Integral yet invisible, the centuries-old technique of architectural projection forms the foundation for contemporary digital work. The digital promise has been sold to architects as "new" and "revolutionary;" the assumption is that traditional modes of communicating design are obsolete, and superseded by the computer. But the seamless interface of 3-D modeling programs belies the familiar conventions of perspectival (central) and orthographic (parallel) projection hiding beneath. A digital rendering is made using vanishing points, horizon lines, and converging lines just as a drawing made by hand. Even digital lighting takes established rules of sciagraphy formed long before the computer and photography existed. The great leap forward is not the adoption of new paradigms, but the manipulations of familiar ones in real time.

The comfort with which architects have adopted digital technology is countered by the difficulty of physically representing the digital; that is, getting the design out of the computer. Architecture cannot exist in the digital world alone; the physical manifestation of three-dimensional space is always a requisite of design, either at full-scale construction or as a physical model. Laser cutting, CNC milling, fused deposition modeling, and other digital fabrication methods afford unprecedented precision and automation in a variety of materials. These processes also provide renewed exploration of the familiar and invisible apparatuses that make architectural representation possible.

To translate digital 3-D into physical 3-D, an architect employs a variety of projection methods. The digital model must be unfolded, sliced, draped, sectioned, or flattened to provide a useable fabrication file. Many of these operations require orthographic projection, often automated by the computer program. But rather than assume that the automation allows...
the architect to skip orthography, should digital architecture not demand a more complex understanding of projection methods?

Parallel Projections is a “cookbook” of both digital and analog projection methods. Each station investigates a variety of techniques and combines them to produce manipulations of historical data, reimpressions of everyday context, experiments in advanced technology, and explorations of phenomenal experience.

Vantage Tees

Almost simultaneous with the codification of perspective in the 15th century, distortions and perversions of perspective became part of the rise of verisimilitude in drawing. Anamorphosis, a cousin of perspective, is an image projected obliquely against a surface, obfuscating the content until the viewer stands at the point of projection. This distortion was immediately popular because of the ability to hide subversive images, typically political messages or erotic imagery—useful in an age of royal court intrigue and pious decorum. Erhard Schön, student of Albrecht Dürer, was especially talented in his anamorphic projections, producing erotic murals visible only to the lord of the house from his private bedroom.

The contemporary t-shirt has enjoyed a central place in popular culture, where images can announce counter-cultural messages, declarations of beliefs, and signs of tribe membership. All t-shirts face out; they are all intended for frontal presentation to the public. What if that traditional role was reversed? Vantage Tees contain anamorphically distorted images that only the wearer can decipher. The shirts contain images not generally acceptable to the public: erotic and explicit sexual imagery, politically sensitive messages, and extremely violent images of death. These are all

To view the anamorphosis, hold the anamorphosis against your chest (image out) with the top of the page just under your chin. Look downward, as modeled at lower right, to reveal the image.
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Profilograph (After Muybridge)

“Profiligraphy” is a neologism outlining a technique of drawing through subsequent contours or profiles. It assumes a three-dimensional form or space through the accumulation of adjacent two-dimensional profile lines. Applied to temporally derived data, such as frames from a film, the extrusion made from the extrapolation of in-between frame data becomes a physical manifestation of motion. Slicing through the extrusion (parallel to the film plane) with increasing depth yields a morphing between frames.

In the case of Eadweard Muybridge’s cinematic studies of animal locomotion, a series of still cameras capture the running horse in sequence, a form of proto-cinema used to freeze fast and complex motion in the natural world. A typical sequence used twelve cameras at regular intervals to capture one cycle of a horse’s gallop. By cinema standards, this is quite sparse. There is a lot of data missing between each frame. By tracing the Muybridge frames, and working them in the computer through a series of digital operations such as lofting, network surfacing, and extrusions, the in-between data materializes in a solid model tracing the full motion of images that are custom to the wearer, both in content and distortion. Different body types yield different surfaces onto which images are projected; a pregnant woman yields a different distortion than an athletic male.
the horse’s run. Taking a slice through any point will yield a new frame in Muybridge’s sequence. Since the model is contiguous, there are an infinite number of frames that can be generated from the original twelve.

The digital model is separated into smaller portions based on the dimensional limits of the 3-D printer. The starch parts are removed from the machine, cleaned, and hand-dipped in hot wax. Wax gates, or channels, are melted into place to provide a path for the molten bronze. The wax assembly is dipped into a slurry mix of ceramic, silica, and binder, waiting for each coat to dry before applying the subsequent layer. After the final coat has dried, they are flash-burned in a 1700 degree kiln and all of the 3-D printer starch and hand-applied wax burns out, leaving a hollow ceramic shell. The shells are heated to 1650 degrees, molten bronze (2150 degrees) is poured, and the molds are left to cool. Once cool, the molds are shattered, excess bronze is cut away, the pieces are welded together into the final form and sandblasted, and a patina is applied to make the final surface finish.
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