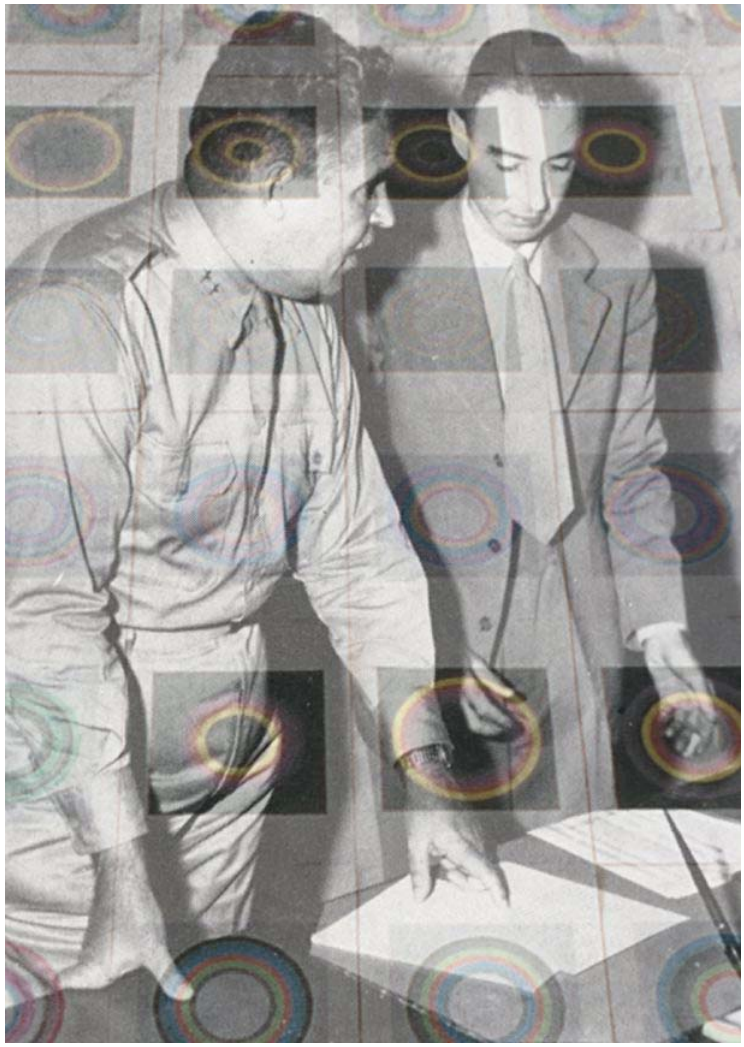


The Color of Loyalty:
A Tribute to Dr. J. Robert Oppenheimer

A Painting Installation by Linda Jean Fisher

1929 Gallery
United States Military Academy
West Point, New York

7 January 2007-11 February 2007

Exhibition Catalogue

Part I

Introduction

This installation uses paintings, citations from history, principles of color science, and my own writings, to teach the value of loyalty as it manifests itself in personal integrity, fellowship, and humanity. Dr. J. Robert Oppenheimer's contributions as a teacher, physicist, and public servant exemplified his love for the United States of America. This exhibition celebrates loyalty in his name.

In spring 2005 I recognized that Leslie Groves is a common denominator in two different areas of military study: the training of commissioned officers for the U.S. Army and the program to investigate the potential military use of fission. How? He graduated from West Point (one of the oldest service academies in the world) in 1918 and later became the director of the Manhattan Project in 1942. (For additional information, please visit the Manhattan Project exhibit in the "History of U.S. Army" Gallery, West Point Museum.) He appointed Dr. J. Robert Oppenheimer to be the director of the Los Alamos National Laboratory in 1943. Their partnership in the wartime effort to design and build the first nuclear weapons was the deciding factor in choosing the 1929 Gallery as the venue.

One of the major bodies of work in this exhibition is a selection of paintings from "The Daily Bread." These pieces reflect the challenge I made in fall 2003 to execute one painting per work session as a means to find personal freedom. "I needed to paint, paint, paint. Not to create a masterpiece, but to find the truth."

In addition, "The Daily Bread" combines my passion for both science and the humanities. My self-directed study of quantum physics, informed by extensive studies in academic color theory, color perception, and pigment properties, introduced me to the life and work of Dr. J. Robert Oppenheimer. Dr. Oppenheimer's role as the director of the Los Alamos National Laboratory began my investigation of the Trinity detonation and the fellowship of scientists and engineers who opened the nuclear age in July 1945. "The Daily Bread" spells out the effects of this research.

This exhibition also includes four "volume projects." This art making system was influenced by the efficiency of General William H. Tunner's Berlin Airlift. 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.

"576" is one of my current "volume projects" and the first 120 pieces are an integral part of this show. The completed piece will add up to 576 11" x 8.5" paintings on paper. Each sheet features a series of circular bands centered within a square. The sum of the rings divides equally into the number 24. This configuration provides a means to explore the 24 colors in Wilhelm Ostwald's color system as well as his principles of color organization and color harmony.

I *should* add that the number 24 was not randomly chosen. Before World War II Dr. Oppenheimer had associations who were communists. All of them had been thoroughly examined by the Army when it cleared him in 1943 and by the Atomic Energy Commission when it cleared him in 1947. In December 1953, they became the basis of new charges and the Atomic Energy Commission formally indicted him with disloyalty and suspended his security clearance. He decided to answer the charges against him and asked for a hearing to clear his name. But instead of the objective inquiry called for by the Atomic Energy Commission's rules, he was subjected to an unfair trial that extended over a 24-day period.

I have complete faith in Dr. Oppenheimer's loyalty to the United States of America. He loved this country and would never have done anything to jeopardize it. He was a peaceful man filled with hope for a peaceful world. I felt it was my duty to affirm the very thing for which he was wrongly prosecuted (i.e. his loyalty). To carry out this endeavor, I made the number of hours that Dr. Oppenheimer endured during his security hearing the basis for a work of art. (24 days x 24 hours = 576 hours).

Moreover, the fundamental structure of the design for "576" is based upon the Bohr model of the atom. "During his visits to Los Alamos the Danish physicist Niels Bohr served mainly as a 'scientific father confessor' to the scientists, clarifying their problems with the atomic bomb and offering possible approaches that might be taken." (Richard Hewlett and Oscar Anderson, *The New World: A History of the United States Atomic Energy Commission, Vol. 1: 1939-1946*, pg. 310) But his primary concern was the prevention of a nuclear arms race: "That is why I went to America. They didn't need my help in making the atom bomb" (quoted in Nielson, pg. 28-29). Bohr's philosophy for interaction in the scientific community was that "science could not exist unless it was open." He foresaw the changes that would come to the world with the discovery of nuclear fission. His idea was to extend this principle of openness to the area of international relations, to problems of security. He said: "...it must be realized that full mutual openness, only, can effectively promote confidence and guarantee common security." This was published in his letter to the United Nations dated 9 June 1950. But he tried to put this idea into practice in 1944 over a year before the Trinity detonation. He proposed the following solution to the problems of security: "…that the Soviet leaders be told about the atom bomb before it was used, and that they be offered a share in the potentialities of the discovery of nuclear energy on the condition that they agree to a system of international control." President Roosevelt found these ideas appealing but Prime Minister Churchill did not.

What does Bohr's solution for international security have to do with Dr. Oppenheimer's 1954 hearing? Dr. Oppenheimer was one of many scientists who found Bohr's 1944 proposal attractive. Some of his lectures including the "Speech to the Association of Los Alamos Scientists" (2 November 1945) and "The Open Mind" (11 December 1948), as well as his work on the "Acheson-Lilienthal Report" (16 March 1946), demonstrate his support. He said: "Bohr was clear…that one could not have an effective control of...atomic energy...without a very open world; and he made this quite absolute.... In principle, everything that might be a threat to the security of the world would have to be open to the world." I believe that if Dr. Oppenheimer's security clearance had not been taken away on 29 June 1954, and had he never died from throat cancer on 18 February 1967, he would have continued to push for Bohr's solution to the problem of international security as a way to prevent an expensive and dangerous nuclear arms race. I am not a historian. I am a receptive observer who anticipates the likelihood for a safer world by way of an open world.

I began studying Dr. Oppenheimer's life and life's work on Monday, 13 October 2003. I understood on Thursday, 16 October 2003 that he was more than "The Father of the Atomic Bomb." On the morning of Friday, 17 October 2003 I promised to educate as many people as possible about his contributions as a teacher, physicist, national hero, and public servant. This painting exhibition is one way I have chosen to fulfill my promise to Dr. Oppenheimer. Therefore it teaches us the value of maintaining our loyalty to others by following through on the commitments that we make to others.

Linda Jean Fisher
Peekskill, New York
2006

"The Color of Loyalty: A Tribute to Dr. J. Robert Oppenheimer"
Wall One of the Painting Installation

Bright Luster and Modest Iridescence, February 2003

The difference between organic and inorganic pigments began to interest me again while I was working on the paintings depicting luster and iridescence. I had to decide whether or not I wanted to use the transparent, synthetic organic pigments that are clean color mixers, or the opaque, synthetic inorganic ones that yield low chroma mixtures. The variation in the level of gloss also became a concern. I wanted the colors to either shine or shimmer because of the color mixtures themselves, not because of the content of the acrylic binder.

I used Golden Artist Colors Titanium White to paint the white stripe near the center of both paintings. The one in the painting conveying modest iridescence appears deeper and grayer than the one in the painting conveying bright luster. This deeper appearance is due to a lack of value contrast.

"Color Perception—After Faber Birren, Bright Luster" [Left] and
"Color Perception—After Faber Birren, Modest Iridescence" [Right]
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions for Both Paintings: 11" x 8.5"

Paint Out Loud, March 2003-April 2003

Pigments become trapped in the hexagonal patterns formed when the acrylic polymer spheres bond. This fact prompted my thorough investigation into the process of emulsion polymerization.

"Paint Out Loud #1"
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 11" x 8.5"

There were also characteristics of waterborne acrylic paints and mediums that I wanted to understand so that I could work *with* them. I began to look for information about acrylic paint chemistry on the Internet. I happened upon a review for Philip Ball's book **"Bright Earth: Art and the Invention of Color."** I purchased it at the bookstore the following week and started to read it.

