18

The Relative Velocity Inscription Device

Paul Vanouse

Background: From Surface to Depth

"There is no scientific basis for race," proclaimed scientists in the summer of 2000, as the completion of the rough draft of the Human Genome Project (HGP) was announced. In fact, the scientific basis for race had been disproved as early as 1950 by an international team of UNESCO scientists, although perhaps with less fanfare.[1] The rationale for the recent statement was to allay public fears of a return to old scientific racisms that might coincide with a return to a biologically determinist framework of scientific investigation. While few imagine that culturally practiced racism will abate, a return to a massive state-sanctioned program of scientific racism now seems unlikely. For instance, the high percentage of black motorists stopped by U.S. police will probably be unaffected by the scientific proclamation, but we have likely seen the end of fanciful evolutionary models of racial development put forth by teams of scientists trying to ascertain average skull capacities of racialized groups.[2]

Racial categories were constructed based on external characteristics of groups (typically native populations in imperial colonies). The most surface characteristic of all—skin color—is the most frequent delimiter. As human genetics moves from the study of the body to the study of micro-bodies; from forms to underlying codes; varied critics have warned of subtler forms of scientific racism such as genetic or molecular racism. For instance, in family planning, the presence of parental genes for sickle-cell anemia has been used to discourage some black families from having children. As theorist Troy Duster notes, police have recently discussed using genetic databases to diagnose "potential" for aberrant behavior and, given the high proportion of blacks in the penal system, any statistical analysis of DNA may produce a self-fulfilling prophecy by implicating other black citizens. But the ultimate molecularization of racial stereotyping occurred in a recent

speech by James Watson, discoverer of the DNA double helix and principal investigator of the HGP. In a lecture at UC Berkeley in November of 2000, Watson discussed an experiment at the University of Arizona in which a group of male students were injected with melanin, the substance produced by genes that makes our skin dark. Watson claimed that the students quickly became sexually aroused—that is, they developed erections. We are left to assume that as the scientifically unpopular concept of race has been removed from skin color, a stigmatization and microanalysis of individual black-identified traits may follow. *Perhaps it is not the black body that is deemed prone to promiscuity, but blackness itself.* The very signifiers of race, rhetorically dislodged from their referents but still encoded within every cell in our bodies, could be personified as sexual deviants awaiting the opportunity to express themselves against our will and irrespective of environment.[3]

In order to address this tense space of contemporary genomics situated between the utopian pole of post-race and the historic racist pole of eugenics, I utilized an early publication by biologist Charles B. Davenport (and Morris Steggerda) called *Race Crossing in Jamaica.*[4] Davenport sought to disprove the theory of hybrid vigor by showing the ultimate inferiority of black/white hybrids. The study was particularly high profile because of its detailed methodology, which tabulated over one hundred examinations upon hundreds of human subjects. One of the factors that particularly intrigued me was the subject of performance, that is, tests of strength and motor control. It was obvious that these tests were the most biased by external, nongenetic factors, such as mood and occupation. Conversely, contemporary genomic studies insure a digital precision—a genetic trait is either present or absent with no ambiguities. All that would be necessary is to design the correct examination for the microbody and its value could be determined unambiguously. As my own family contains black/white hybrids of Jamaican descent, the subjects were easily selected—mother, father, sister, and brother (myself).

A Race about Race: DNA in Action

I refer to my artworks as "Operational Fictions." They are hybrid entities—simultaneously functional machines and fanciful representations—intended to resonate in the equally hyperreal context of the contemporary technologized landscape. In *The Relative Velocity Inscription Device* (*RVID*), I wanted to have genes from my own "bi-racial" family members literally compete with one another to determine the gene's fitness (figure 18.1). My goal was to build "a race about 'race'" in which (as theorist Bill Egginton adds) "the body has been erased." The multimedia installation is in fact a "real" scientific experiment, in which the entire process unfolds (live) in the space of public display.

