

COMMON HUMAN ANCESTOR, CAMBRIAN EXPLOSION AND PUNCTUATED EQUILIBRIUM IN PHOTOGENETICS

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Abstract

Analysis of computation of photography in context of visual genetic analysis, but also genetic programming, is often limited to theory of genotype and phenotype, due to its relation to artificial life theory. This presentation dives back into historical pieces of photography computation to indicate presence of other genetic concepts, as; theory of common human ancestor, Cambrian explosion and punctuated equilibrium. By focusing on works of pioneers Nancy Burson, Gerhard Lang, and Mongrel, this presentation aims is to show how artistic experiments were not limited to a genetic master-narrative but also had worked with other hypotheses.

Keywords

Cambrian explosion, Common Ancestor, Evolution, Genetics, Photomontage, Photogenetics, Photography, Phototypes, Origin

Introduction

Technology, and more precisely post-photographic technology, allows us to test genetic combinations between humans, seeing how someone's children might look alike and crossing species that are vanishing. Thus, it permutes photographs of phenotype in order to provide some behind information of genotype. They can, besides conditions of existing faces, they can also compute some new faces of non-existing people from records of existing ones, as for example in Mike Tyka's *Portraits of Imaginary People* (2017), *Flick Kai* (2018) by Daniel Heiss, who entered 50 000 visitors into a photobooth to generate new faces, or Philip Wang's *This Person Does Not Exist* (2019), or *Face Generator* by Greg Surma. These artworks are commonly analyzed through general standpoints of Darwinian evolution, with assistance of concepts of genotype and phenotype theory by Wilhelm Johannsen; meaning that they show generations of successors in combinations of ancestors, forming family trees between parents (training set) and children (versions).

Succeeding Dawkins, not only on the metaphorical level, distinction between genotype and phenotype has been introduced in so-called genetic programming in the early nineties

[1]. Whitelaw draws the parallel between genetic and computed structures;

'Genetic algorithms, a central technique, roughly simulate biological genetics in digital computation. A genetic algorithm involves a 'genotype,' which is a string of code specifying a 'phenotype.' The phenotype can be any digital artifact: an artificial organism, a three-dimensional form, or a piece of software. By simulating the genetic variations caused by sexual reproduction and mutation, a genetic algorithm alters the genotype and the phenotype; and since this process is computational rather than biological, breeding is rapid and prolific.' [2]

Similarly, McCornack and D'Inverno concluded that 'the majority of evolutionary art systems produce programs (genotypes) which are compiled or interpreted and expected to produce artworks (phenotypes). However, the user is normally only shown the phenotypes' [3]. Yet, while postulating evolutionary theory, artificial creativity, or artificial life, frequently associated with so-called generative programming (GP) or the art of artificial evolution using so called 'creative evolutionary systems' [4] the 'art of artificial evolution' [5] also casts doubt on it, referring to creativity as creationism [6]. Besides this version of the 'origin', some of earlier artworks computing photographs also refer to other concepts in genetics.

By this analysis, I would like to show that besides Darwinian evolutionary theory, there are also accompanying theory of 'common ancestor', but as well theory of 'Cambrian explosion' that relates all species.

Based analogue combinations of negatives by eugenicist Sir Francis Galton, and latter experiments by Lewis Hine, in the second half of the Twentieth century, as the implementation of computers allowing the blending of many more images, a composite method was used more creatively and more frequently [7]. The first to compute photographs was an artist and programmer Lilian Schwartz, who worked at Bell Labs and who staid the most famous for blending image of Mona Lisa with Leonardo's self-portrait, proving morphological similarities [8] (Patterson 2015). Her works from 60s were covered with professional articles on image computation, in which she explained the method. Another author important for the computation of images was also a woman, Joan

Truckenbrod. She has continuously published on her implementation of photographs [9]. Yet, the most considerable advancement came from a photographer Nancy Burson, making first successful digital composites in collaboration with scientists from the Massachusetts Institute of Technology (MIT) in the eighties [10] Burson is often seen as a ‘pioneer of morphing’ [11], producing the earliest computer-refurbished morphs since 1979. The best known is Burson’s *The Age Machine* (1979) which enabled anticipating the ageing process from photographs [12]. In order to produce this piece, according to her own words, Burson was using originally a lot of makeup and re-photographed the process [13]. After a series of collaborations with the aim to produce the most perfect image blending, that included Carl Machover, Tom Schneider with whom Burson patented *The Method and Apparatus for Producing an Image of a Person’s Face at a Different Age*, she finally made method of image blending with Richard Carling and David Kramlich [14].