"Paint Out Loud #4"
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 11" x 8.5"

"Paint Out Loud #5: Saved By Howard Goodman on 3-28-03 at 7:43 p.m."
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 11" x 8.5"

I had a difficult time with material pertaining to light reflecting or scattering off objects, light being absorbed by objects, and light transmitting through objects. I turned to the basics of color and vision that were simply explained on a high school tutorial website called **"The Physics Classroom."** For the first time I comprehended that the color of my paints is not in the pigments themselves. The color is in the light that shines upon them that eventually becomes reflected or transmitted to my eyes.

"Paint Out Loud #6: Red and Blue (The Color Is In the Light)" [Left]
Copyright © 2003 by Linda Jean Fisher
Acrylic and graphite on a wood panel
Un-Matted Dimensions: 10" x 8"

"Paint Out Loud #3" [Right]
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Matted Dimensions: 11" x 8.5"

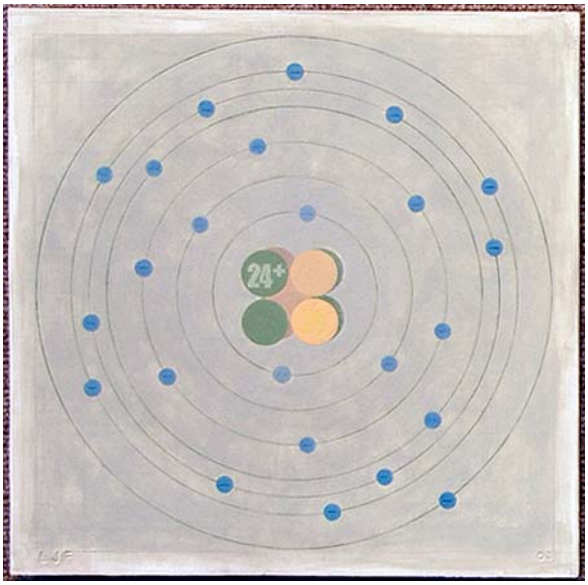
The electrons of atoms have a natural frequency, like a tuning fork, at which they are inclined to vibrate. When a light wave with that same natural frequency touches upon an atom, the electrons of that atom are set into vibrating motion. This example of the resonance principle introduced me to the atom and other chemistry fundamentals. To review these ground rules, I looked at a website called **"Chem4Kids."**

I went back to Philip Ball's book after learning the nuts and bolts of physics and chemistry. It's a good thing that I had taken the time to familiarize myself with some of this language, because under a sub-heading in the second chapter called **"Color From the Earth,"** he introduces the crystal field. The color of several gemstones is caused by the presence of transition metals as impurities in an otherwise transparent crystal lattice. The chemical bonding between the host crystal and guest impurity involves the donation of electrons on the crystal to empty energy levels on the metal impurity; the metal is bound by this means to the crystal and the crystal is the connection. Such ionic crystals were ground in artist's studios until the introduction of modern synthetic pigments in the nineteenth century.

The crystal field theory preoccupied me for weeks and began my expedition into the world of quantum physics.

"The Color of Loyalty: A Tribute to Dr. J. Robert Oppenheimer"
Wall Two of the Painting Installation

Chromium, 5 May 2003



"Chromium"

Acrylic and graphite on a wood panel
12" x 12"

I'm afraid of the painting I've started of the Bohr Model of the element chromium. I'm afraid because I know it's going to redirect me to an unfamiliar place—where I'm sure to get redirected somewhere else I don't know. I always say I want to be a beginner—but it's also kind of pleasant to know what I'm doing.

At 7:35 a.m., my teakettle whistles in the kitchen. As I'm pouring water through the coffee grinds into my cup, I say these exact words out loud: "The thing I fear most, is the thing I do first."

I started painting before finishing the preparation of my coffee.

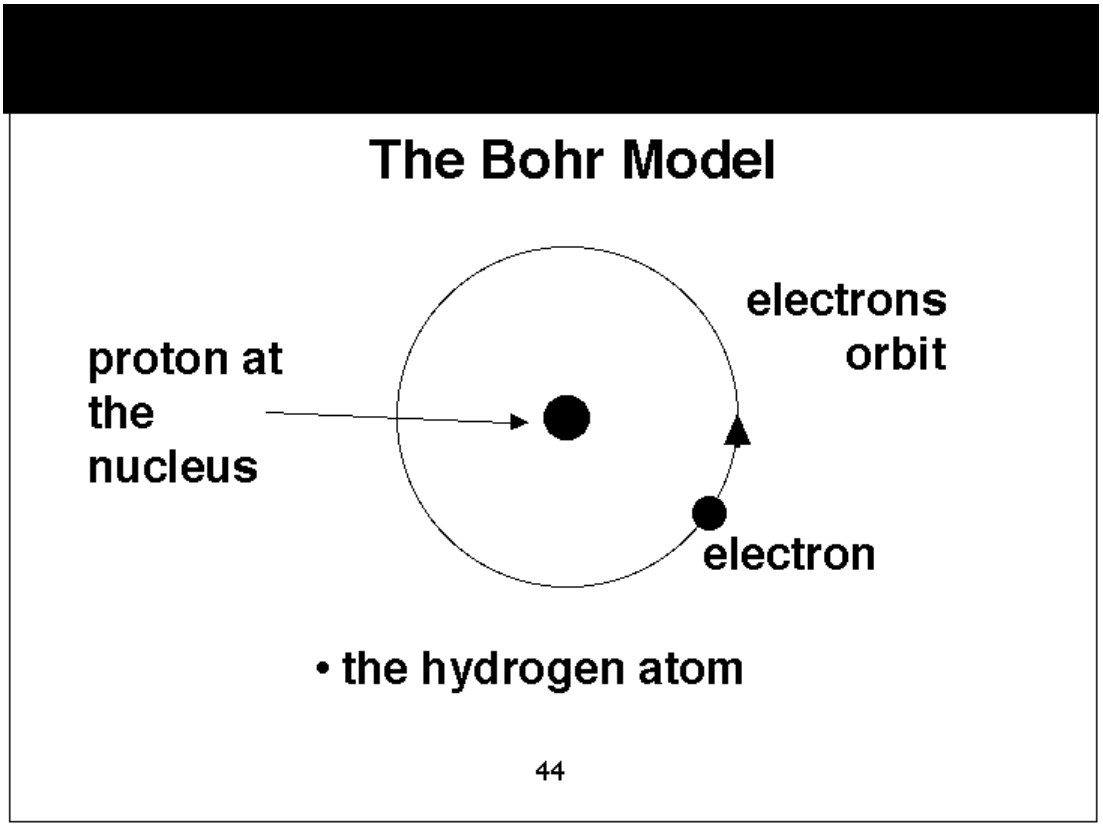
Atoms Made Simple

Atoms are the basic building blocks of ordinary matter. They can join together to form molecules, which in turn form most of the objects around you.

Atoms are composed of particles called protons, electrons, and neutrons. Protons carry a positive charge, electrons carry a negative charge, and neutrons carry no electrical charge at all. The protons and neutrons (both of these particles are called nucleons) cluster together in the central part of the atom, called the nucleus, and the electrons 'orbit' the nucleus. The total number of nucleons is known as the Mass Number, or A. The number of electrons in an atom is called the Atomic Number, or Z. A particular atom will have the same number of protons and electrons and most atoms have at least as many neutrons as protons.

Protons and neutrons are both composed of other particles called quarks and gluons. Protons contain two 'up' quarks and one 'down' quark while neutrons contain one 'up' quark and two 'down' quarks. The gluons are responsible for binding the quarks to one another.

Niels Bohr
7 October 1885-18 November 1962



The Bohr model illustrated in **"Atoms Made Simple"** represents hydrogen as a single proton orbited by a single electron. In heavier atoms, the nucleus is made up of both protons and neutrons, with the appropriate number of electrons (one for each proton) in orbit around it.

Atoms that have the same number of protons but different numbers of neutrons are called isotopes. Protium, the most common isotope of the element (A substance composed of atoms having an identical number of protons in each nucleus and not reducible to a simpler substance. [1]) hydrogen has no neutrons at all; there's also a hydrogen isotope called deuterium, with one neutron, and another, tritium, with two neutrons.

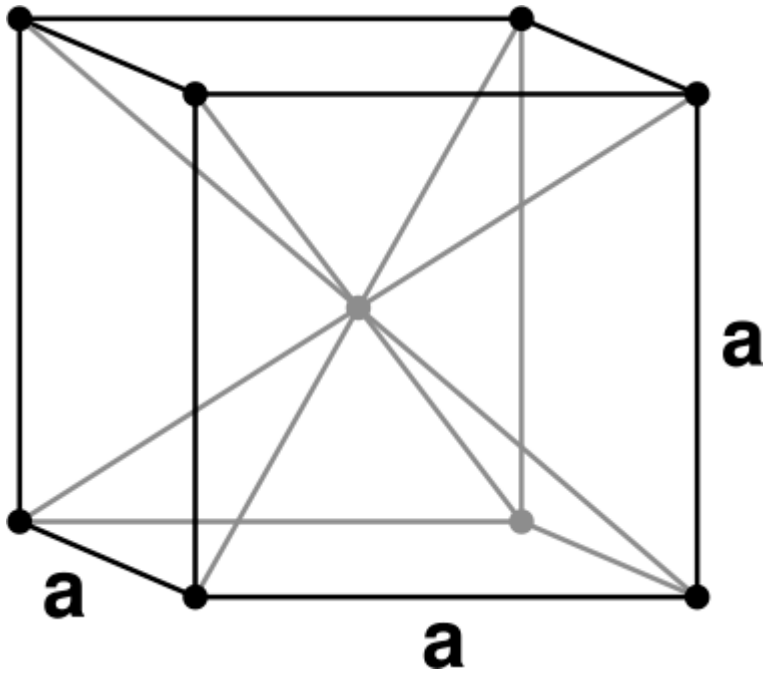
Here is a table[2] providing the basic information for Chromium:

Name	Chromium
Symbol	Cr
Atomic Number	24
Atomic Mass	51.9961 amu^{+}
Melting Point	3374.6 °F
Boiling Point	4841.6 °F
Number of Protons/Electrons	24
Number of Neutrons	28
Classification	Transition Metal^{++}
Crystal Structure	Body-Centered Cubic (bcc)$^{+++}$

✦1 atomic mass unit = 1.66053886 _ 10^{-27} kilograms

✦✦The 38 elements in groups 3 through 12 of the periodic table are called "transition metals". As with all metals, the transition elements are both ductile and malleable, and conduct electricity and heat. The interesting thing about transition metals is that their valence electrons, or the electrons they use to combine with other elements, are present in more than one shell. This is the reason why they often exhibit several common oxidation states. There are three noteworthy elements in the transition metals family. These elements are iron, cobalt, and nickel, and they are the only elements known to produce a magnetic field.[3]

✦✦✦ In the Body-Centered Cubic (BCC) unit cell there is one host atom (lattice point) at each corner of the cube and one host atom in the center of the cube. [4]



Body-Centered Cubic (bcc) [5]

The passage named **Atoms Made Simple** was cited from the **Thomas Jefferson National Accelerator Facility - Office of Science Education,** May 2, 2003, **http://education.jlab.org/qa/atom.html** unless otherwise noted.

