

Final Report

## **The Uses of Additive Light Blending**

**by David Duclos**

**A report on a workshop conducted under the auspices of Nightswimming's Pure Research program, in association with the University of Toronto's Graduate Centre for Study of Drama. Conducted at the Centre's Glen Morris Studio Theatre, in Toronto, October 19-23, 2010.**

---

My investigations and activity in the Pure Research program were aimed at the question: does additive light blending have a role to play in modern stage light design?

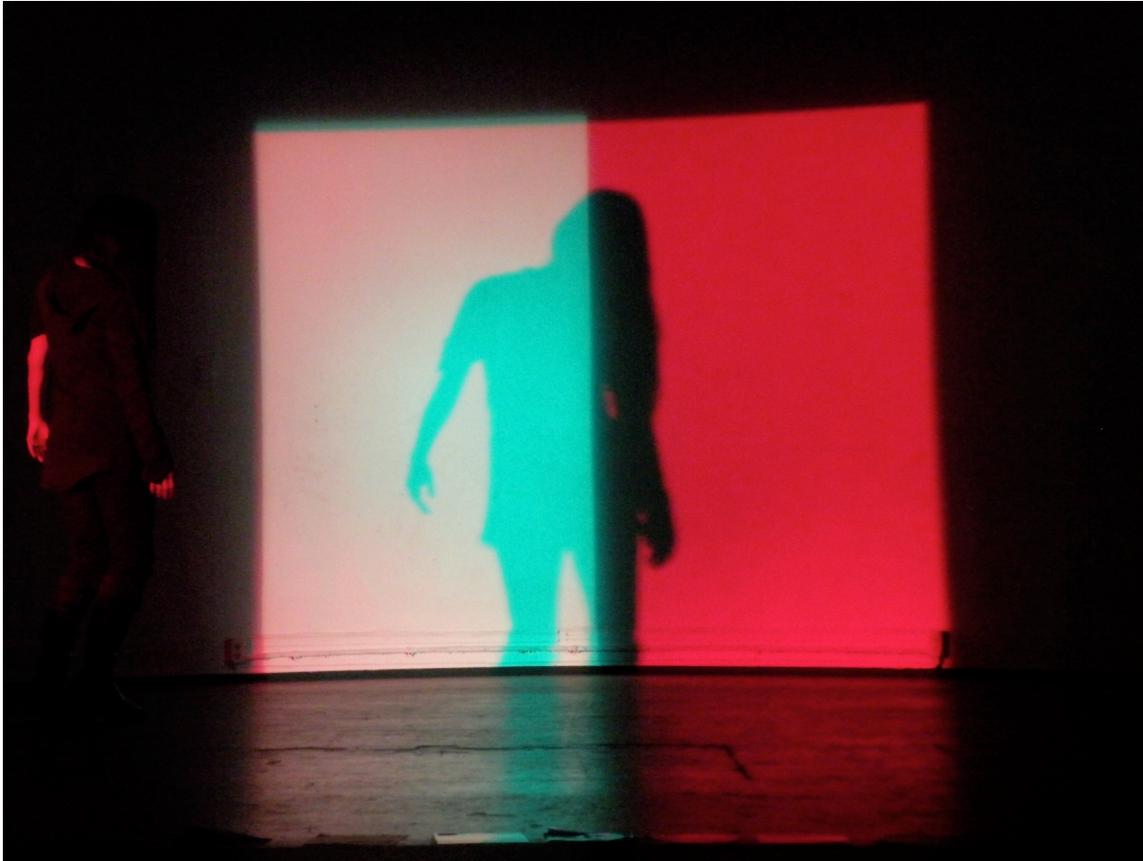
Briefly, Additive Light Theory explains how coloured light sources combine or blend when they strike a (white) target. When blending light, the primary colours are red, green and blue (RGB). In theory, by mixing these primary colours in various proportions, every other colour in the visible spectrum can be produced. Thus, aiming a beam of blue light and a second, separate beam of green light at the same target will produce cyan; red and green will produce yellow; and red and blue will produce magenta. Cyan, yellow and magenta are secondary colours.