Prior to installation of the experiment, the blood of each family member was drawn by Dr. Amos Dare. The DNA was isolated from these blood samples by Drs. Kelly Owens and Mary-Claire King, who then amplified specific genes understood to influence skin color, some of which varied between family members.[5] These genes were thereupon sub-

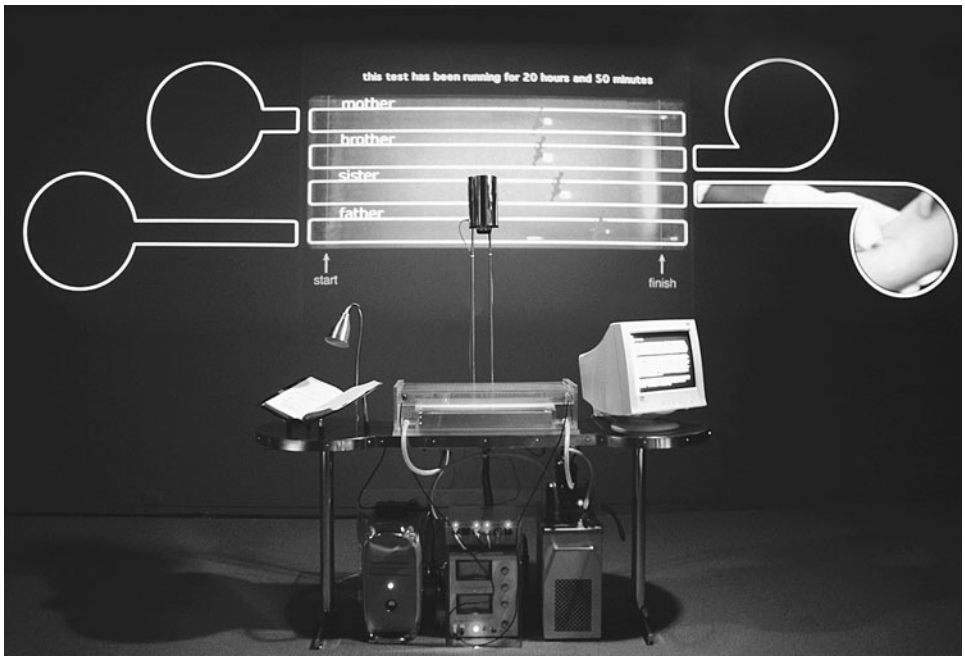

Figure 18.1

Paul Vanouse, *The Relative Velocity Inscription Device*, 2002. Installation view, dimensions variable, Henry Art Gallery, Seattle, WA.

jected to enzymes (invented by Dr. Owens) that cut the amplified genes. Whether an enzyme cuts or not depends on the presence or absence of one particular base of several hundred bases in a gene fragment. In each race these DNA fragments (one from each family member) were placed side by side in an electrophoresis gel (described later) and raced against one another in a series of twenty-three races.

The experiment employs a process called ''gel electrophoresis'' that allows us to discern the different rates at which fragments of the family members' DNA move through an electrically polarized gelatin. Gel electrophoresis is a scientific protocol generally used to analyze DNA fragments—the familiar representation being the ''DNA fingerprint.'' Gel electrophoresis involves first pouring a thin (agarose) gel of about one cm and allowing this gel to set. This gel is placed flat in a container and voltage is applied across the length of the gel. DNA is placed in small holes at the negatively polarized end of the gel (figure 18.2). The gel is composed of microscopic pores, which allows the DNA to slowly diffuse through the gel—however, all DNA is negatively charged and is electrically drawn toward the positive voltage at the far end of the gel. Thus, over a given time period, the

Figure 18.2
Paul Vanouse, *The Relative Velocity Inscription Device,* 2002. Every two to three days fresh DNA is inserted into the electrophoresis gel.

DNA samples migrate towards the electrically positive pole of the gel at consistent speeds that depend upon their molecular size. The electrophoresis rig designed for *RVID* is approximately thirty inches in length—longer than typically used in laboratories. This allows each dramatic contest to last for two to three full days.