[1]**The American Heritage Dictionary**, Copyright © 2001 by Houghton Mifflin Company

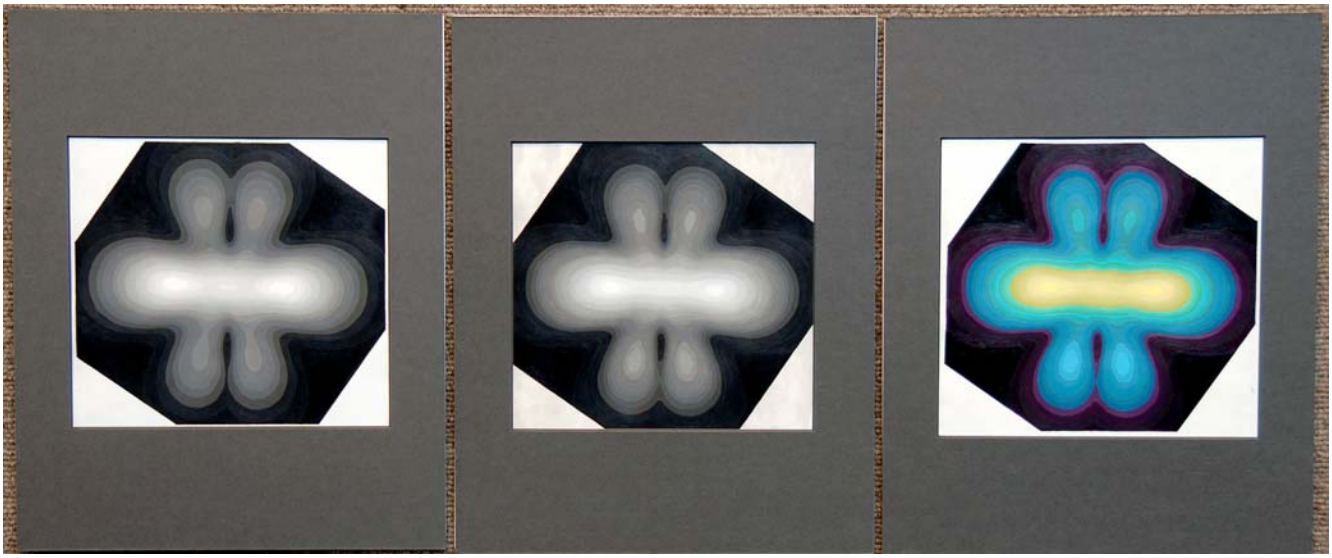
[2]Bentor, Yinon. **Chemical Element.com - Chromium.** Dec. 14, 2006 <http://www.chemicalelements.com/elements/cr.html>.

[3]Ibid.

[4]**Department of Chemistry, Louisiana State University**. Dec. 14, 2006 http://www.chem.lsu.edu/htdocs/people/sfwatkins/MERLOT/lattice/03bcc.html

[5]"cubic crystal system." **Wikipedia.** Wikipedia, 2005. *Answers.com* 15 Dec. 2006. http://www.answers.com/topic/cubic-crystal-system

Electron Orbital $3Dz^2$ (2003)



From Left to Right: "Electron Orbital 3 Dz^2 #1," "Electron Orbital 3 Dz^2 #2," and "Electron Orbital 3 Dz^2, Color #1"

Acrylic on 65 lb. neutral pH cover paper
Un-Matted Dimensions for All Three Paintings: 11" x 8.5"

"These weird looking diagrams of balloons on sticks kept popping up everywhere. They represent the regions of space inhabited by electrons known as orbitals. I was used to the planetary model of the atom with the electrons traveling around the atomic nucleus. I just couldn't grasp this newer concept and began my search for a simple description. That's when I accidentally stumbled into particle physics. I found an encyclopedia by John Gribbin called "Q is for Quantum" to use as a reference book while I searched for what grew into a list of things I needed simple descriptions for."

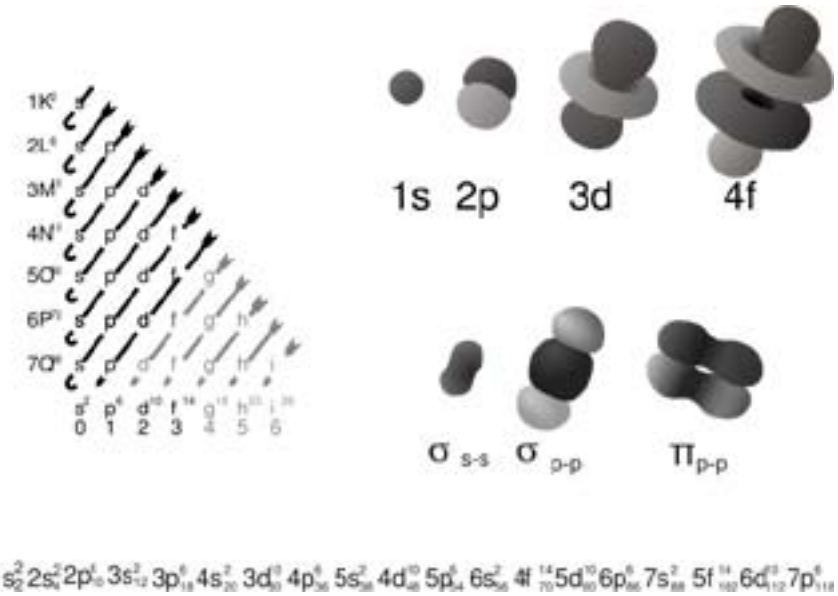
Linda Jean Fisher
28 August 2006
Peekskill, New York

For the Love of Orbitals

In physics and chemistry, an **atomic orbital** is the region in which an electron may be found around a single atom. Specifically, atomic orbitals are the **quantum states** of the individual electrons in the **electron cloud** around a single atom. Classically, the electrons were thought to orbit the atomic nucleus, much like the planets around the Sun (or more accurately, a moth orbiting *very* quickly around a lamp). However electrons cannot be described as solid particles (as a planet or a moth), so a more accurate comparison would be that of a (huge) atmosphere (the spatially distributed electron) around a (tiny) planet (the nucleus). Hence the term "orbit" had to be substituted with something else: orbital.[1]

Explaining the behavior of the electrons that "orbit" an atom was one of the driving forces behind **quantum mechanics.** In quantum mechanics, the atomic orbitals are the quantum states that electrons surrounding an atom may exist in. These can be described as a wave function over space, as shown in the diagram here, by the *n*, *l*, and *m* **quantum numbers** of the orbital, or by the names of the orbitals, as used in electron configurations. [2]

The orbital names (s, p, d, f, g, h,...) are derived from the quality of their spectroscopic lines: **s**harp, **p**rincipal, **d**iffuse and **f**undamental, the rest being named in alphabetical order. [3]



$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^6 7s^2 5f^{14} 6d^{10} 7p^6$

Electron atomic and molecular orbitals

Glossary:

A **quantum state** is any of the possible states of a system described by quantum theory. [4]

The **electron cloud** is made of various standing waves, which surround the nucleus. These standing waves are not material. They are patterns of potential. The shape of the various standing waves which comprise the electron cloud tells physicists the probability of finding the point electron at any given place in the cloud.[5]

> **Example:** The electrons in the $2p_x$ orbital of an atom are generally found within a dumbbell-shaped cloud about the x-axis (there is a 2p orbital included in the preceding diagram).

Quantum mechanics are the laws of physics that apply on very small scales. The essential feature is that energy, momentum, and angular momentum (as well as charges) come in discrete amounts called quanta. [6]

The values of a particle's charge, **spin**✦ and other major characteristics are represented by specific numbers. These numbers are called **quantum numbers**. Every particle has a set of quantum numbers which identify it as a particular type of particle. Every particle of a particular type has the same set of quantum numbers as every other particle of the same type. Every electron, for example, has the same quantum numbers as every other electron. An electron's quantum numbers, however, distinguish it from protons, all of which also have the same quantum numbers. Individual particles don't have much personality. In fact, they don't have any personality at all.[7]

✦Subatomic particles **spin** about a theoretical kind of axis like a spinning top. One big difference between a spinning top and a spinning particle, however, is that a top can spin either faster or slower, but a subatomic particle always spins at exactly the same rate. Every electron, for example, always spins at exactly the same rate as every other electron.[8]

Note from Linda Jean: I made a sincere effort to simply define the orbital (for both you and me). For more information on orbitals (and the other things that came up while I was making the sincere effort to simply define them) I recommend **"The Dancing Wu Li Masters: An Overview of the New Physics"** by Gary Zukav.

[1]"atomic orbitals." **Wikipedia.** Wikipedia, 2006. Dec. 10, 2006 **http://en.wikipedia.org/wiki/Atomic_orbital.**

[2]Ibid.

[3]Op. Cit.

[4] "quantum state." **Wikipedia.** Wikipedia, 2006. Nov. 11, 2006 **http://en.wikipedia.org/wiki/Quantum_state.**

[5]Gary Zukav. **The Dancing Wu Li Masters: An Overview of the New Physics**. Bantam Books: New York, Toronto, London, Sydney, and Auckland. Copyright © 1979 by Gary Zukav. p. 108.

[6] "quantum mechanics." **Wikipedia.** Wikipedia, 2006. Dec. 14, 2006 **http://en.wikipedia.org/wiki/Introduction_to_quantum_mechanics**

[7]Gary Zukav. **The Dancing Wu Li Masters: An Overview of the New Physics**. Bantam Books: New York, Toronto, London, Sydney, and Auckland. Copyright © 1979 by Gary Zukav. p. 210.

