Linda Jean Fisher
Ninety Red Crosses (2005)

The Actual Catalyst For This Volume Project:
That summer of 1928, Robert was also reading the 1922 novel ***The Enormous Room,*** an account by e. e. cummings of his four-month incarceration in a French wartime prison camp. He loved cummings' notion that a man stripped of all his possessions can nevertheless find personal freedom in the most spartan of surroundings. The story would take on a new meaning for him after 1954. (p. 72, ***American Prometheus, The Triumph and Tragedy of J. Robert Oppenheimer,*** Kai Bird and Martin J. Sherwin)

A Brief Synopsis Regarding Edward Estlin Cummings' Imprisonment:
(From *Answers.com*)
Edward Estlin Cummings went to France in 1917 as a volunteer for the Norton-Harjes Ambulance Corps in the First World War. However, due to an organizational mix-up, Cummings was not assigned to a unit for five weeks, during which he stayed in Paris. During this time Cummings became enamored with the city, which he would return to throughout his life. Cummings was eventually assigned to an ambulance unit, though, after five months, he and a friend, William Slater Brown, were arrested on 21 September 1917 on suspicion of espionage (the two openly expressed pacifist views on the war). The two were sent to a detention camp, the *Dépôt de Triage*, in La Ferté-Macé, Orne, Normandy for ninety days. Cummings' experiences in the camp are later related in his novel ***The Enormous Room***. He was released from the camp on 19 December 1917, after much intervention from his father.

A Brief Overview of J. Robert Oppenheimer's Career:
(From *Wikipedia*, the free encyclopedia)
J. Robert Oppenheimer (April 22, 1904 – February 18, 1967) was an American theoretical physicist of German-Jewish origin, best known for his role as the scientific director of the Manhattan Project, the World War II effort to develop the first nuclear weapons, at the secret Los Alamos laboratory in New Mexico. Known colloquially as "the father of the atomic bomb", Oppenheimer lamented the weapon's killing power after it was used to destroy the Japanese cities of Hiroshima and Nagasaki. After the war, he was a chief advisor to the newly created Atomic Energy Commission and used that position to lobby for international control of atomic energy and to avert the nuclear arms race with the Soviet Union. After invoking the ire of many politicians and scientists with his outspoken political opinions during the Red Scare, he had his security clearance revoked in a much-publicized and politicized hearing in 1954. Though stripped of his direct political influence, Oppenheimer continued to lecture, write, and work in physics. A decade later, President Lyndon B. Johnson awarded him the Enrico Fermi Award as a gesture of rehabilitation. As a scientist, Oppenheimer is remembered most for being a chief founder of the American school of theoretical physics while at the University of California, Berkeley

Pulling It All Together:
At 7:09 a.m., 25 July 2005 the following three things came to mind simultaneously: the term personal freedom, Cummings' ninety-day incarceration, and Oppenheimer's 1954 security hearing. I had just entered my live/work space and was walking up the stairs that lead into the studio. At the top of the staircase I looked around my stark 16 ft. x 756 sq. ft. "enormous room." I recognized the fact that over the last three years I have stripped myself of

everything I want in order to do what I need. Doing what I need is my personal freedom and I found it by letting go of unnecessary belongings.

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I happened to be carrying my copy of ***The Enormous Room*** and glanced down at the cover. It has a red cross with barbed wire running across it. The red cross gave me the idea to commit to painting ninety crosses in the red hue family in ninety days. One red cross for each of the days Cummings was in prison. I would start the project on 21 September 2005 and would have to be finished no later than 19 December 2005.

Ninety Red Crosses is a single work consisting of ten rows of nine 11" x 8.5" acrylic paintings on paper. For this "volume project" (**A 'volume project' is a designated number of works of art that must be completed within a certain time period while adhering to specific regulations. The sum of the works and the duration of time for which I create a production schedule are drawn from history or personal living experiences. The rules I follow were established to sustain the output of the production schedule.**) I wanted to restrict myself to the barest essentials. I set out to use a limited number of palettes to color the same design in quantity as if I were a machine. While working on ***Hundred Hearts*** and ***Fifty Eggs*** I explored such things as color arrangements, color mixing procedures, variations within hue families as defined by The Munsell Color Standard, and color effects including luster, luminosity, and iridescence. Although I was following the basic principles of mass-producing an object, I could not resist the challenge of an opportune experiment. Now I wondered if it were possible for me to paint ninety pieces without stopping to think. I thought that if Cummings and Oppenheimer could find their personal freedom after being stripped of possessions or power— that the paintings could find their personal freedom after being stripped of the person painting them.

