their subsequent development.

index—(visual art, semiotics) an index has an existential relation to the referent. Indexical means of creating a visual image employ a direct physical relationship between the visual signifier (the artwork) and the signified (visual concept, meaning, etc.), such as the use of fingerprints to identify a subject, X rays, shadows, the registration of light on the photographic negative. The term index is used in contrast to symbol and icon.

invagination—(embryology) the infolding of the blastula (two layers of cells) to form the enclosed space of the gastrula (three layers of cells) in the early development of the embryonic disc.

limen—(perceptual psychology) the threshold of a psychological or physiological response. In my usage, the limen is represented by the stroke (/) between binary terms, self/other, art/science, figure/ground.

undifferentiated—(embryology) the morphological state of embryonic development before differentiation has begun.