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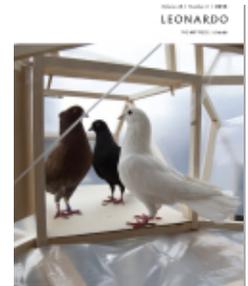
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Leonardo, Volume 44, Number 3, June 2011, pp. 221-227 (Article)

Published by The MIT Press



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Fertilization Narratives in the Art of Gustav Klimt, Diego Rivera and Frida Kahlo: Repression, Domination and Eros among Cells

Scott F. Gilbert and
Sabine Brauckmann

The cell is both a biological “fact” and an artistic interpretation. Flannery [1] has documented that the scientific construction of a cell is an artistic process and that there is no such thing as an uninterpreted cell. Stains, instruments and the wavelengths of light allow us to see certain things and not others; and the representation of cells is an ongoing process of data accumulation and interpretation. Moreover, when pictures of cells become widespread throughout society, they, too, become cultural artifacts and can be used as symbols, indices and icons [2–4].

Gustav Klimt (1862–1928), Diego Rivera (1886–1957) and Frida Kahlo (1907–1954), three artists whose art and reputations often centered on their sexual and political lives, each depicted cellular events associated with fertilization and pregnancy. Klimt used an early embryonic stage of human development, the blastocyst, to indicate the successful fertilization of Danae and the victory of creativity over repression. Rivera used the ovulating ovarian follicle as an icon of man’s (gendered) control over nature. And Kahlo saw in the union of sperm and egg the central act of love between two individuals.

KLIMT’S *DANAË*: A SUCCESSFUL FERTILIZATION OF ART AND SCIENCE

Gustav Klimt’s *Danaë* is a masterpiece of Secessionist art, representing the complex interplay of masculinity and femininity, freedom and repression, classicism and eroticism that characterized Freud’s Vienna before the Great War. It is also a fascinating instance of interplay between science and art. In *Danaë*, Klimt presented a stylized depiction of the mammalian blastocyst and used this early embryonic structure to show the victory of creativity over repression.

This 1907 oil painting (Fig. 1) depicts the impregnation of the beautiful Danaë by Zeus, who appears as a shower of golden coins/rain flowing between her legs. Danaë’s father,

King Akrisios of Argos, fearing the prophecy that he would be killed by his grandson, had locked his daughter in a tower to ensure that no pregnancy could occur. Art historians have interpreted the rectangle near Danaë’s genitals to be the symbol of Zeus’s masculinity.

Indeed, Klimt used the rectangle as a phallic symbol in other paintings during this time, including *Lebensbaum* (1905–1909) and *Der Kuss* (1907–1908). Certainly rectangles were part of Klimt’s sexual vocabulary.

Fig. 1. Gustav Klimt, *Danaë*, oil on canvas; 77 × 83 cm, 1907. Private collection. The rectangle on the left represents Zeus, while the circular biomorphic forms in the purple robe are interpreted to be blastocysts [73]. Danaë had been imprisoned to prevent her becoming pregnant. Zeus, however, visits Danaë, and the prophecy is fulfilled. (Danaë’s son, Perseus, does accidentally kill Akrisios with a discus.) The dating of the painting is not exact [74].



ABSTRACT

Fertilization narratives are powerful biological stories that can be used for social ends, and 20th-century artists have used fertilization-based imagery to convey political and social ideas. In *Danaë*, Gustav Klimt used an esoteric stage of early human embryos to indicate successful fertilization and the inability of government repression to stifle creativity. In *Man, Controller of the Universe*, Diego Rivera painted a mural of a man controlling an ovulating ovary, depicting Trotsky’s view that society will rationally regulate human fertilization. His former wife, Frida Kahlo, refuted this view in *Moses: Nucleus of Creation*, wherein she painted images of fertilization and embryo formation as the ultimate acts of erotic consummation and generation.