[8]Ibid. p. 207.

The Davis Paintings, July and August 2003

During July and August of 2003 I felt it was time to shake things up a bit and get uncomfortable. My foundation-painting instructor at The School of Visual Arts was Scott Davis. Every week we had to complete a painting for the critique that opened the six-hour class session. Excuses for not having a picture were not welcome from Scott or the students who had fulfilled the assignment. I decided to commit to making a painting in a week's time and established two key rules. **Rule #1:** Use atypical shapes, colors, and color effects without ever asking yourself why you are using them. **Rule #2:** As soon as you finish one piece, you must start the next one no matter what.

“Hexagon Cure” [Left] and “Painting X” [Right]
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Matted Dimensions for Both Paintings: 11” x 8.5”

Nine

“When a nucleus gives off a beta particle (an electron), the new nucleus plus the beta particle is slightly less massive than the old nucleus. The difference in mass, not completely accounted for by the kinetic energy of the beta particle, is assigned to the almost undetectable ‘ghost particle,’ the neutrino.” (p. 229, **“Atom Journey Across the Subatomic Cosmos**,” Isaac Asimov)

“Nine” [Left] and “Don’t Try Too Hard” [Right]
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Matted Dimensions for Both Paintings: 11” x 8.5”

Don't Try Too Hard

I like using **"Microsoft AutoShapes"** and **"WordArt"** as a drawing medium. I enjoy the mind exercise I get from solving design problems. I also love coming up with ways of tricking **"Microsoft Word"** into making a picture that doesn't come naturally to its routine picture-making capabilities. Here is an example of what I mean: I create hybrid shapes by fusing together two or more pre-existing shapes with yet another shape, nicknamed the **"connectron,"** by changing the **"connectron's"** line color to white. This action erases the *connectron* and forms the hybrid shape.

While I was designing **"Don't Try Too Hard,"** I was selecting shapes from the font called **"Monotype Sorts."** I was striking keys to see what came up, and was determined not to be too picky choosy. All of the sudden the Star of David appeared. This is exactly what I said to myself: "I can't put that in the picture because people will think I'm Jewish." I am not prejudice (Or am I without ever having realized it?). Yet while I was a teenager, I can remember feeling a tinge put off when some of my peers assumed I was Jewish. Were these feelings something I inherited from the age of my parents and grandparents? Was it fear of persecution? Is there any hope of liberation? I immediately inserted the Star of David in the picture. There is also a two-dimensional space-time graph based on an elevator in free fall. But this elevator isn't falling—it's rising!

Electron Jump and States of the Eleven, August 2003

"Electron Jump"

During the **"Blackout of 2003,"** I didn't have enough light to proceed with the painting I was working on. I spent time reading about how electrons jump from one energy level to the next. They supposedly disappear from one level and reappear in another.

"Electron Jump" [Left]
Copyright © 2003 by Linda Jean Fisher
Acrylic on 8-ply neutral pH matboard
Un-Matted Dimensions: 9.25" x 7.625"

"States of the Eleven" [Right]
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Matted Dimensions: 8.5" x 11"

I thought about how my mother's dining room chandelier can be controlled by a dimmer switch. The light fades in and fades out. The quantum models of the electron orbitals remind me of lights glowing through atmospheric mist. I was in the dark and melting on 18 August 2003. The thought of being in my mother's illuminated and air-conditioned living room was very comforting. I guess I never realized how much I take the convenience of modern electricity for granted. Anyway, in my over-heated stupor, I began to sketch out my interpretation of an electron jump. About 20 minutes after I began to draw, I heard the hum of my refrigerator. Now I associate that sound with gratitude.

"States of the Eleven"

I saw a Periodic Table of the Chemical Elements illustrating the electron states of the first eleven atoms. I noticed that each element has one electron more than the one before it. As more electrons are added, they first fill the ring closest to the nucleus (the ground state) and then fill the next ring, and so on (these are the states of increasingly higher and higher energy). A quota is figured out for each state by the mathematical rules of quantum theory. For example: only two electrons can be in the ground state, and eight are permitted in the next higher state. As the quota of each state is filled, the electrons are forced into higher states. This progression made me think of the order of the visible spectrum. Then I took it a step further and imagined the spectrum as energy levels. Red is the ground state and violet is the highest energy state. The chroma of the hues increases as each new band of color is added.

144 89 3, Dedicated to Lise Meitner

Lise Meitner 1900

Lise Meitner at 59 in 1937

Lise Meitner 1960s

"I believe all young people think about how they would like their lives to develop. When I did so I always arrived at the conclusion that life need not be easy provided only that it was not empty. And this wish I have been granted." Lise Meitner

"Her most holy commitment...the vision she never lost that filled her life, was of physics as a battle for final truth." Otto Frisch, Lise Meitner's Nephew

In a typical fission reaction, a bombarding neutron enters a uranium-235 nucleus and causes it to split into the isotopes barium-144 and krypton-89. Three neutrons are also emitted. The large amount of energy released in the reaction gives the fragments and neutrons high velocities and also produces penetrating gamma rays.

1 neutron + 235 uranium nucleons = 144 barium nucleons + 89 krypton nucleons + 3 neutrons
The nucleon number is preserved

That's the significance of the numbers that run vertically, from the bottom to the top, on the left side of "**144 89 3.**" This painting is my tribute to Lise Meitner, the Austrian-born physicist who was one of the first people to investigate nuclear fission.

"144 89 3"
DEDICATED TO LISE MEITNER

Acrylic on .125" Plexiglas
11" x 11"

The Discovery of Nuclear Fission

In 1938 Lise Meitner (1878–1968), Otto Hahn (1879–1968), and Fritz Strassmann (1902–1980) were the first to recognize that the uranium atom, when bombarded by neutrons, actually split.

The discovery of the neutron by James Chadwick in 1932 gave new impetus to radioactivity studies because this uncharged atomic particle could penetrate the secrets of the atomic nucleus more successfully. Meitner, Hahn, and another chemist, Fritz Strassmann, who had worked with the partners since 1929, were deeply involved in identifying the products of neutron bombardment of uranium and their decay✦ patterns. It was generally expected that elements close in atomic number—quite possibly elements with higher atomic numbers than uranium—would be produced. In 1938 Meitner had to leave

Berlin because the Nazis were closing in on all people of Jewish ancestry. She soon found a congenial setting for her research at the Nobel Institute in Stockholm. Her nephew, the physicist Otto Frisch, was located at Niels Bohr's institute in Copenhagen. Meanwhile, Hahn and Strassmann found that they had unexpectedly produced barium, a much lighter element than uranium, and they reported this news to Meitner. She and her nephew worked out the physics calculations of the phenomenon based on Niels Bohr's "droplet" model✦✦ of the nucleus and clearly stated that nuclear fission of uranium had occurred. It was quickly recognized that barium was among the stable isotopes that were the products of the radioactive decay of transuranic elements✦ ✦✦ that must have been initially formed after neutron bombardment of uranium. News of the splitting of the atom and its awesome possibilities was brought by Bohr to scientists in the United States and ultimately resulted in the Manhattan Project.

Hahn, Meitner, and Strassmann were not engaged in nuclear weapons research during World War II. At the end of the war Hahn was astonished to hear that he had won the Nobel Prize for chemistry in 1944 and that nuclear bombs had been developed from his basic discovery. Later, as director of the Max-Planck-Gesellschaft (the postwar successor to the Kaiser Wilhelm Gesellschaft), he spoke vigorously against the misuse of atomic energy. Meitner—who many thought should have received the Nobel Prize with Hahn—continued to do nuclear research in Sweden and then England. Strassmann nurtured the study of nuclear chemistry in Mainz, Germany.

The passage named “The Discovery of Nuclear Fission” was cited from **www.chemheritage.org** © 2005 **Chemical Heritage Foundation** unless otherwise noted.

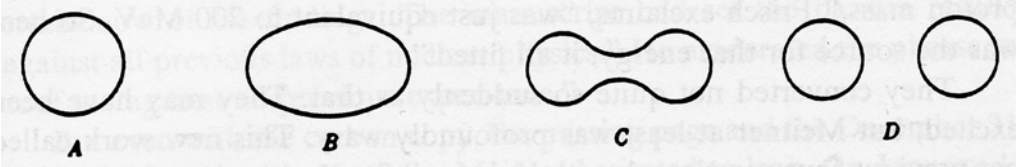
✦**Radioactive decay** is the decrease in the intensity of radiation from a radioactive material over a period of time. Radioactive decay is important in determining when it is safe to approach an area contaminated by radioactive material without risk of radiation sickness.[1]

✦✦ **Niels Bohr's "droplet" model:** The nucleus contains lots of positive charge in a small space. Anyone who knows even a little about electrostatics will realize that like charge repels like, and that this force of repulsion becomes stronger the closer the charged particles become. A very strong force must be in place to counteract this strong repulsion. This force, which is still not fully explained, is called the strong nuclear force, or the binding energy, given its role in binding the nucleus together.

Often, when one cannot fully explain a situation, it is convenient to have model. The most common model for this situation is a simple water drop.

One can imagine a nucleus as a single water drop: incompressible and un-stretchable. The drop forms into a sphere as a result of the surface tension of the water (binding energy). This minimizes surface area and the energy needed to keep the sphere together. However, the particles within that sphere of water are repelling away from each other. (This is one flaw of the water drop model, as water particles do not really repel). The particles would ideally form a larger volume to minimize the repulsive force. But this is prevented by the surface tension of the drop.

Thus, an optimum value is reached: a compromise between the particles repelling and the surface tension binding them together. Like all systems, the nucleus or water drop will try to minimize the energy of the system until a minimum is reached: the optimum spherical shape.



The Making of the Atomic Bomb
Richard Rhodes
Diagram featured on p. 229[4]

✦ ✦✦ **Transuranic Elements:** Elements that have atomic numbers greater than 92; all are radioactive and are products of artificial nuclear changes. Also known as transuranium elements.