I drew a cross with the same proportions as the one on the book cover using *Microsoft Word's AutoShapes*. It is constructed from five bands. The central band is .375" wide and the two inner and outer bands are .25" wide. For the first forty crosses I was able to stick to my original project format. Well, sort of. Some of the palettes were pure colors, tints, tones, and shades mixed from members of the red hue family in my inventory and some were reds that I mixed using members of the red-purple and yellow hue families. So I did experiment— but in moderation.

While I was working on ***2005-272 (red cross 40)*** I became preoccupied with an illustration exploring simultaneous contrast in Johannes Itten's ***The Elements of Color***. Each of the six pure color squares on page 53 includes a small neutral gray square matching the background color in brightness. Each gray square seems to be tinted with the complementary of the background. I was convinced it was a trick and needed to conduct the same test with my paints. But in order to carry out this experiment, I would have to let go of my aim to strip the paintings of the painter. Then it occurred to me that it was the paintings themselves

who made the decision to explore simultaneous contrast. One painting develops out of all the paintings and learning before it and feeds the ones after it. If I stuck to my initial objective it would be for me and not for the paintings. The paintings found personal freedom as soon as I stripped them of my intent.

For ***2005-273 (red cross 41)*** I created a 5.5" x 5.5" cross out of a .625" band. I colored it in using *Golden Artist Colors Neutral Gray N4*. I painted the 7" x 7" square-shaped background area with pure Chromium Oxide Green because it matches the gray cross in brightness and is red's complement. When I finished filling in the design the gray cross did indeed appear reddish.

Next, while I was painting ***2005-28 (red cross 48)*** I began to reread parts of one of my first books in the field of color. Faber Birren's ***Creative Color*** is a course divided in two sections: the first is dedicated to academic tradition, and the second focuses on the human perception of color effects. Each chapter contains experiments that the reader can execute and collect as visual notes. Chapter Five concentrates on the *uniform chroma scale—colors which have the same apparent color content but which differ in lightness and darkness*. (***Creative Color,*** Faber Birren, p. 27) *To make a uniform chroma scale of pink, for example, the high value may consist merely of white and red. As deeper values are mixed, black plus a touch of red will be added. If the scale extends down to maroon, the low value may have no white in it at all and may be comprised solely of red and black. Each step in the scale, however, whether light or dark, will appear to contain the same amount of hue.* (***Creative Color,*** Faber Birren, p. 28)

Faber Birren credits Wilhelm Ostwald (German, born 2 September 1853, Riga, Latvia; died 1932) for recognizing and scientifically defining the uniform chroma scale. These scales run in vertical rows about the gray scale in the Ostwald color system. In Chapter Six, Birren introduces *The Birren Color Equation*. It expresses the principles of color arrangement in mathematical terms and is directly related to the work of Ewald Hering (Austrian physician, born May 3, 1866, Vienna; died 1948) and Wilhelm Ostwald. *It plots colors in neat visual and psychological order—and uses mathematics rather than 'feeling' to accomplish this. In each instance, the first number gives the white content of each color, and the second number gives the black content. The hue content is not included; it is the difference between the sum of these two numbers and 100.* (***Creative Color,*** Faber Birren, p. 32)

I thought it would be good practice to mix my own uniform chroma scales and compare them to the scales I mixed using *The Birren Color Equation*. Especially because I never felt I had done enough them enough back in October 2001 (twenty-two scales painted from 12 October 2001 through 22 October 2001 to be exact).

One painting develops out of all the paintings and learning before it and feeds the ones after it.

Then I reviewed color value and sequence in Chapter Nine. I came upon two diagrams on page 43 that I had never understood. They illustrate how both the Munsell and Ostwald color systems scale pure hues. Later on, Birren writes *there are two ways in which colors*

may be scaled—first in straight horizontal rows toward a neutral gray of the same value (like Munsell), or in sequences that scale toward a common gray tone (like Ostwald). Both will have concordance, but the latter arrangement will be truer to the nature of color perception. (***Creative Color,*** Faber Birren, p. 45) I had studied (and put what I studied to use) the Munsell color system in depth in 2004. But even after all of that painting and reading, I still didn't get why Ostwald's way to scale pure hues was truer to the nature of color perception than Munsell's. That left me only one thing to do. It was time to acquaint myself with the Ostwald color system.