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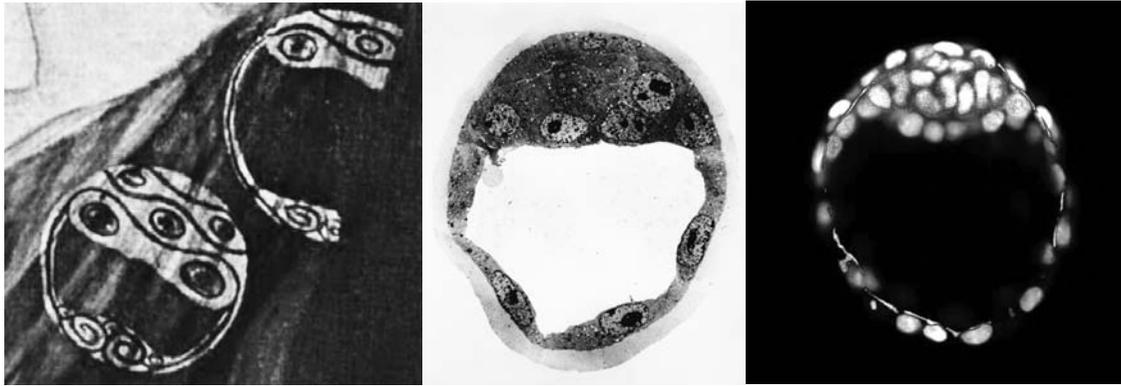


Fig. 2. Figures in Klimt's *Danae* (a) compared with photographs of mouse blastocysts seen by electron microscopy (b) and light microscopy (c). ([b] © Thomas Ducibella [75]; [c] © Janet Rossant [76].)

What, however, are the prominent circular biomorphic forms in Danae's purple gown and why are they in the forefront of the painting? Art historians have assigned to these "gold filigree disks" a vague Mycenaean character [5] or a purely ornamental function, describing them, for example, as "ovaloid shapes between gentle wave-like lines" [6,7]. We believe that these biomorphic forms are indeed embryonic cells, specifically mammalian blastocysts (Fig. 2). This interpretation would complement the idea that Klimt depicted Zeus's golden shower as "chromosome-like biological shapes" [8] or "gilded spermatozoa" [9]. Moreover, art historians have noticed that the nude Danae is confined to a "closed embryonic oval" [10], referencing the womb, and we propose that Klimt was artistically depicting blastocysts inside Danae's uterus, indicating the pregnancy that Akrisios so feared.

The blastocyst, first described by August Rauber and Rudolph Leukart in the 1880s, is a diagnostic stage of mammalian development [11]. It is a mass of cells characterized by (a) an outer ring of cells (the trophoblast) that will adhere to the uterus and form the fetal portion of the placenta; (b) the inner cell mass, which adheres to one pole of the trophoblast and is the source of the embryonic stem cells that generate the fetus; and (c) a fluid-filled cavity, the blastocoel. To an embryologist, these figures in Danae's robe certainly look like a Secessionist rendering of a blastocyst.

Blastocysts are not exactly part of public knowledge then or now. Did Klimt, then, really know about the blastocyst? He could readily have received information about this early embryonic form from two societal contacts at the Zuckerkandl salon: Emil Zuckerkandl (1849–1910), who was the leading anatomist

of Vienna, and Hans Przibram (1874–1944/5), a renowned embryologist who was founder and director of the Vivarium in Vienna's Prater Park.

Emil Zuckerkandl was the chair of Anatomy and Pathology at the University of Vienna. He not only took clinical and comparative anatomy to new heights [12–14] but also was an exceptional teacher, who accompanied his lectures with excellently drawn and accurate illustrations [15,16]. Socially liberal, Zuckerkandl was professionally and personally involved in promoting university education for women and actively participated in explaining scientific research to society [17,18].

His wife, Bertha Szeps-Zuckerkandl (1864–1945), one of the most remarkable personalities of Viennese society during the last decades of the Austro-Hungarian Empire, was a novelist, journalist and writer; but her passion was for modern art. Her salon became a meeting place for artists, literati and academics, and her circle of friends included Auguste Rodin, Josef Hoffmann, Gustav Mahler, Max Reinhardt, Hans Przibram and in particular Gustav Klimt, whom she openly supported against his critics [19–21]. Her 1905 interview with Klimt concerning the scandal of his murals at the University of Vienna (which the Ministry of Education, on grounds of morality, refused to exhibit [22,23]) remained his major statement about license and artistic freedom [24,25].

Szeps's marriage to Zuckerkandl opened another venue for her—namely, the world of science. In her memoirs she wrote,

Stimulated by Gustav Klimt, my husband started to hold scientific evening lectures for artists. On these evenings, the Anatomical Institute in the Währingerstrasse was filled with a mood that you meet else-

where at sensational theatre premieres. The auditorium was densely packed. Painters, novelists, and musicians were there, or sent representatives [26].

There (more accurately, in the "Volkshaus" Adult Evening Center in Ottakring [27]), her academically robed husband thrilled his audience by showing, through projected slides, the microscopic wonders of blood vessels, the epidermis, arteries and brain neurons. Szeps-Zuckerkandl claimed explicitly that Klimt's palette was enriched and influenced by the microscopic anatomy shown at Emil Zuckerkandl's evening lectures ("Gerade Klimts Palette ist von diesem Anreiz der Sinne bereichert und beeinflusst worden" [28]).

