

## Projecting the Invisible

By Bob Bernard

Long Beach Opera's March production of Philip Glass' *Akhmaten* pushed the already-expanding horizon of projected operatic stagecraft well beyond anything previously done.

A jumble of cardboard boxes, a few vertical panels, and a pivotable rake were displayed with startling effectiveness as being a ceremonial altar and a processional ramp, right along with imbuing the dance ensemble's choreography with a sense of dramatic urgency that would have been otherwise unrealizable with a straightforward display of human motion. Below is a photo of the repositionable ramp, taken alongside one of the vertical panels. The rake is 18 degrees—about 4 degrees greater than that used by David Hockney for LA Opera's *Tristan*, but considerably less than what Achim Freyer used for LA Opera's *Ring*.

The on-going technological evolution in stagecraft lighting has been gathering speed: In 2007, LA Opera used pre-recorded projections that depicted the descent into the dungeon in *Fidelio*; In 2008, soldiers marched up a wall of virtual grass, with their footsteps initiating ripples in the meadow in the Met's *La Damnation de Faust*; LA Opera affected virtual scene transformations in 2010's *Die Gezeichneten*; and, of course, of recent date both LA Opera and the Met have integrated pre-recorded video material with the moving about of massive stage machinery for their respective productions of Wagner's *Ring*.

Now, LBO's recent venture was accomplished via a three-step process:

1. The stage was illuminated with infrared (IR) light from a selection of three locations.
2. The reflected IR was sensed, processed, blended in computers matched to each light source, and transferred into the visible spectrum.
3. Selected images (being blended and processed) were then projected in a real-time operation, the only delays being miniscule computer frame times.

Conversations with Interactive Video Designer Frieder Weiss and Lighting Designer Dan Weingarten keyed the understanding of the technical process. To begin with, IR light was used as an additional illuminating source because IR lies outside the visible spectrum, thus creating an independency from visible light, even allowing for the use of cameras in almost total darkness. Commercial IR sources are very expensive, so this production employed an often used, jury-

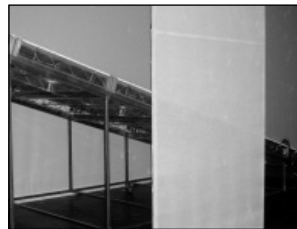
rigged technique: standard tungsten theater lights were used, with color gels placed over the tungsten's output, filtering out the visible spectrum.

Projection/sensing locations for *Akhmaten* were: (1) The Terrace Theatre's cyclorama—looking “head on” from audience orchestra level to full stage; (2) Directly overhead from center stage; and (3) High on stage right (approximately 45 degrees up from the stage floor). Operational logistics dictated that there had to be a division of labor among these two creative team members: Lighting Designer Weingarten implemented the modulations in the intensity of IR projected to the three stage locations, while Video Designer Weiss processed the sensed IR and programmed the visible projections seen by the audience. These latter projections were typically projected onto the large front scrim (cooperatively rented from LA Opera).

Mr. Weingarten summarized the on-going creative team work: “As we progressed through the opera, Frieder would ask for more or less IR in these locations in order to get an appropriate contrast between the people & props against the background,” and, then summing up the situation, “Essentially there were two lighting designs in the opera: the one we could see, and the one we could not.”

Here from the opening scene, IR was concentrated on the rake, creating a separation between the dancer's motion and the floor below, the computer producing a line drawing of the dancer as he moved and projecting that drawing onto the cyclorama.

In a composite projection/dance/ceremonial scene, *Akhmaten* and family are visually isolated on a platform, while dancers go through a series of hieroglyphic poses. These poses, sensed and stored in one of the computers, are then time-delayed and projected back onto the front scrim, each of the succeeding elevated lines of dancer images being delayed a different amount of time from when first sensed.