This new method included digitization of the images, overlaying the grid that can be stretched which served better adaptation. Grid is warped to meet the idea and visibility is chosen by the artist. In digital composite *Warhead I* (1982) images of political world leaders’ images during the Cold War Era, like Ronald Reagan, Leonid Brezhnev, Margaret Thatcher, Francois Mitterrand and Deng Xiaoping are attributed the amount of visibility that corresponds to the size of the territory they rule. Similar were morphs of different beauty standards; she used computers in *First and Second Beauty Composites* (1982 -ongoing) [7], *The First Beauty Composite* blended portraits of old Hollywood divas as Bette Davis, Audrey Hepburn, Grace Kelly, Sophia Loren and Marilyn Monroe. The *Second Beauty Composite* used faces of actresses of a younger generation such as Jane Fonda, Jacqueline Bisset, Diane Keaton, Brooke Shields and Meryl Streep. Producing morphs that can be marring and relativizing the beauty, beauty composites relativized the aesthetic criteria embodied in eugenics approaches. Aside of these morphs, focused on famous and iconic faces, Burson also developed visual systems that are used today, as development of the *Age Machine* that included person, relatives and another person of the age that has to be calculated) [15]. This method was exercised on images of missing children (Dee Scofield, Kurt Newton, both commissioned by their families in 1983, and Etan Patz commissioned by FBI in 1984). Its variants are used till today to locate numerous kidnapped children around the world. In *Fusion of Artistic and Scientific* writing, thus, Adams and Fuchs on the importance of the Age machine, pointing to commissions made by Federal Bureau of Investigation, claiming that ‘This same artistic use of technology has the potential for contributing to many areas of science’ [16].

Common human ancestor

Another artwork with a solid genetic input is *Evolution* (1984), in which Burson combines images of chimpanzees

and humans, lining them up as if to prove Erasmus Darwin’s theory of evolution. Goodyear noted, about prophetic Burson’s work:

‘... *portraiture has long reflected the impact of scientific and technological advances on perception of human identity. With the recent proliferation of digital media and the deciphering of human genome, this historic link has reasserted itself*’ [17].

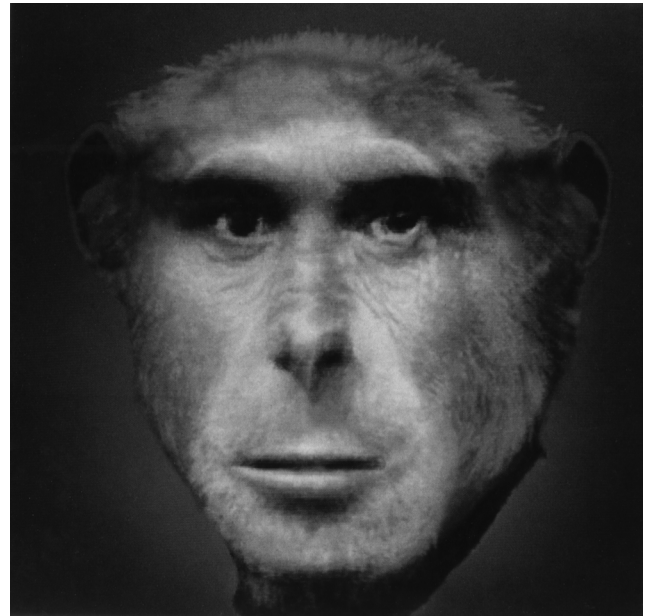


Figure 1. Nancy Burson: *Evolution* (1984). © Nancy Burson, with permission of the author.

Yet, not all the projects by Burson were practical and sociological. Burson also referred to rare genetic conditions in her other pieces, such as porphyry and cranio-facial disorders. Relativization of eugenics reached its peak in Burson and Kramlich’s work *The Human Race Machine* (2000), an interactive piece in which the user could change and alter their race by modifying photographic parameters, illustrating the fact that all human races actually share 99,97% genes.