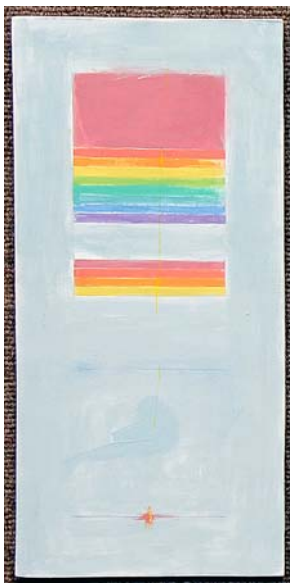
[1]**Copyright ©2006 SPG Media Limited. All rights reserved.** Dec. 15, 2006
http://www.army-technology.com/glossary/radioactive-decay.html

[2]© 1998 James McComish. Dec. 15, 2006
http://www.users.bigpond.com/Sinclair/fission/Fission3.html

[3]Copyright © 2006 Answers Corporation. Dec. 15, 2006
http://www.answers.com/topic/transuranic-elements

[4]Richard Rhodes. **The Making of the Atomic Bomb.** Simon and Schuster, Inc. New York, London, Toronto, Sydney, and Tokyo. 1986.

Conduction



"Conduction"
Copyright © 2003 by Linda Jean Fisher
Acrylic on .125" Plexiglas
15" x 7"

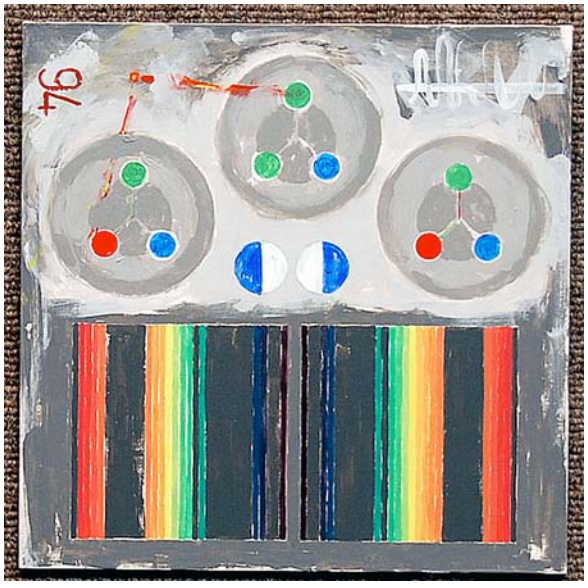
The populating of the energy bands is what determines the properties of a crystal. The highest band that is not fully occupied is called the **conduction band**. The electrons in the **conduction band** have room to wiggle around. This means they can respond to an applied voltage from a battery or generator.

Symmetry [2003], Dedicated to Roger S. Jones

The following two passages from **"Physics for the Rest of Us"** by Roger S. Jones inspired the painting I named **"Symmetry"**:

Inside of a proton, the red, green, and blue quarks interact by exchanging gluons. For example, a red quark interacts with a green quark by exchanging a red-green gluon. It turns out that when the red quark emits the red-green gluon, it immediately turns green. Momentarily, there are two green quarks and a blue quark. There is a color imbalance. The proton is no longer color symmetric or invariant to color transformations among its quarks. The symmetry of three complementary colors has been broken. To restore the red-green-blue symmetry, the green quark must turn red. The exchanged red-green gluon is the agent that transforms the green quark into a red one. The gluon restores the broken symmetry. (pp. 300-301, **"Physics for the Rest of Us"** by Roger S. Jones)

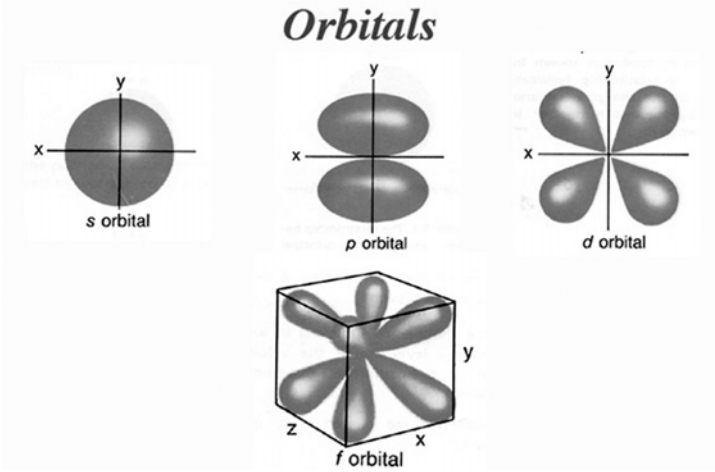
Plutonium, the ninety-fourth element and the most poisonous substance known, is artificially created by earthlings, primarily for the production of atomic weapons. It is found nowhere else in the universe. Nature knew better than to make plutonium. (p. 245, **"Physics for the Rest of Us"** by Roger S. Jones)



"Symmetry"
DEDICATED TO ROGER S. JONES

Acrylic on .125" Plexiglas
10.125" x 10.125"

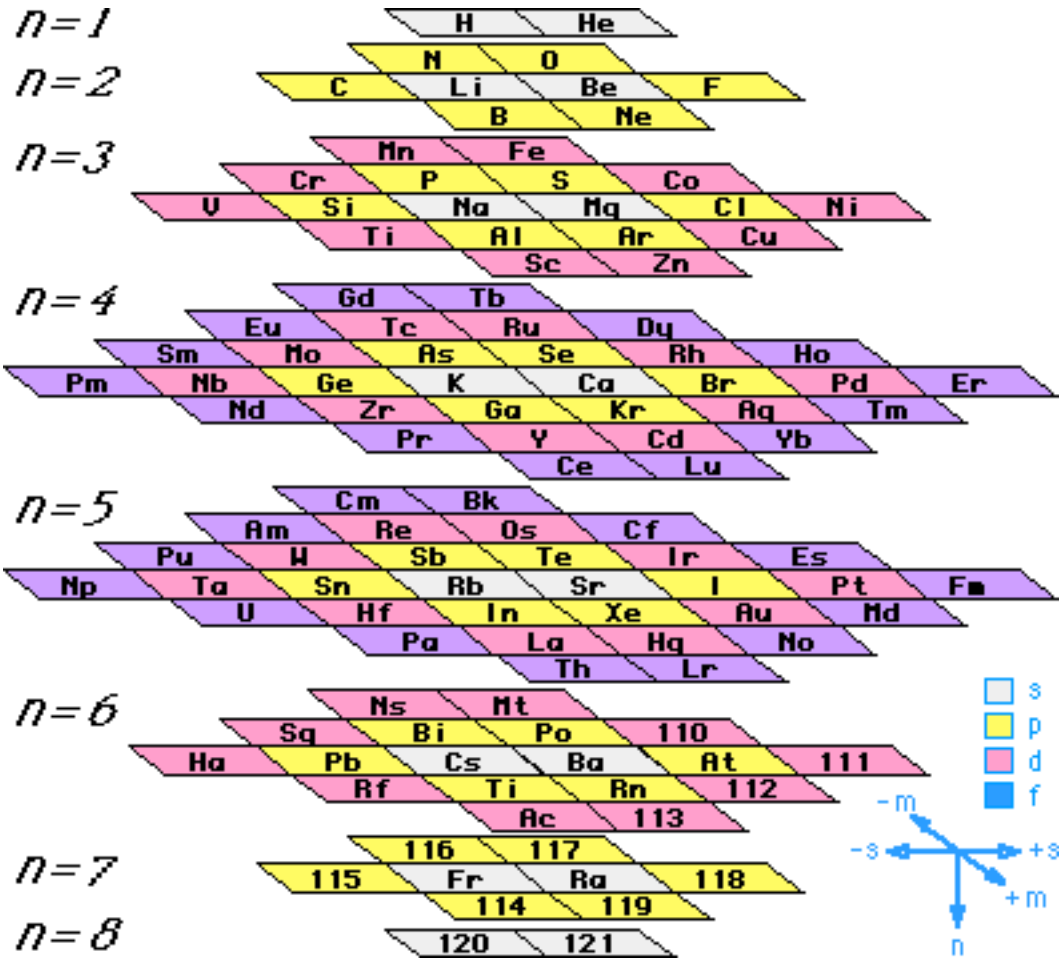
S and P Orbitals and Depth Rows for Dr. Stowe



I found these illustrations of the s, p, d and f orbitals during the course of my studies. I learn by repetition and felt that three paintings of the electron orbital $3Dz^2$ just wasn't enough.

"S and P Orbitals" [Left]
Copyright © 2003 by Linda Jean Fisher
Acrylic on 6-ply neutral pH matboard
Un-Matted Dimensions: 13.125" x 5.125"

"Depth Rows for Dr. Stowe" [Right]
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Matted Dimensions: 11" x 8.5"



Dr. Timmothy Stowe's Physicists Periodic Table

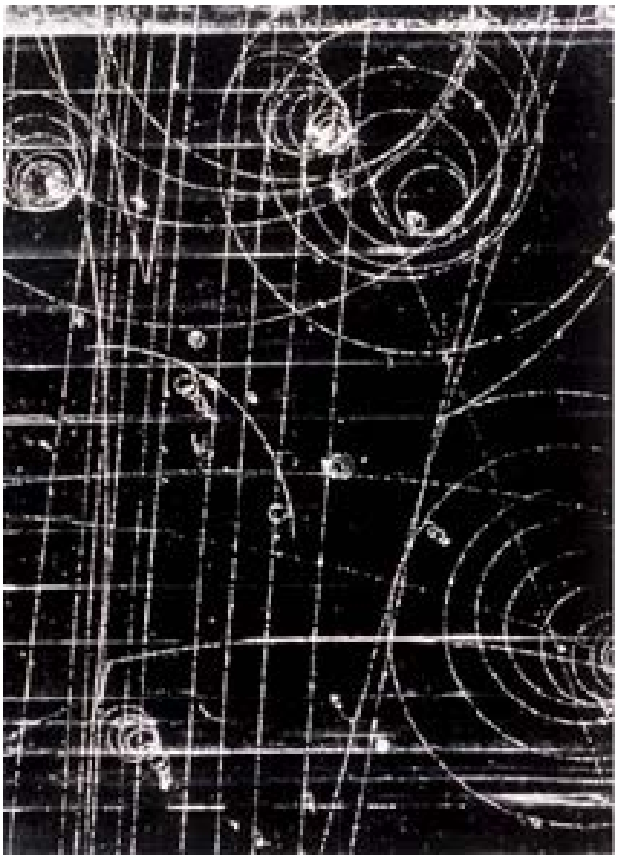
Dr. Stowe's Physicists Periodic Table displays the physical ordering of the intricate shells of orbital sets of electrons in atoms, innermost at the top, using quantum numbers. (**"Essential Elements, Atoms, Quarks, and the Periodic Table,"** Walker & Company, New York.