If Klimt had wanted specific knowledge of embryos, there was also another member of the Zuckerkandl salon to turn to: Hans Przibram. Przibram (1874–1944/5; he died in Theresienstadt concentration camp) was founder and director of Vienna's Prater Vivarium, one of the leading developmental biology research institutes in Europe [29,30]. He was a leading researcher on the laws of growth and was one of the first experimental embryologists to use chemistry, biomechanics and mathematics in his explanations. He was also an accomplished artist and writer. According to Sander Gilboff, "Przibram was noted for his artwork, and his drawings were exhibited at the Secession, Vienna's center for *Standstill* art, and printed in the Secession journal: *Ver Sacrum*" [31]. The contact between artist and painter was so close that musicologist Anna Harrell Celesta writes, "One of Klimt's most loyal assistants, an amateur painter named Hans Leo Przibram (1874–1944), was simultaneously making a name for himself as a biologist" [32]. Thus, Vienna's leading embryologist, who, like other contem-

porary embryologists, had depicted blastocysts in his textbooks [33], was also a Secessionist artist, art critic and friend of Klimt.

Thus, if Klimt wanted to depict the successful impregnation of Danae by representing an early embryonic stage, he would have had ready access to this type of knowledge. Blastocysts would have been an exciting, esoteric and accurate way of showing the successful result of Zeus's visit to the imprisoned princess. This victory of creativity over a repressive ruler was most likely the subtext of this painting, for Klimt had just been involved in a series of censorship battles, especially those concerning the University murals. Conception, that archetypal creative act King Akrisios so feared, has happened, and the representation of Zeus on the left side (the rectangle and golden stream) is balanced on the right side by the blastocysts embedding into the purple lining of Danae's gown. *Danae* represents not only the successful mating of Zeus and Danae but also the circumvention of repression by creativity and the successful marriage of science and art in fin-de-siècle Vienna.

DIEGO RIVERA'S *MAN AT THE CROSSROADS: CELLS OF THE SOCIALIST UTOPIA*

Diego Rivera (1886–1957) also used the control of sexual reproduction as a theme in one of his major murals, and here, too, a microscopic image of human biology is used in the service of art. However, unlike Klimt's stylized depiction of the blastocyst, Rivera's painting of human ovulation is a direct borrowing of an icon from medical textbooks.

In 1932, Diego Rivera was commissioned by Nelson Rockefeller to paint a mural for the ground floor of the RCA Building in Rockefeller Center. It was to be, in Rockefeller's words, "Man at the Crossroads Looking with Hope and High Vision to the Choosing of a New and Better Future." With the help of six assistants, Rivera started working on the 63-foot-wide mural in March 1933. However, the Rockefeller patrons were neither pleased nor amused by the Communist nature of the painting. May Day parades and Lenin among the workers were not scenes favored by America's predominant family of capitalists. Therefore, on 22 May

1933, Rivera was paid in full and barred from the premises; and on the night of 9 February 1934, workers with axes and hammers destroyed the mural. The mural, however, was reconstructed that year by Rivera and his assistants in the Palace de Bellas Artes in Mexico City, where its title became *Man, Controller of the Universe (or Man in the Time Machine)*. In *Man, Controller of the Universe*, Rivera added the image of his friend, the Communist Leon Trotsky, whom he would soon help to receive asylum in Mexico. Trotsky and his wife lived in the house of Frida Kahlo and Diego Rivera until shortly before the time he was assassinated [34–36].

In the center of the painting is a commanding presence, Man, the Controller of the Universe (Fig. 3). His gloved hands are on buttons and levers controlling heavy industrial machinery. A third hand, indeed a phallic hand, reaches out to grasp a ball that appears to be a control panel. On the top of the ball are engraved dials, and in the center of the ball is a dividing cell in mitotic metaphase.