Wilhelm Ostwald, A Brief Summary:

Ostwald set out to create a simple system which he soon discovered had to be based on measurement related to the three essentials of vision: light, the human eye, and sensation. If there is no light, we cannot see; when eyes fail, light has no effect on them. He was the first to distinguish between the colors of the spectrum (seen only in a dark room) which he called *unrelated* to the world outside, and the surface colors of our everyday experience which he called *related* to it. He was the first to measure white and to establish a hue circle of true complements. For the two earlier, inexact color constants, purity and luminosity, he substituted the measurable *hue content, white content,* and *black content.* He was the first to apply Fechner's Law of Sensation to the organization of colors. To express their psychological equality, he invented the equation F + W + B = unity (any color) where F is full color, W is white content, and B is black content. He demonstrated that the principles of color harmony could be derived from the relationships of these quantities systematically arranged in his color solid. (***Basic Color: An Interpretation of the Ostwald Color System,*** Egbert Jacobson, p. 3)

I purchased a used copy of ***The Color Primer: A Basic Treatise of the Color System of Wilhelm Ostwald*** (Edited and with a Forward and Evaluation by Faber Birren) and started reading. Like Birren's ***Creative Color,*** Ostwald's ***The Color Primer*** combined two of my favorite things: color and math. Now, these are not two of my favorite things because I'm good at them. These are two of my favorite things because they are difficult for me and I need to stretch my mind to reach them.

I began using the color mixtures that Ostwald classified as the shadow series (his term for the uniform chroma scale). I wanted to compare the paints I mixed using his equations with the ones I mixed using both *The Birren Color Equation* and my own formulas. I also thought this would be a good way to study the diagram of his monochromatic triangle and learn the values of the letters that indicate the white and black content of each color mixture.

Each series of colors, whether it be parallel to the upper side of the triangle, to the lower side, or to the gray side, contains steps in an orderly progression which conforms to the Weber-Fechner Law of Sensation. This law states that the sensation of equidistance between members in a series is produced by stimuli arranged in geometric progression.

In the gray scale, for example, we see that .89 is to .56 as .35 is to .22, and so on. The same kind of ratio is found in the white content of the light clear series, in the hue content of the dark clear series, and in the hue and white content of the series parallel to the gray scale. (***Basic Color: An Interpretation of the Ostwald Color System,*** Egbert Jacobson, p. 45)

I made a group of tables for all of the Ostwald color equations. I organized them according to series: the achromatic colors (gray scale), the light clear colors (the addition of more and more white to a full color), the dark clear colors (the addition of more and more black to a full color), and the muted colors. The muted colors are sub-divided into the following categories: uniform white content (also known as equal white content), uniform black content (also known as equal black content), and the shadow series (also known as the equal purity series). In *The Birren Color Equation,* his light clear series is a pure tint scale (without any black in it) that runs from pure color to white: 0-0, 10-0, 25-0, 50-0, 100-0. As previously mentioned, the first number is the white content, the second number is the black content, and the hue content is the difference between the sum of these two numbers and 100. I had no problem comprehending these equations because what he wrote in the text matched the answer to the equations.

Here is a table illustrating what I mean:

Table 1

White	Black	Pure Color	Sum
0	0	100%	100%
10%	0	90%	100%
25%	0	75%	100%
50%	0	50%	100%
100%	0	0	100%

As you can see, the three figures equal 100 and there is no black in the paint mixtures.

But with Ostwald's light clear series, I found two facts written in the text that didn't agree. *To make certain that these are light clear, i.e., nearly black-free colors, we add a second letter* ***a*** *which signifies black content. By referring to the gray scale of Figure 11, the letter* ***a*** *signifies a pure white. Therefore where it is used as a second letter, black would be absent in the color.* (***The Color Primer: A Basic Treatise of the Color System of Wilhelm Ostwald,*** p. 42)

In general, all colors consist of a part of C full color, a part of W white and a part of B black. If these parts are expressed in percentages, we get for each color the equation:

$$C + W + B = 100$$

In muted colors, all three elements, C, W, and B have finite values. In light clear colors which contain no black, B = 0. (***The Color Primer: A Basic Treatise of the Color System of Wilhelm Ostwald,*** p. 51)

These two passages confused me. The first one states that the light clear colors are nearly black-free and the second one states that they contain no black. For me, nearly black-free means there is a smidgen of black and no black means I'm not putting black in that color mixture. So I turned to the equations on the monochromatic triangle.