Omega Minus #3, October 2003

On 11 February 1964, a team from the Brookhaven National Laboratory, Long Island, New York, sent an historic paper to the journal **"Physical Review Letters*,"** announcing the discovery of the particle dubbed the "omega-minus". It was the last piece in a subatomic puzzle put together independently by theorists Murray Gell-Mann and Yuval Ne'eman. Their puzzle related different particles through their properties of electric charge and "strangeness", but one particle, with negative charge and three units of strangeness was missing. This was the particle Gell-Mann called the omega-minus, and the image below shows that historic first

observation, recorded in Brookhaven's 80-inch hydrogen bubble chamber. The trail of the omega-minus, about 2-cm long, can be seen as the short track just below the track that abruptly heads off to the right, in the lower half of the image. This discovery confirmed the importance of the relationships between many particles, which was soon to be understood in terms of their underlying structure in the form of quarks.[1]

(* See **"Physical Review Letters 12 204"** [1964])



The Lark of the Quark

Quarks are one type of matter particle. Most of the matter we see around us is made from protons and neutrons, which are composed of quarks. There are six quarks, but physicists usually talk about them in terms of three pairs: up/down, charm/strange, and top/bottom. (Also, for each of these quarks, there is a corresponding antiquark.) Quarks have the unusual characteristic of having a fractional electric charge, unlike the proton and electron, which have integer charges of +1 and -1 respectively. Quarks also carry another type of charge called color charge.[2] Color charge is a property of certain particles completely separate from electrical charge. Particles with color charge respond to the strong force.

This is the strongest of the forces. It is carried by the gluon and keeps quarks together in hadrons. (A heavy particle made up of three quarks. Protons and neutrons are the most well known hadrons.) There is also a residual strong force that is carried by mesons (A particle made of a quark and an antiquark), keeping protons and neutrons together in the nucleus of an atom. [3]

"Omega Minus #3"
Copyright © 2003 by Linda Jean Fisher
Acrylic on .125" Plexiglas
10.125" x 10.125"

Color charge has three values for matter particles (red, green, and blue). Anti-matter particles have color charges of anti-red, anti-green, and anti-blue. [4]

The naming of quarks began when, in 1964, Murray Gell-Mann and George Zweig suggested that hundreds of the particles known at the time could be explained as combinations of just three fundamental particles. Gell-Mann chose the name "quarks," pronounced "kworks," for these three particles, a nonsense word used by James Joyce in the novel **"Finnegan's Wake"**: "Three quarks for Muster Mark!" [5]

In order to make their calculations work, the quarks had to be assigned fractional electrical charges of 2/3 and -1/3. Such charges had never been observed before. Quarks are never observed by themselves and were initially regarded as mathematical fiction. Experiments have since convinced physicists that not only do quarks exist, but there are six of them, not three. [6]

There are six flavors of quarks. "Flavors" just means different kinds. The two lightest are called **up** and **down**.

The third quark is called **strange**. It was named after the "strangely" long lifetime of the K particle, the first composite particle found to contain this quark. The fourth quark type, the **charm** quark, was named on a whim. It was discovered in 1974 almost simultaneously at both the Stanford Linear Accelerator Center (SLAC) and at Brookhaven National Laboratory. [7]

The fifth and sixth quarks were sometimes called truth and beauty in the past, but even physicists thought that was too cute.

The **bottom** quark was first discovered at Fermi National Lab (Fermilab) in 1977, in a composite particle called Upsilon (ϒ). The **top** quark was discovered last, also at Fermilab, in 1995. It is the most massive quark. It had been predicted for a long time but had never been observed successfully until then. [8]

[1]Copyright ©1998. Brookhaven National Laboratory. Dec. 15, 2006
http://www.particlephysics.ac.uk/news/picture-of-the-week/picture-archive/the-omega-minus--the-last-piece-in-a-puzzle.html

[2]**http://www.particleadventure.org/particleadventure/frameless/quarks.html**

[3]©1997 Shaheen Ghandi and Rahul Jain, All Rights Reserved. This site is a **ThinkQuest** 1997 Contest Project. Dec. 15, 2006 **http://library.thinkquest.org/10380/glossary.shtml#C**

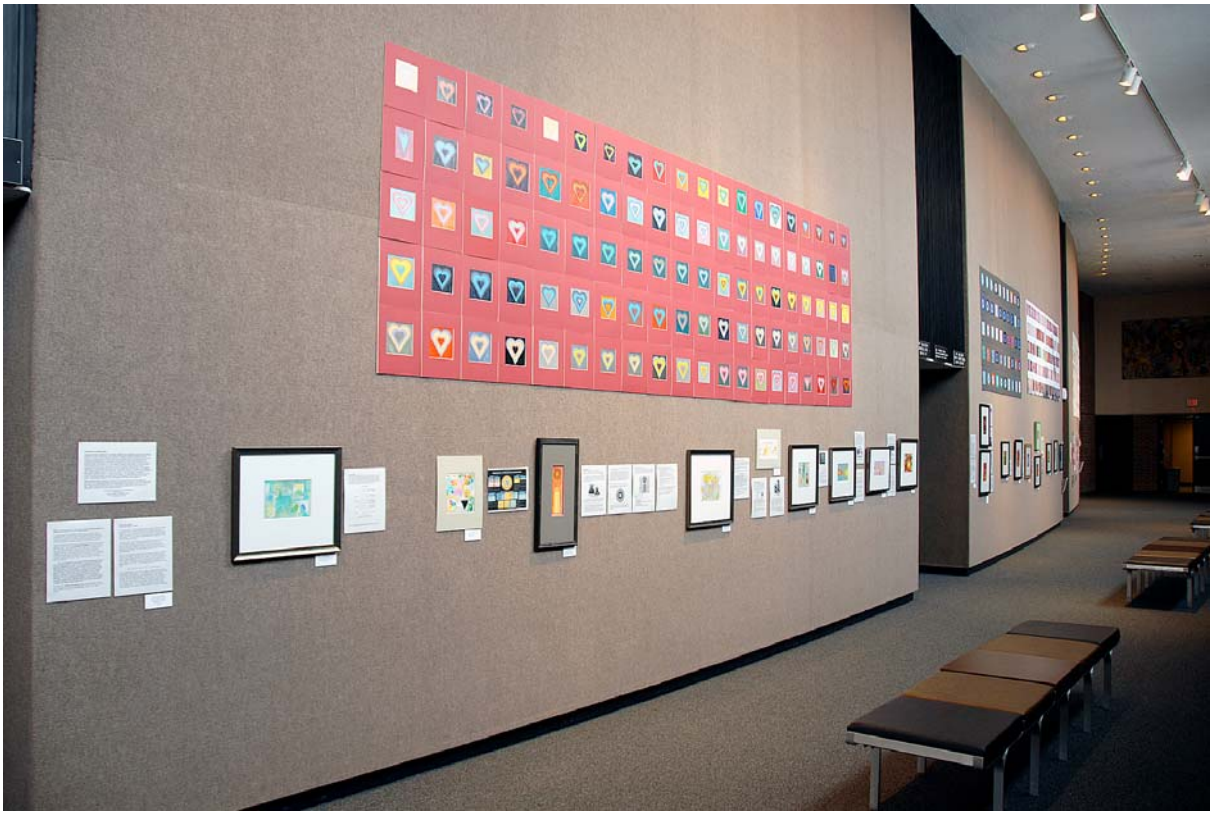
[4]Ibid.

[5]**http://particleadventure.org/particleadventure/frameless/quarknaming.html**

[6]bid.

[7]Op. Cit.

[8]Op. Cit.



"The Color of Loyalty: A Tribute to Dr. J. Robert Oppenheimer"
Wall Three of the Painting Installation

Introduction to The Daily Bread

During the months of September and October hesitation had managed to weasel its way between the work and I and was devouring precious time. I needed to pump out paintings pell mell because my brain was generating them faster than I seemed capable of working. Therefore these feelings of uncertainty had to be determined and eliminated so that I could expedite pictures. I suspected that nagging fears regarding the art-making process were the perpetrators and understood that the only way to rid myself of them was to put them to use. I made a list of the following things I was afraid to do: make abstract paintings, paint directly on a blank substrate, create muddy areas of color, use high key colors like Cadmium Yellow Primrose in the background, and apply paint color onto a picture by squeezing it from the tube. On 31 October 2003 I began a project called **"The Daily Bread."** I made it my business to complete one painting per work session using one or more of these fears. My self-directed exploration of quantum physics, informed by extensive studies in academic color theory, color perception, and pigment properties, introduced me to Dr. J. Robert Oppenheimer. Dr. Oppenheimer's role as the director of the Los Alamos Scientific Laboratory began my investigation of the creation of the atomic bomb. The paintings included in The Daily Bread bear the effects of this research.

After the picture dried, I scanned and emailed it to the same three women who referred to themselves as **"The Quintrinity"** (the "Quin" represented Keith, the baby boy one of the women was expecting at the time and gave birth to on 12 April 2004). I think email has become an "orgy of junk." What could be a fast and fun way of communicating with others has gone haywire. I retaliated by using it with completely good intentions.