The DNA samples in the gel glow when bathed in ultraviolet light. During ultraviolet light illumination, the samples' positions in the gel are captured digitally (with a specialized video camera), analyzed by a computer, and projected upon the rear wall, in order to ascertain the progress of the race at any time. The position of all samples at the conclusion of each race is stored in a database, which can be accessed by viewers via a touchscreen monitor.[6]

Viewer Experience: The Apparatus Itself

The RVID is by definition less of a device than it is an apparatus. A narrow, stainless steel workbench holds an assortment of technologies including the gel electrophoresis chamber, power supply, power switcher, computer, fluid circulator, and fluid cooler interconnected by tubes, cables, wires, and valves. The assemblage hums—each component producing distinct oscillating drones that are amplified by hidden microphones to produce a dense, emergent soundscape.

An image of the electrophoresis gel is captured live by a video camera and projected magnified onto the rear wall (figure 18.3). Individual lanes with the family member's

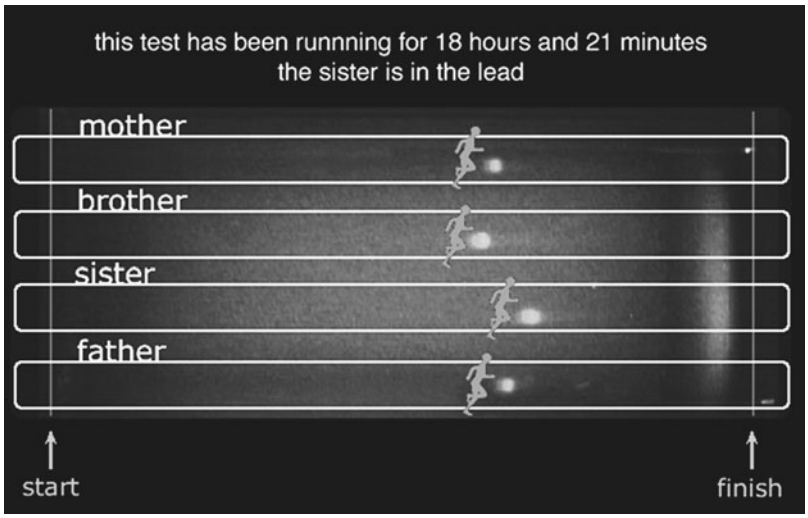

Figure 18.3

Paul Vanouse, *The Relative Velocity Inscription Device,* 2002. A live video image of *RVID* electrophoresis gel with graphical overlays. The four bright dots are individual DNA samples from the four family members, which are glowing because of the UV light irradiation below the gel.

names (Mother, Father, Sister, Brother) are superimposed atop the video feed. Every ten minutes, a new video frame is captured by the computer, and machine vision algorithms find the samples' current positions within it. To further underscore the metaphorical slippage between the DNA's movement through the gel and the individual family member's fitness, an animated icon of a running figure marks the position of each individual's DNA sample.

On the workbench, framing the electrophoresis rig, are a book (left) and touchscreen monitor (right). The book is a first edition of the actual, *Race Crossing in Jamaica* study, appropriately purchased from the collection of the anthropologist Dr. Henry Fairfield Osbourne. The text contains over five hundred pages of photographs, studies, family trees, and hypotheses about the problem of race-crossing. Key pages of the book are tagged. These pages describe (1) methodology, (2) individuals studied, (3) procedures, (4) results, and (5) conclusions. The touchscreen monitor displays a hypertext database borrowing the previously mentioned categories to describe the *RVID* experiment. The results are updated after each race and show the exact positions and relative velocities of each family member, in each race, at the time of its completion. The entire apparatus was designed to create a tension in regard to the viewer's relationship to this "genetic horserace," in terms of his or her own sense of racial identity.