Table 2: The Light Clear Colors

Color Equation	White Content	Black Content	Hue Content
pa	3.5%	11%	85.5%
na	5.6%	11%	83.4%
la	8.9%	11%	80.1%
ia	14%	11%	75%
ga	22%	11%	67%
ea	35%	11%	54%
ca	56%	11%	33%
a	89%	11%	0

When I looked at the color equations, I noticed the numbers supported one statement and not the other. According to the color equations for the light clear series, each mixture contains 11% black. So they are indeed "nearly black-free" colors. The light clear colors are the tints in Ostwald's monochromatic triangle. I had always understood a tint to be a color mixture made with "straight from the tube" pure color and white. If I were to add any black I would be making the white a gray and creating a tone. This preconceived model of a tint further compounded my "learner's block."

I knew that I was missing a point that would answer this question for me. I also knew that this detail was probably in ***The Color Primer*** but written in a way that I could not take in. Faber Birren lists Egbert Jacobson's ***Basic Color: An Interpretation of the Ostwald Color System*** among his references and refers to it as "the best exposition of the overall contribution of Wilhelm Ostwald." It was my hope that Jacobson's book would provide me with a clear answer to the following question:

How come each color mixture for the light clear series has 11% black (B) content when it is written that *in the light clear colors which contain no black, B = 0*?

Chapter Four is dedicated to the color solid and is broken down into six sections. Section Four focuses on the color notation and points out the following: *Every surface color we can make with paint, or ink, or dye contains some white and some black in addition to the hue, even when it appears to be absolutely pure.**

**Dr. Ostwald's original organization of the colors provided for theoretically perfectly pure white, black, and full colors. He diagrammed this in a color solid which had as its north pole a 100 per cent white and at its south pole a 100 per cent black. The chromatic, equatorial colors were also assumed to be 100 per cent pure. But such surface colors are not possible to produce. Hence they are not included in the system of notation.*

This clearly explained the presence of black in the light clear series. It *appears* to me that I am adding the correct percentages of white, black, and full color into my mixtures. But there is *actually* no such thing as an absolutely pure white, black, or full color. All of Ostwald's equations take this into account. This also explains the presence of black in the following formula for white:

Table 3

Full Color	White	Black	Sum
0	89%	11%	100%

So now what do I do? Do I take the black paint out of these paint mixtures because it's *actually* already present in both the white and full color paints? But wouldn't that throw off the visually equidistant steps created by the geometrical progression that exists in the scale? There was only one thing left to do. I needed to take Ostwald's scale for the light clear series apart, put it back together without black content, and see what happens to the equations and the color mixtures.

I see and feel paint and paintings as matter that is not elementary and indivisible. I split both into parts and discover smaller parts in those parts, and so on and so on.

Table 4

Ostwald's Original Color Equation	White Content	Black Content	Hue Content
na	5.6%	11%	83.4%

Variation #1	White Content	Black Content	Hue Content
na	5.6%	0	94.4% (83.4% + 11%)

Variation #2	White Content	Black Content	Hue Content
na	11.1%(5.6 % + 5.5%)	0	88.9% (83.4% + 5.5%)

The above tables show the original equation for a clean tint according to Ostwald's monochromatic triangle. Variations #1 and #2 were the first two ways I thought of adjusting the percentages of white, black, and hue. But there's one tiny glitch. I have not taken the geometric progression that exists between all the original equations into consideration.

The white content increases in difference at the same rate from step to step in the light clear series.

Table 5: The Light Clear Colors
The Rate of Increase for the White Content Amounts

White Content Amounts	Rate
5.6:3.5	1.60
8.9:5.6	1.58
14:8.9	1.57
22:14	1.57
35:22	1.58
56:35	1.60
89:56	1.59

It has already been stated that this ratio is found in the white content of the light clear series, in the hue content of the dark clear series, and in the hue and white content of the series parallel to the gray scale. But I figured out the rate for the hue content to continue breaking down the numbers in the table:

**Table 6: The Light Clear Colors,
The Rate of Increase for the Hue Content Amounts**

Hue Content Amounts	Rate
85.5:83.4	1.02
83.4:80.1	1.04
80.1:75	1.06
75:67	1.11
67:54	1.24
54:33	1.63
33:0	0

For my next step I figured out the difference between the hue content rates to break down the numbers even more.