In continuity to critical political analysis made by Nancy Burson, an artist collective known as Mongrel (Graham Harwood and Matsuko Yokokoji, with Richard Pierre-Davis and Mervin Jarman, occasionally with Matthew Fuller, 1995-2008) today running as YoHam, made a project based on photography, titled *National Heritage*. Artists describe the very rhizome of the project;

‘For National Heritage we did a massive photo shoot of friends, family, and students from Artec all in the same pose. Then we customized all the images to make up Frankenstein characters [...] Once we made the digital images, we then made an interface where you could

interact with the characters and where different storylines and narratives around racial issues would emerge.’ [18]



Figure 2. Mongrel: *Human race machine* (2000), ©Mongrel, Blackwhitemask, with permission of the author.

A section of this massive program was a hack of Photoshop 1, the program they named *Heritage gold* from 1998, they zipped and sent by e-mail. The program allowed blending of four skin types, changing various parameters, as social status and race. In the interview accompanying the show on Net.art, Mongrel describes the method. The program was used for a poster which Mongrel described in an interview to media theorist Geert Lovink;

‘M: Out of a total of 100 faces we made eight faces and divided them into four colours: black, brown, yellow and white, both men and women. It is all montage, digital photography. We tried to construct a white male, or black woman, according to what we think these categories look like. We can never prove that somebody is a white

² Mongrel, *Heritage Gold*. <https://anthology.rhizome.org/heritage-gold> simulation of the program can be run at <https://sites.rhizome.org/anthology/heritage-gold.html>

male person. How would you define a black person? There are no characteristics according to medical terms. There are no ‘real’ categories, only stereotypes.’ [19]

Basing their work on photographic image, Rhizome’s *Net.art Anthology* refers to its relation to ‘photography’s historical use as a tool to produce racist ‘evidence’ of genetic and social difference, Heritage Gold cast digital culture not as a more fluid social context, but one in which social categorization took on a new and ominous importance.’¹² This common ancestor is also well illustrated by *Family tree* (2001) piece by Chinese artist Zhang Huan. Huan writes on his face information on his ancestors coming up to the common human ancestor, advocated by Charles Darwin’s grandfather Erasmus in *Temple of Nature* (1803).

Cambrian explosion

While Burson and Mongrel relate races and monkeys to humans, works by Gerhard Lang do so with other species as well.

Lang’s *Palaanthropical Physiognomy* (1991-2000), exhibited originally at Venice Biennale 1995 show *Identity and Otherness: A Brief History of the Human Body Over the Last Century*, used a machine alike *Identikit*, a ‘montage unit’ device created in Fifties by Japanese company Minolta. The original purpose of the apparatus was to visually reconstruct faces of victims of nuclear bomb in Hiroshima and Nagasaki, by making a composite. Another version of this machine, now named *Phantombildgerät* was used by German police to track down terrorists, in connection to Baader Meinhof group. In *Palaeanthropical Physiognomy* (1991–1992) and the machine was used only on images of prisoners.

A box is consisting of four slots, a main and three reflecting ones, made to magnetically attach the slot with passport size of photos. The main image, onto which projection is made is put on the top, while three sides serve to add other images, which are reflected onto the main one. Each image has a reflective mirror in front, much alike Galton’s experiments at the end of his life, which is cut to shape human face; rectangular for eyes, triangular for nose and square for mouth area. As the mirrors are out of focus, elements run smoothly one into another, not showing sharp edges. Images can be slightly adapted in terms of size and sharpness matching. The apparatus has an output on video camera recording and broadcasting onto monitor. In the original production he works in collaboration with detectives, in police station in Wiesbaden, not allowed to use machine independently by himself.³ Lang blends images of people from the small village Schloss-Naues in which he lives, animals from zoo, as gorillas, oaks, but also insects as bees and skulls from

³ Latter he bought the machine from police.

Senckenberg Natural History Museum in Frankfurt as well as images of puppets. He made photographs by himself. In *Flores Umbrae*, Lang inter-breeds shadows of plants, being photographs producing inter-specie.



Figure 3. Gerhard Lang: Palaeanthropical Physiognomy Projections (1991–1992).