The invention of gelatinous filters (called "gels") has largely made the practice of live light blending obsolete. Gels offer the lighting designer a huge range of colour at a great economy of cost – in comparison to which the use of primary coloured glass filters is limiting and cumbersome.

After five structured workshop sessions, my conclusion is that, in some circumstances, live light blending produces some effects which cannot otherwise be achieved.

The most interesting, vibrant effects are to be found in the shadows. This is limiting in two senses: first, shadow-based effects are used only in specific, isolated circumstances in theatre and dance. Second, in order to throw shadows with any precision, a rigid blocking geometry must be maintained. Actors or dancers must have a keen awareness of position with respect to light.

That said, the magic of the effect is compelling. Have you ever seen a blue shadow?



*Dancer Andrea Nann's shadow bifurcated in 2 colours. Photo by Brian Quirt*

**Method:**

In order to conduct my investigations, I set up two modern stage lamps (I chose Source 4's because they produce a cool, white light) and aimed them at a white sphere (a balloon) suspended against a white backdrop.

I had chosen a set of 4 red, 4 green and 4 blue gels. These colours were chosen with a view to having a range of colour temperatures and saturations. I methodically worked through all possible colour combinations, pausing to take a digital photo of each result.

On the second day, I extended this range by adding cyan, yellow and magenta gels so that I could catalogue primary/secondary blends.

I then added a set of coloured balloons to the mix, to investigate (briefly) how additive blending of light sources combines with subtractive blending on the target: in other words, for example, what happens when a red light strikes a green object? (The object appears to turn blue....)

I should note that I was assisted by a student at the University of Toronto's Graduate Centre for Study of Drama, Mr. Vojin Vasovic.

**Summary:**

Day One was characterized by set-up and hard work. We photographed all possible colour combinations and thereby exhausted all our preconceived ideas. At the end of the day, with the remainder of our time, we played with the placement of our lamps and made a very exciting discovery: by separating the light sources far left and far right, we were able to produce stunning, saturated, *coloured* shadows.

Day Two we discovered that all the previous days' photos were in the wrong format. The digital camera was compressing data and thereby altering the resulting image. We re-set the camera to RAW format but very quickly got carried away, playing with the previous day's discovery and abandoning all methodology.

Day Three was all method. We re-shot the entire catalogue in RAW format. We were unable to examine our images on the computer when we discovered that new software was required in order to read and process RAW format image files

Day Four: with the new software in place, much to our dismay, we discovered that all our images were underexposed. We re-read the camera manual, learned about "white balance" and we re-shot the entire catalogue.

Day Five we presented our findings to a select group of invited colleagues.

In summary, I learned a lot about my camera; a lot about photographing light in RAW format; and a lot about my laptop and its software programs. I learned that a laptop and digital camera are fantastic, portable resources for a lighting designer to have on site! And I learned a lot about light and colour blending.

**Conclusion:**

It is interesting to realize that the effect I sought and found lay not on the object being lit, but in the shadow. The trick works because the light hitting the wall blends to white. The observer assumes this light is being produced in the usual fashion – by a single filament, or series thereof. A shadow is a cancelation of light. By canceling one of the colours making the white-blend, the other colour leaps forth.

The photographic catalogue is useful because it references which gel combinations blend to white.

It's an interesting trick, colouring the shadows, but it is also a trick capable of "up-staging" the action. In other words, the back wall or screen becomes more interesting than the performers...which is fine, but not something always welcome.

If, however, the screen and its shadows were the focus and reason for the show... it might feel and look like an action-painting with light. So there is an idea for the future here, too, for which I am grateful.

The opportunity to conduct this research was timely and exciting. There is no question that it has added depth and dimensionality to my work as an artist.

I would like to express my heartfelt thanks to Nightswimming for supporting this work.

**David Duclos is a theatre set and light designer, and a painter. Recently, he has designed theatre environments for bluemouth inc. (*Dance Marathon*), Andrea Nann (*Beside Each Other*), and Peter Chin (*Transmission of the Invisible*).**

*For more information about Nightswimming: [www.nightswimmingtheatre.com](http://www.nightswimmingtheatre.com)*

*Pure Research is conducted in association with the University of Toronto Graduate Centre for Study of Drama: <http://www.gradrama.utoronto.ca/>*