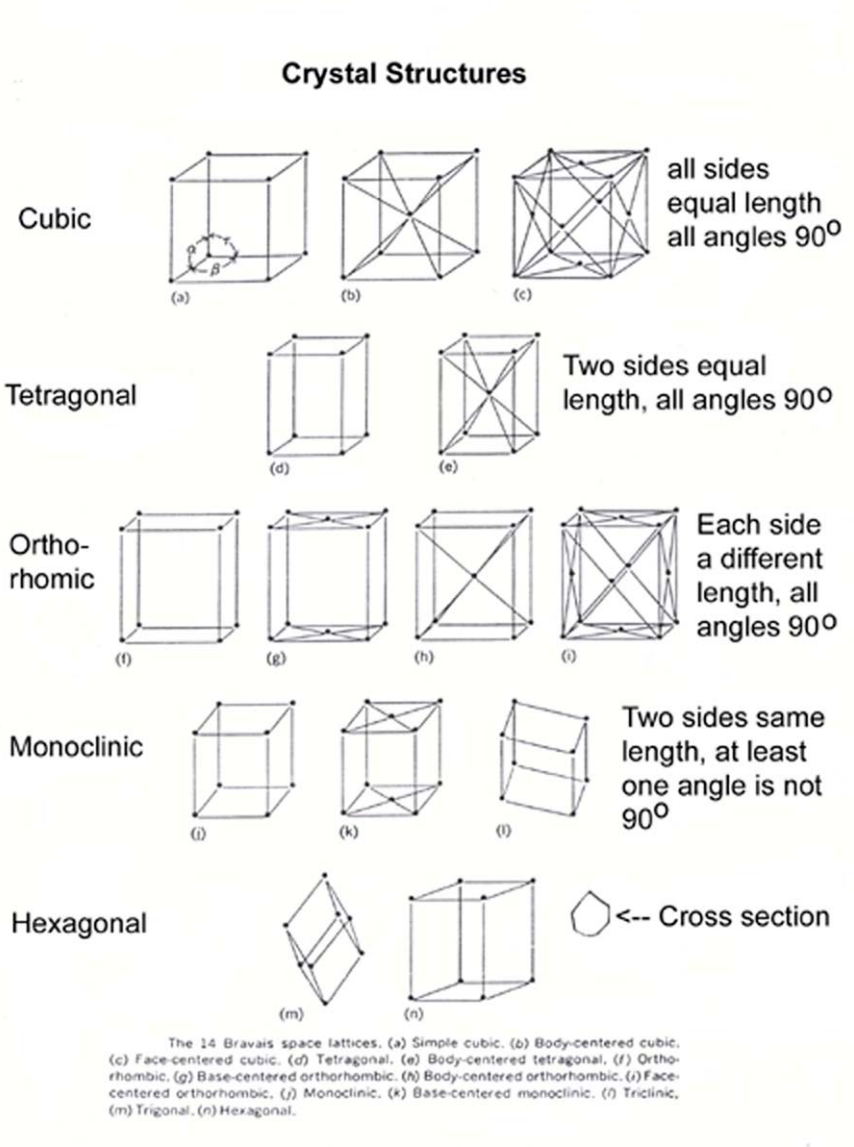
The passages included with "**The Daily Bread"** were taken from **"Day of Trinity"** by **Lansing Lamont** unless otherwise noted.

VII [11-13-2003]

"VII [11-13-2003]"

Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 8.5" x 11"

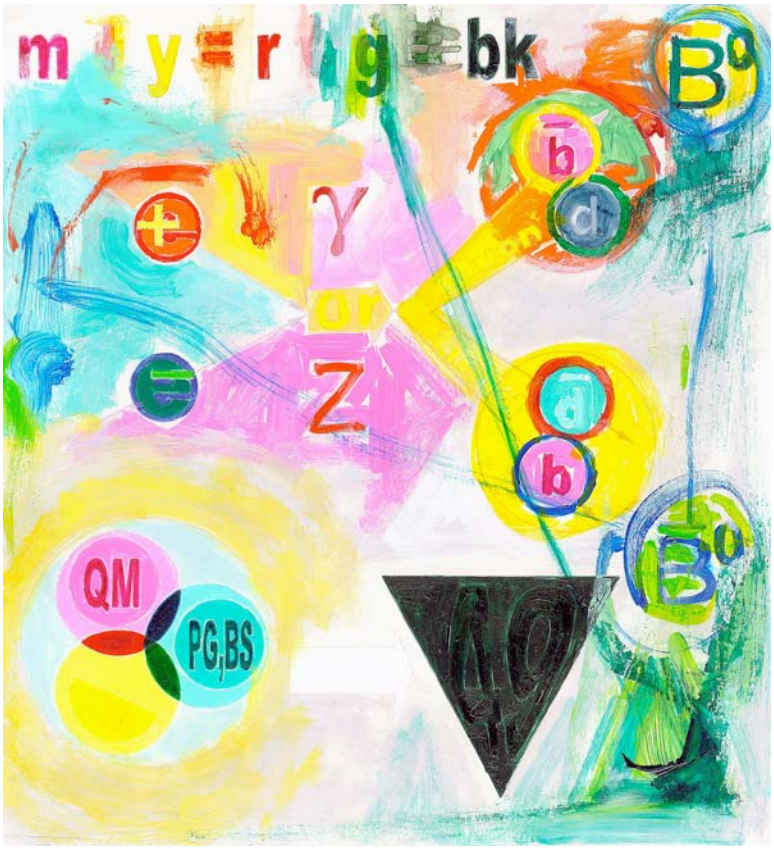
Crystals are simple repeated patterns of unit cells. Like apples in a market stall, atoms and molecules can grow into large three-dimensional solids, the pieces positioned to give the best balance between attractive and repulsive forces.[1] "**VII [11-13-2003]"** features a diagram depicting the Body-Centered Cubic (BBC) unit cell. As previously mentioned in **"Atoms Made Simple,**" the Body-Centered Cubic (BCC) unit cell has one host atom (lattice point) at each corner of the cube and one host atom in the center of the cube.



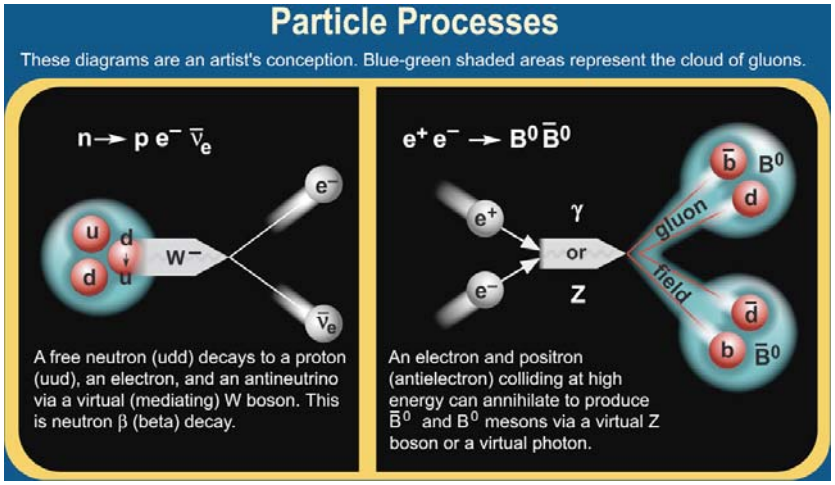
The 14 Bravais space lattices. (a) Simple cubic. (b) Body-centered cubic. (c) Face-centered cubic. (d) Tetragonal. (e) Body-centered tetragonal. (f) Orthorhombic. (g) Base-centered orthorhombic. (h) Body-centered orthorhombic. (i) Face-centered orthorhombic. (j) Monoclinic. (k) Base-centered monoclinic. (l) Triclinic. (m) Trigonal. (n) Hexagonal.

[1]Matt Tweed. **Essential Elements: Atoms, Quarks, and the Periodic Table**. Walker & Company, New York. Copyright © 2003 by Matt Tweed. p. 14

VIII [11-14-2003]



"VIII [11-14-2003]"
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Matted Dimensions: 8.5" x 11"
From the Collection of Debbe Fisher



© 2006 Contemporary Physics Education Project
http://www.cpepweb.org/images/chart_details/Particle.jpg

XII [11-21-2003], Diagram of the Teller-Ulam Thermonuclear Bomb

"XII [11-21-2003]"
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 11" x 8.5"
From the Collection of Bebe Hutter

"It is still an unending source of surprise for me to see how a few scribbles on a blackboard or on a sheet of paper could change the course of human affairs."
Stanislaw Ulam

All thermonuclear weapons existing in the world today appear to be based on the **"Teller-Ulam" design** (after its inventors Stanislaw Ulam and Edward Teller) or "staged radiation implosion" for a physically descriptive designation. Other designs have been devised that use thermonuclear reactions to enhance weapon yield in various ways, but the term "hydrogen bomb" can be taken to be virtually synonymous with this scheme.[1]

Edward Teller (left) and Stanislaw Ulam (right)
Los Alamos Wartime Badge Photos
These images are in the public domain.

Fission bombs worked, but they weren't very efficient. Thermonuclear bombs, also called Fusion bombs, have higher kiloton (equal to the detonation of 1000 tons of TNT) yields and greater efficiencies than fission bombs.[2]

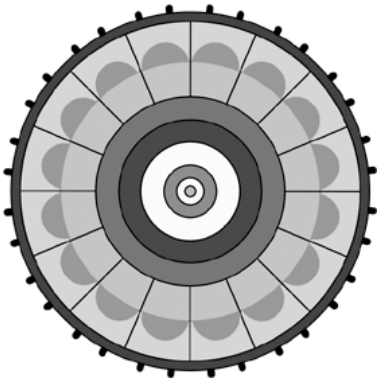
To design a fusion bomb, the following problems have to be solved:

- Deuterium (a stable isotope of hydrogen, meaning that it is not radioactive and has a very long life span) and tritium (a rare radioactive isotope of hydrogen with two neutrons and one proton in the nucleus), the fuel for fusion, are both gases, which are hard to store. [3]
- Tritium is in short supply and has a short half-life (the amount of time needed for half of a sample of unstable atoms or particles to undergo decay) so the fuel in the bomb would have to be continuously replenished. [4]
- Deuterium or tritium has to be highly compressed at high temperature to initiate the fusion reaction. [5]

First, to store deuterium, the gas could be chemically combined with lithium to make a solid lithium-deuterate compound. To overcome the tritium problem, the bomb designers recognized that the neutrons from a fission reaction could produce tritium from lithium (lithium-6 plus a neutron yields tritium and helium-4; lithium-7 plus a neutron yields tritium, helium-4 and a neutron). That meant that tritium would not have to be stored in the bomb. Finally, it was Ulam who recognized that the majority of radiation given off in a fission reaction was X-rays, and that these X-rays could provide the high temperatures and pressures necessary to initiate fusion. Therefore the solution to several fusion bomb problems, was to encase a fission bomb within a fusion bomb. [6]

Diagram✦ Representing the Implosion-Triggered Fission Bomb

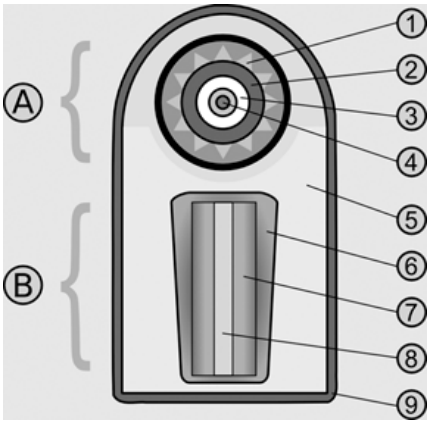
Depicts from center: neutron initiator, air-gap, hollow plutonium core, air-gap, tamper, pusher, explosive lenses (fast explosives, slow explosives, fast explosives), casing, and detonators (two per lens).