Pivotable ramp & vertical panel

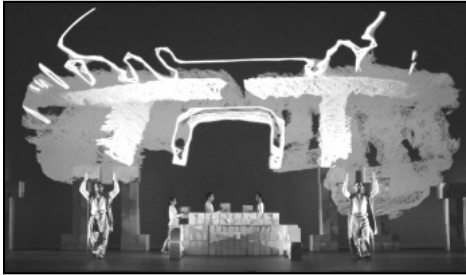


Opening scene



Hieroglyphic poses

In the following example, the “C” and “T” shaped images were first sensed from directly above as the dancers came on stage, the rotated “C” being the image of the altar under construction and the dual “T”s being the cumulative reflected images of the dancers moving about while placing boxes on this altar. This composite representation was then, in effect, rotated 90 degrees towards the audience by transferring the image to the computer that, in turn, projected the scene onto the front scrim.



*Altar ceremony*

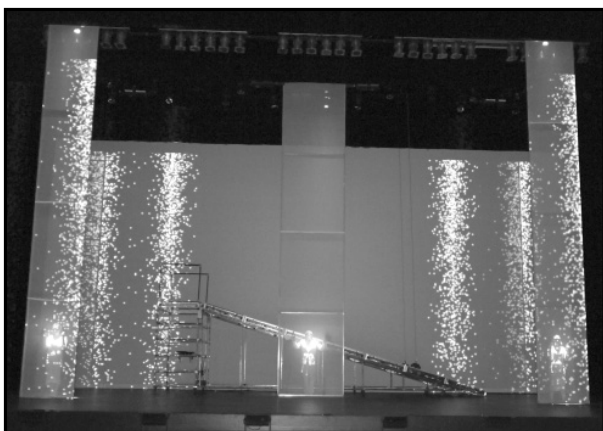
Some people find a Philip Glass opera, with its relentless, reiterative arpeggiation, to be quasi-meditative and a bit static while scene changes are occurring. To ameliorate these transitions, Video Designer Weiss employed his sole “semi-canned” program, a basic, full-screen pixel raster image, which he would cause to swirl about in dynamic harmony with what was the ambient on-stage background. Here Mr. Weiss added a colored flow of pixels to the isolated image of Akhnaten, the color and directional flow of the pixels controlled by manipulating his iPad.



*Akhnaten orates*

Another application using pixel raster imaging involved the projection of vertical lines onto a group of panels. These vertical lines, centered on each panel, served as reference points for selected element groupings of raster pixels, the orientation of these pixels being programmed so as to congregate symmetrically about their respective vertical references, resulting in a group of floor-to-ceiling, column-like images:

Finally, here is an example of the above pixel rastering technique being combined with another camera-to-



*Raster columns*

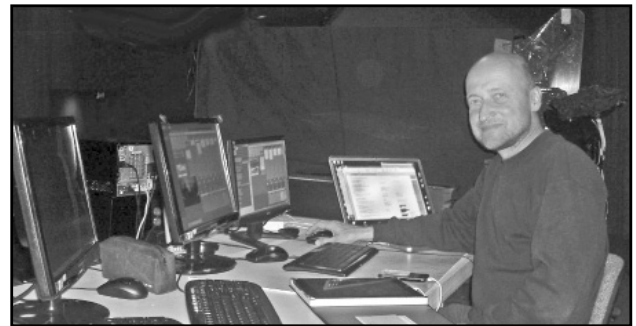
computer-to-projection image technique, producing dramatization of dancer motion. Note how each of the group of dancers (lower left-hand corner of image) are encased in an envelope of white light. This three-step process went like this:

- Each dancer’s motion was sensed and stored in a computer
- A selected (brief) period of time later a succeeding collection of dancer positions were sensed and also stored
- The difference between dancer positions was computed, amplified (producing the white light), and projected onto the front scrim



*Dance dramatization*

Interactive Video Designer Frieder Weiss, working so intently with the invisible, was almost invisible himself: Here we see him, situated at his work station at the rear of the Terrace Theatre, Orchestra level, armed with a trio of computer monitors, keyboards and an iPad, poised to function as busily as the proverbial ‘one-armed paperhanger’.



*Man at work*

This production of Akhnaten pointed a way to a cost-effective implementation of visual displays. With Necessity continuing to be ‘The Mother of Invention’, the combination of computers, IR technology, and evermore powerful projectors will be most certainly be functioning as a midwife for the next generation of stagecraft.

Acknowledgements:

Production photographs by Keith Ian Polakoff for LBO  
Photos of Mr. Weiss and of the backstage ramp & panel by Bob Bernard