As this machine is created for humans physiognomy and it adapts to various species, Lang's pieces are showing the relationship among many species; mammals and insects. Contrary to previous authors in photomontage and computed images, his standing points, according to his own words, are not supporting Darwinian theory of the evolution but rather Jay Gould's idea of *Cambrian explosion*, which anticipated that all variety of species, including those we never met, were created at once, not by evolution [20]. And the times succeeding is the time of continuous loss.⁴

References

- [1] Juan Romero and Jesus Penousal Machado. *The Art of Artificial Evolution*. (Berlin and New York: Springer, 2007).
 [2] Mitchell Whitelaw. *Metacreation: Art and Artificial Life* (Cambridge and London: MIT Press, 2004).
 [3] Jon McCornack and Mark D'Inverno (eds.) *Computer and Creativity* Springer 2012), 48.

⁴ Fossils found at the beginning of the Twentieth century were showing that Cambrian explosion occurred 5 600 000 years ago. Scientists that interpreted them done so to support Darwinian

Punctuated equilibrium and artificial selection

Finally, the most challenging theory is advocated by Eva Sutton. A continuation of this work may be seen in Eva Sutton's made software that shows sped-up evolution and possible variants.⁵ Theory of 'punctuated equilibrium' shows by Gould and Niles Eldredge show the dynamics in which species change and find equilibrium, but also disappear is quick and short, rather than long as Darwin thought, and one of these appears with genetic alternation. Sutton writes;

„by the genetic manipulation of specific individuals, a compression of the evolutionary process occurs. What may have taken millennia to evolve, can now occur within one generation—a veritable nanosecond of evolutionary time.“ [21].

Conclusion

Analysis of computation of photography in context of visual genetic analysis, but also genetic programming have not researched a variety of genetic theories that can be implemented or illustrated by creative programming. Such analysis may be useful for not only art interpretation and art history, but as well serve as scientific illustrations.

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- [4] Peter Bentley and David Corne *Creative Evolutionary Systems*, (San Diego: Morgan Kaufmann, 2001): 129–144.
 [5] Romero, Juan and Jesus Penousal Machado. *The Art of Artificial Evolution*. (Berlin and New York Springer, 2007).
 [6] Raymond Williams, *Keywords* (revised ed.). (London: Fontana Press. Peter Bentley, 1983)
 [7] Ana Peraica, "Genotype, Phenotype, Phototype: Digital Photography, Biological Variety, and Excessive Overpopulation of Types", in: *Routledge Handbook of the Digital Environmental Humanities*, edited By: Charles Travis,

theory yet, in the Eighties, they were interpreted in the framework of Cambrian explosion

⁵ Eva Sutton. Still pictures. <https://www.evasutton.com/installations/mutations/still-pictures/>