This man at the crossroads is physically on the intersection of two diagonal lines, each representing that which he

Fig. 3. Diego Rivera, *Man, Controller of the Universe*, fresco mural, 4.85 × 11.45 m, 1934, detail. Palacio de Bellas Artes, Mexico City. (© 2011 Banco De Mexico Diego Rivera Frida Kahlo Museums Trust, Mexico, D.F.; Artists Rights Society [ARS], New York)





Fig. 4. Frida Kahlo, *Moses (The Nucleus of Creation)*, oil on masonite, 61 × 75.6 cm, 1945. Private collection, Texas. This painting is not only an interpretation of Freud's *Moses and Monotheism* but also a rebuttal of the masculine view of the world in Diego Rivera's *Man, Controller of the Universe*. (© 2011 Banco De Mexico Diego Rivera Frida Kahlo Museums Trust, Mexico, D.F.; Artists Rights Society [ARS], New York)

controls. On one diagonal line are the forces of the physical universe. On the other line are the elements of the biological world. On the left side of this diagonal are cells. These are not abstract cells but cells as they appear in bacteriology textbooks. These are cells from the heroic age of microbiology. Strings of rod-shaped bacteria are shown being digested within these immune system cells [37,38]. These images would indicate man's growing control over infectious disease. Looking at the right side of the diagonal, however, one sees a different group of cells. This biological form is also derived from a textbook illustration. It is the lower portion of the iconic clock face representation of mammalian ovulation. In this depiction, the maturation of the ovarian follicle is shown in a circular fashion, showing the egg developing from early follicle through ovulation into

the hormone-secreting corpus luteum as it proceeds around the periphery of the ovary. This was the depiction of ovulation pioneered in the textbooks of Bradley Patten [39,40], which has become the normative way of portraying these events [41]. The inclusion of a ripe ovum being ejected from its follicle at the moment of ovulation (a rare event but one illustrated by Patten and others) also demonstrates that this is from a textbook illustration. In Rivera's mural, the ovarian oocyte is seen in two stages of development, culminating in the ruptured follicle and the expulsion of the matured egg into the oviducts. Yes, the mural says, humans will control fertility, too.

Indeed, fertility control and eugenics (the two ideas were merged during the first half of the 20th century) was a major goal of the Rockefeller Foundation, and the Rockefellers have had a major role in

supporting birth control in the United States [42]. Moreover, the domination of nature and fertility by technology was a locus where the interests of capitalists and communists converged. The mural is an almost perfect artistic reflection of the words written by Rivera's friend Trotsky: "The proper goal of communism is the domination of nature by technology and the domination of technology by planning, so that raw materials of nature will yield to mankind all that it needs and more besides" [43].

Trotsky specifically extended this control to fertility. In his famous work *Literature and Revolution*, he prophesied that man "will become the object of the most complicated methods of artificial selection and psycho-physical training. This is entirely in accord with evolution" [44]. Also, in 1934, just as Diego Rivera was finishing his mural, Trotsky predicted,

"You Americans, after taking a firm grip on your economic machinery and your culture, will apply genuine scientific methods to the problem of eugenics" [45].

Thus Diego Rivera employed textbook images of biology to demonstrate the new powers that science had given humankind to rid the world of infectious disease and to control human reproduction. Guided by Marx, Lenin, Trotsky and Darwin (whose images are in the mural), Rivera saw man at the crossroads entering a wonderful new age of control over disease and the scientific planning of the human race.

MOSES OR THE NUCLEUS OF CREATION: FRIDA KAHLO'S UTERINE UNIVERSE

Frida Kahlo was an artist obsessed with anatomy and development. Her desire to be a physician and her training as a pre-medical student are reflected in numerous morphologically detailed depictions of internal human anatomy [46,47]. In *My Nurse and I*, Kahlo presents the breasts of her Mexican wet-nurse in such a way as to show the milk ducts and mammary lobes. In *Henry Ford Hospital*, Kahlo became probably the first artist to represent a miscarriage (her own). There is no problem in understanding where Kahlo obtained her knowledge of embryology. Even after her medical studies, she kept in her house a "large lithograph depicting fertilization, embryonic development, and birth." Rosenzweig and Rosenzweig note that this is "undoubtedly a reference she consulted when painting many of her works" [48].

Two paintings that highlight developmental biology are *Family Tree: My Grandparents, My Parents and I* (1936) and *Moses* (1945). In *Family Tree*, Kahlo presents herself in self-portraits: (1) as a naked girl in the Blue Room; (2) as a fetus connected to her bridal mother by an umbilical cord; and (3) as an egg being fertilized by her father's sperm. In this last image, the sperm is seen entering the egg close to the egg nucleus with which it will merge. The presence of the *zona pellucida* and *corona radiata* around the egg shows that this is from a textbook illustration.

Kahlo's *Moses* (Fig. 4) brings us once again to the arts and sciences of Vienna, for this is Kahlo's interpretation of Freud's *Moses and Monotheism* (1939), bringing the birth of Moses under the glowing rays of a scientifically accurate and actively energizing solar disc. It is also a rebuttal of her ex-husband's idea

of Man the Controller. The central panel of this tripartite painting shows the embryology of the waterborne Moses, the fertilization event at the right, the successful fertilization shown by the dividing cell at the left and the fetus in the center. As Herrera has noted, the organization of the painting resembles "the anatomy of the pelvic region" and "Moses' birth is situated, quite appropriately, in the middle" [49].