**Table 7: The Light Clear Colors,
The Difference Between Hue Content Rates**

Hue Content Rates	Difference
1.04 – 1.02	0.02
1.06 – 1.04	0.02
1.11 – 1.06	0.05
1.24 – 1.11	0.13
1.63 – 1.24	0.39

Then I posed the following question to myself: If I moved the percentage of the black content in **ca** into the hue content column, and increased the difference of this figure by the same rates listed in Table 6, would I still have visually equidistant steps?

Table 8: The Light Clear Colors, Revision 1

Color Equation	White Content	Black Content	Hue Content	Sum
pa	3.5%	0	96.5%	100%
na	5.6%	0	94.1%	99.7%
la	8.9%	0	90.1%	99%
ia	14%	0	85%	99%
ga	22%	0	76%	98%
ea	35%	0	61.2%	96.2%
ca	56%	0	37.5%	93.5%
a	89%	0	0	89%

**Table 9: The Rate of Increase for the Hue Content Amounts
The Light Clear Colors, Revision 1**

Hue Content Amounts	Rate
96.5:94.1	1.02
94.1:90.1	1.04
90.1:85	1.06
85:76	1.11
76:61.2	1.24
61.2:37.5	1.63
37.5:0	0

As seen in Table 9, the hue content does increase at the same rate as it does in Ostwald's original equations for the light clear series. But as I've shown in Table 8, the sum is no longer 100% in seven out of eight equations. So I had to try one more thing. I wanted to see what would happen to the geometrical progression of the white content if I increased it enough so that the sum would equal 100% throughout the entire scale:

Table 10: The Light Clear Colors, Revision 2

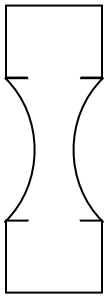
Color Equation	White Content	Black Content	Hue Content	Sum
pa	3.5%	0	96.5%	100%
na	5.9%	0	94.1%	100%
la	9.9%	0	90.1%	100%
ia	15%	0	85%	100%
ga	24%	0	76%	100%
ea	38.8%	0	61.2%	100%
ca	62.5%	0	37.5%	100%
a	100%	0	0	100%

Table 11: The Light Clear Colors,
The Rate of Increase for the White Content Amounts, Revision 2

White Content Amounts	Rate
5.9:3.5	1.68
9.9:5.9	1.67
15:9.9	1.51
24:15	1.60
38.8:24	1.61
62.5:38.8	1.61
100:62.5	1.60

Well, it *is* off. But I see a pattern and have created a diagram to illustrate what I see.

Figure 1: A Diagram Loosely Depicting the Rate of Increase
for the White Content Amounts, Revision 2



The pattern is not *actually* as symmetrical as the diagram in Figure 1 shows. But the rate starts big and similar, squeezes in, and gets back on the big and similar track.

Will the color equations in Table 10 yield a tint scale with visually equidistant steps? The experiment I conducted on Ostwald's light clear series equations is theoretical (today). I started out to briefly explain what happened while I was progressing through ***Ninety Red Crosses*** and began to dissect the equations so I could better understand them. Instead of editing this material out—I kept it in. It gives an honest and open account of how my brain insists on breaking things down into smaller parts for comprehension. This system of learning directly feeds and expands my art-making process.

At 6:15 a.m., 18 December 2005 I completed ***2005-322 (red cross 90)***. I placed it on the floor next to ***2005-321 (red cross 89)***. At that exact moment I made this statement out loud: "I'll have to fine-tune my color mixtures just a little more next time." I stopped for a minute and wondered why I didn't say, "I'm finished with ***Ninety Red Crosses*** a day early." I realized that for the first time I was really feeling something I've always thought. *I will never have a finished work, because all works are composites of smaller works, and this number of smaller works is never-ending.*

Of the many possible laws of harmony only the simplest ones could be mentioned here. Their application expands the already vast realm of color harmony into the unimaginable. It would require the combined work of many hands and many years just to create the most important among them in their simplest form and to exhibit them.
(*The Color Primer: A Basic Treatise of the Color System of Wilhelm Ostwald,* p. 69)