- Deborah P. Dixon, Luke Bergmann, Robert Legg, Arlene Crampsie. (Abingdon and New York: Routledge, 2022)
- [8] Zabet Patterson. *Peripheral Vision: Bell Labs, the S-C 4020 and the Origins of Computer Art*, (Cambridge and London: MIT Press, 2015).
- [9] Joan Truckenbrod, "Creative Computer Imaging", *Comput & Graphics* 10(2, 1986): 1991-1997. Truckenbrod, Joan. "A New Language for Artistic Expression: The Electronic Arts Landscape", *Leonardo* (Supplemental Issue, Vol. 1. Electronic Art, 1988), 99-102. Joan Truckenbrod. "Physicalising the image, Physicalising the Digital", *International Journal of Art, Culture and Design Technologies* 2(1, 2012): 1-9.
- [10] Alexander Todorov, *Face Value* (Princeton, NJ: Princeton University Press, 2017), 89.
- [11] Anne Collins Goodyear. "Digitization, Genetics, and the Defacement of Portraiture", *American Art* 23 (2, 2009): 28-31. p. 29.
- [12] Rebecca Buselle. "A Defining Reality: The Photographs of Nancy Burson": *Aperture* 136 (Summer/ Metamorphoses: Photography in the Electronic Age, 1994): 73-75.
- [13] Burson interview with the author 2023.
- [15] Nancy Burson and Richard Carling, David Kramlich, *Composites: Computer Generated Portraits* (New York City: Beech Tree books, William Morrow, 1986).
- [16] Christopher Hookway. "...A Sort of Composite Photograph": Pragmatism, Ideas, and Schematism". *Transactions of the Charles S. Peirce Society* 38 (2/Winter-Spring, 2002): 29-45. p.31.
- [17] Nancy Burson and Richard Carling, David Kramlich, *Composites: Computer Generated Portraits* (New York City: Beech Tree books, William Morrow, 1986), 15.
- [18] Dennis Andams and Mary Fuchs. "The Fusion of Artistic and Scientific Thinking", *Art Education*, Vol. 38, No. 6 (Nov. 1985): 22-24.
- [19] Anne Collins Goodyear. "Digitization, Genetics, and the Defacement of Portraiture", *American Art* 23 (2, 2009): 28-31. p. 28
- [20] Mongrel Interview. <https://rhizome.org/editorial/2017/feb/02/mongrel-interview/>
- [21] Jay Gould, Stephen. *Ontogeny and Phylogeny*. (Belknap University Press, 1977)
- [13] Eva Sutton. Still pictures. <https://www.eva-sutton.com/installations/mutations/still-pictures/>
- Burson, Nancy and Richard Carling, David Kramlich, *Composites: Computer Generated Portraits*. (Beech Tree books William Morrow, 1986)
- Buselle, Rebecca "A Defining Reality: The Photographs of Nancy Burson": *Aperture* 136 (Summer/ Metamorphoses: Photography in the Electronic Age, 1994): 73-75.
- Collins, Anne Goodyear. "Digitization, Genetics, and the Defacement of Portraiture", *American Art* 23 (2, 2009): 28-31. p. 29.
- Goodyear, Anne Collins. "Digitization, Genetics, and the Defacement of Portraiture", *American Art* 23 (2, 2009): 28-31. p. 28
- Gould, Stephen. Jay. *Ontogeny and Phylogeny*. (Belknap University Press, 1977)
- Hookway, Christopher. "...A Sort of Composite Photograph": Pragmatism, Ideas, and Schematism". *Transactions of the Charles S. Peirce Society* 38 (2/Winter-Spring, 2002): 29-45.
- Jon McCornack and Mark D'Inverno (eds.) *Computer and Creativity* Springer 2012),
- Mongrel Interview. <https://rhizome.org/editorial/2017/feb/02/mongrel-interview/>
- Patterson, Zabet. *Peripheral Vision: Bell Labs, the S-C 4020 and the Origins of Computer Art*, MIT Press.
- Peraica, Ana. "Genotype, Phenotype, Phototype: Digital Photography, Biological Variety, and Excessive Overpopulation of Types", in: *Routledge Handbook of the Digital Environmental Humanities*, edited By: Charles Travis, Deborah P. Dixon, Luke Bergmann, Robert Legg, Arlene Crampsie. (Abingdon and New York: Routledge, 2022)
- Romero, Juan and Jesus Penousal Machado. *The Art of Artificial Evolution*. (Springer, 2007).
- Todorov, Alexander. *Face Value* (Princeton University Press, 2017).
- Truckenbrod, Joan "Creative Computer Imaging", *Comput & Graphics* 10(2, 1986): 1991-1997.
- Truckenbrod, Joan. "A New Language for Artistic Expression: The Electronic Arts Landscape", *Leonardo* (Supplemental Issue, Vol. 1. Electronic Art, 1988), 99-102.
- Truckenbrod, Joan. "Physicalising the image, Physicalising the Digital", *International Journal of Art, Culture and Design Technologies* 2(1, 2012): 1-9.
- Whitelaw, Mitchell. *Metacreation: Art and Artificial Life*. (Cambridge and London: MIT Press, 2004).
- Williams, Raymond. *Keywords* (revised ed.). (London: Fontana Press. Peter Bentley, 1983)

Bibliography

Adams, Dennis and Mary Fuchs. "The Fusion of Artistic and Scientific Thinking", *Art Education*, Vol. 38, No. 6 (Nov. 1985): 22-24.

Bentley, Peter and David Corne *Creative Evolutionary Systems*, (San Diego: Morgan Kaufmann, 2001), 129-144.

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