In *Moses*, Kahlo provides the female response to Rivera's masculine universe. If Rivera paints Man, the Controller of the Universe, Kahlo is painting Woman: Creator of Life. The subtitle of the painting is *The Nucleus of Creation*. If Rivera's mural has a phallic arm controlling nature, then Kahlo's entire image can be viewed from afar as the universe as a uterus (the two reclining nudes forming the oviducts) about to give birth. As in Rivera's mural, there is a portrait gallery of famous individuals; but this is a painting where woman's fertility is the center of the universe. Indeed, Kahlo makes this clear in her diary accounts and her lecture on this painting [50–52]. The sun, which was one of those elements in Rivera's diagonals, is now a central element, the "creator and reproducer of life." The dividing cell, which had been engraved on the control panel of the controlling man, is now an active living agent. Like Klimt, she views the stages of cell division as proof that fertilization has succeeded. "On either side of the child," Kahlo explained in her lecture, "I put the elements of his creation, the fertilized ovum and cellular division." Moreover, Kahlo continues, Moses's basket is itself a womb (i.e. a womb within the womb), and the river in which this ark floats "signifies the maternal source in the birth of a child" [53]. As Bakewell [54] observed, the concentration on the vagina as an orifice of going out, not only of coming in, is also the subject of Kahlo's *My Birth* (1932), as well as the horrific element in her impalement by a metal rod at age 18.

Kahlo's female universe is not a passive world but a world of female generative power. For Kahlo, fertilization is the symbol for ultimate love and the one single law—life itself. "Everything moves according to one law—life. . . . All is all and one. Anguish and pain, pleasure and death, are nothing but a process in order to exist. . . . Universes and universal cells" [55]. The sperm and egg are these universal cells of creation and procreation. The sperm and egg are, as biologist F.R. Lillie claimed, "single cells, each on the point of death; but by their union a rejuvenated individual is formed, which

constitutes a link in the eternal process of Life" [56,57]. The universe and universal cells.

CODA

The cell is both a biological entity and a cultural artifact [58,59], and art and science interact in its interpretation. Artistic conventions are used to render living and stained cells as textbook representations [60–62], and artists reinterpret these textbook illustrations that have become part of our cultural matrix. The "cell," as well as the "sperm" and "egg," microscopic entities though they are, have become part of our cultural context thanks to their renderings in textbooks and popular culture. Thus it should not be surprising that not only Klimt, Rivera and Kahlo, but also Max Ernst [63], Odilon Redon [64], Wassily Kandinsky [65], Paul Klee, Peter Randall-Page [66] and Edvard Munch [67] have referenced cells in their artwork.

In particular, the sperm and the egg are continually being re-interpreted according to political norms and aspirations. The collective term for these sex cells, *gamete*, comes from the Greek *gamos* (marriage), and there is a microcosm/macrocosm relationship between the union of these sex cells and the union of men and women. The Biology and Gender Study Group [68,69] and Emily Martin [70] have shown that fertilization narratives model the expected interactions of men and women and that as courtship models changed, so did the scientific stories of sperm and egg. So it should not be surprising to see fertilization stories used in art as well.

As we have seen, Klimt, Kahlo and Rivera each took textbook representations of cells and used them as emblems of a larger reality. Klimt used blastocysts to show the victory of creativity over repression; Rivera painted ovarian follicles to show the victory of man over the forces of nature and procreation; and Kahlo employed fertilization and later development to show the act of ultimate love and the continuation of life. Interestingly, although these three paintings span a 50-year period and thousands of miles, the social interactions between scientists, physicians and avant-garde artists in the capital and Catholic cities of Mexico and Austria may have been very similar and especially conducive to the portrayal of scientific objects in art. Coomaraswamy claimed that a "three-fold path" of fertility, eroticism and endurance mediates natural objects into art [71,72]. This may also be true for the mediation of scien-

tific representations of natural objects into art, for these qualities are certainly seen in the presentation of cells by Klimt, Rivera and Kahlo.

Acknowledgments

Scott Gilbert is supported by the U.S. National Science Foundation and the Academy of Finland. The research of Sabine Brauckmann was financially supported by a Basic Research Grant PPIRT08907 of the Estonian Ministry of Education and Research and the University of Tartu (Estonia). We would like to thank Stacy Bomento for her administrative help.

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Manuscript received 10 May 2010.

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