Scientific Experiment as Live Spectacle

Several aspects of the work could not be performed live, including drawing blood, extracting DNA from the blood, and amplifying DNA from selected regions of skin color genes. *However, all other phases of the process take place live in the space of public display.* Since gel electrophoresis uses DNA fragments that (when stained) are visible to the naked eye, this technology was perfect for public display in that it is performed at a scale at which viewers can actually see what is happening. It was essential that viewers witness:

1. The experimental process itself—the DNA slowly moving through the polarized gelatin.
2. Its abstraction into data—the camera periodically grabbing images of the gelatin so that computerized image-processing algorithms could find the location of each sample, and track which sample crosses the finish-line first.
3. Records of previous races—the viewer can access, via touchscreen, the results of all previous races, which are updated automatically as the experiment runs.

Each of these processes occurs live in the public arena. *The gallery is not merely an incubation chamber in which a process is occurring, nor is it merely a display space to post the results of this experiment, but an entire automated laboratory where all the phases can be viewed and evaluated.*

Technological Addendum: Integration and Automation

RVID is an assemblage of three different processes that previously have not been combined into a single apparatus in laboratory practice: gel electrophoresis, UV florescence imaging, and machine vision.

To reiterate, gel electrophoresis is a laboratory procedure for separating DNA that was re-purposed in *RVID* for racing DNA. Some of the challenges in re-purposing this technology for public display involved making the DNA visible to the viewer. Typically, a gel is "imaged" outside the electrophoresis rig in a special, opaque cabinet that contains UV light. The scientist then views the DNA bands through a camera (since the DNA glows orange when stained and bathed in UV light, the camera blocks the harmful invisible UV light from the eyes of the scientist). *RVID* is built from a combination of UV-emitting clear acrylic and UV-opaque clear acrylic to allow the UV light to make the DNA glow as the experiment runs, while protecting the viewer from the harmful UV radiation. The computer-controlled camera periodically grabs images of the glowing DNA, and custom, machine-vision algorithms locate each glowing sample. This step was challenging to accomplish within the gallery context as background light levels change, the DNA florescence diminishes over time, and the coherence of a DNA band is reduced over long periods (two days) in the gel. The machine-vision algorithm, which corrects for varying

conditions, runs as follows: first, searches the camera image for pixels containing the highest intensity orange values; second, sorts these pixels into groups of adjacent pixels; and third, evaluates which of these groups are brightest and have the requisite size, shape, and density characteristics to determine the position of each DNA sample. It is through these steps that the software is able to determine the positions of samples at all points in the race and determine the winning sample at the end of each race.

A single Macintosh computer regulates the entire apparatus. This computer controls power to all of the electrophoresis equipment via a custom electrical switcher box, turning on voltage, UV lights, cooling fans, and fluid circulation pumps. It captures camera images and evaluates DNA positions. As viewers observe, the computer updates the projected image—showing an enlarged image of the gel—and highlights the position of each sample. It also stores information from each race and makes it available to viewers via a touchscreen display. This allows viewers to grasp the relationship of the specific moment in the race to the larger scope of the *RVID* experiment.

RVID was created with funds from the New York State Council for the Arts and the Henry Art Gallery in Seattle, Washington.

Notes

1. Discussed by Evelynn M. Hammonds, "New Technologies of Race," in *Processed Lives: Gender and Technology in Everyday Life*, ed. Jennifer Terry and Melodie Calvert (New York: Routledge, 1997).

2. The term "racial groups" implies a natural essence to the designation of racial type; on the other hand, the term "racialized groups" denotes the fact that race is a cultural construction and that a given group was actively "racialized."

3. Paul Vanouse, "Race, Inter-Race and Post-Race in the Study of Human Genetics," *Afterimage* (September–October, 2002).

4. Charles B. Davenport and Morris Steggerda, *Race Crossing in Jamaica* (Washington, DC: Carnegie Institute, 1929).

5. The amplification process is used to increase the amount of a small sample.

6. The fully tabulated results from the first *RVID* experiments (twenty-three races) at the Henry Art Gallery in Seattle, WA, were published in "A Race about Race," see note #3. In these races, the Mother's DNA showed the highest relative velocity, followed closely by Father, Sister, and Brother.