✦The original blueprints of the interior of the implosion-triggered fission bomb are still classified. However, there is some information about the main parts in the public domain. This diagram portrays the basics of an implosion-method nuclear weapon design.

Teller-Ulam Design of a Fusion Bomb

To understand this bomb design, imagine that within a bomb casing you have an implosion fission bomb and a cylinder casing of uranium-238 (tamper). Within the tamper is the lithium deuteride (fuel) and a hollow rod of plutonium-239 in the center of the cylinder. Separating the cylinder from the implosion bomb is a shield of uranium-238 and plastic foam that fills the remaining spaces in the bomb casing.[7]



The Teller-Ulam Thermonuclear Bomb List of Parts

A : fission stage B : fusion stage

1. **High-Explosive lenses**
2. **Uranium-238 ("tamper")**
3. **Vacuum ("levitation")**
4. **Tritium gas ("boosting", in blue) enclosed in plutonium or uranium hollow core**
5. **Polystyrene foam**
6. **Uranium-238 ("tamper")**
7. **Lithium-6 deuteride (fusion fuel)**
8. **Plutonium (sparkplug)**
9. **Reflective casing (reflects X-Rays towards fusion device)**

Detonation of the bomb caused the following sequence of events:

- The fission bomb imploded, giving off X-rays.
- These X-rays heated the interior of the bomb and the tamper; the shield prevented premature detonation of the fuel.
- The heat caused the tamper to expand and burn away, exerting pressure inward against the lithium deuterate.
- The lithium deuterate was squeezed by about 30-fold.
- The compression shock waves initiated fission in the plutonium rod.
- The fissioning rod gave off radiation, heat and neutrons.
- The neutrons went into the lithium deuterate, combined with the lithium and made tritium.
- The combination of high temperature and pressure were sufficient for tritium-deuterium and deuterium-deuterium fusion reactions to occur, producing more heat, radiation and neutrons.
- The neutrons from the fusion reactions induced fission in the uranium-238 pieces from the tamper and shield.
- Fission of the tamper and shield pieces produced even more radiation and heat.
- The bomb exploded. [8]

All of these events happened in about 600 billionths of a second (550 billionths of a second for the fission bomb implosion, 50 billionths of a second for the fusion events). The result was an immense explosion that was more than 700 times greater than the “Little Boy” explosion: it had a 10,000-kiloton yield. [9]

[1]”Teller-Ulam Summary.” Dec. 24, 2006. **http://nuclearweaponarchive.org/Library/Teller.html**

[2] “How Nuclear Bombs Work.” © 1998-2006 HowStuffWorks,Inc. Dec. 18, 2006. **http://science.howstuffworks.com/nuclear-bomb.htm/printable**

[3]Ibid.

[4]Op. Cit.

[5]Op. Cit.

[6]Op. Cit.

[7]Op. Cit.

[8]Op. Cit.

[9]Op. Cit.

XIII [11-23-2003], In Memory of Dr. J. Robert Oppenheimer

"XII [11-23-2003]"
IN MEMORY OF DR. J. ROBERT OPPENHEIMER

Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 8.5" X 11"

On December 22, 1953 the Atomic Energy Commission suspended Dr. Robert Oppenheimer's security clearance. He could either resign from everything or else submit to an in-camera hearing before an independent three-man board. Both he and the commission would be represented by counsel, both could call witnesses, both could cross-examine. If the vote went against him he could appeal it to the commission. The next day Dr. Oppenheimer made the decision to fight his case before the commission panel.[1]

On Sunday 23 November 2003, at approximately 5:30 a.m., I read the following passage from **"The Swift Years: The Robert Oppenheimer Story"** by Peter Michelmore while sitting at the table in my kitchen:

Roger Robb was the trial lawyer chosen to prosecute Dr. Robert Oppenheimer during this three-week personnel security board hearing. Edward Teller was a star witness for the prosecution.

May 6, 1954, Atomic Energy Commission Building, Room 2022, Washington, D.C

…he (Robb) put the question (to Teller) within three minutes: "Do you or do you not believe that Dr. Oppenheimer is a security risk?"

…he (Robb) put the question (to Teller) within three minutes: "Do you or do you not believe that Dr. Oppenheimer is a security risk?"

"In a great number of cases I have seen Dr. Oppenheimer act…in a way which for me was exceedingly hard to understand," said Teller. "I thoroughly disagreed with him in numerous issues and his actions frankly appeared to me confused and complicated. To this extent I feel that I would like to see the vital interests of this country in hands which I understand better, and therefore trust more….In this very limited sense I would like to express a feeling that I would feel personally more secure if public matters would rest in other hands."

Teller went on to say that Oppenheimer's work on the postwar atom committees was more a hindrance than a help to the people actively laboring in the atomic and thermonuclear field, and he had not lifted a finger, though he was desperately needed, to assist the super bomb project.[2]

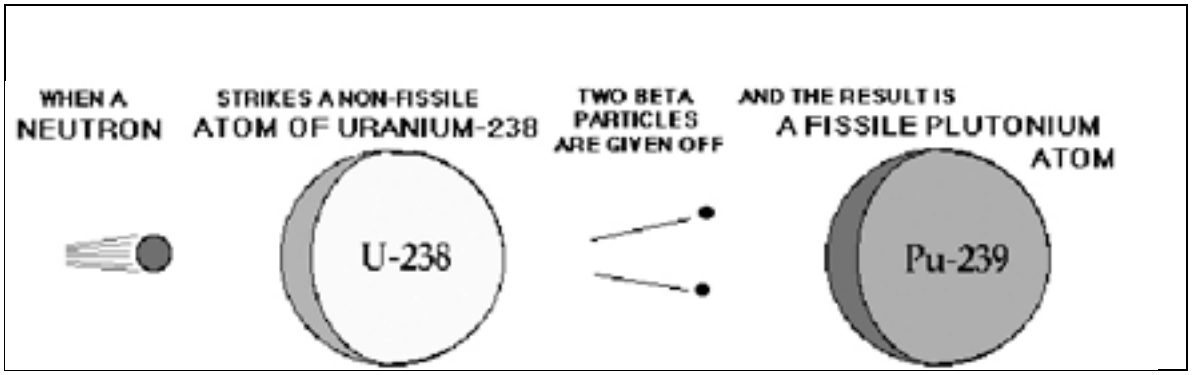
When I was finished, I put my hands (palms down) on either side of the tabletop, pushed my chair back, and stood up. Then I rotated my body counterclockwise and walked twenty-three feet into my workspace. I picked up the first substrate (surface to be painted) I saw and painted "**XIII [11-23-2003]."**

You will notice a diagram portraying the Teller-Ulam thermonuclear bomb design in the lower left and room number 2022 at the top (left of center).

Breeding Plutonium-239 [11-23-2003]

"Breeding Plutonium-239 [11-23-2003]"
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Matted Dimensions: 8.5" X 11"

U-238 will only undergo fission when it is struck by faster neutrons of certain energies. Sometimes it will absorb neutrons of certain energies. When it does this, the U-238 will undergo a series of decays to form Plutonium-239 (Pu-239). When this happens, the Pu-239 may also fission with thermal neutrons. In the typical commercial reactor, Pu-239 is created and fissions throughout the period of a cycle. Just before the reactor is shutdown for refueling almost 30% of the power generated by the reactor may be due to the Pu-239.



Source: http://www.cannon.net/~gonyeau/nuclear/basic.htm

The Discovery of Plutonium as written by Glenn T. Seaborg

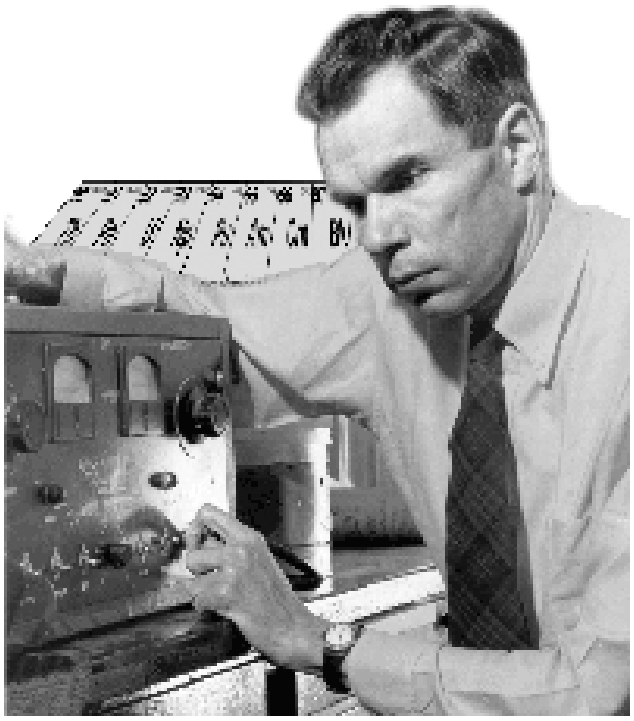
My co-workers and I (Edwin McMillan, Joseph Kennedy and Arthur Wahl) first synthesized and identified, that is, discovered, plutonium (atomic number 94, symbol Pu) at U.C. Berkeley on the night of February 23-24, 1941. We found this plutonium in the form of isotope ^{238} Pu. This isotope was produced by the bombardment of uranium with deuterons in the 60-inch cyclotron at U.C. Berkeley.

Kennedy, Wahl and I were soon joined by Emilio Segrè. Together we discovered the isotope ^{239}Pu, produced by the bombardment of uranium with neutrons. We demonstrated that this isotope was fissionable with slow neutrons on March 28, 1941.

Plutonium-239 was first isolated in visible amounts (the first such observation from a transmutation reaction) on August 20, 1942 and first weighed on September 10, 1942 in my laboratory at the wartime (WWII) Metallurgical Laboratory of the University of Chicago. While working there I was responsible for devising the multi-stage chemical process for the separation, concentration and isolation of plutonium, which was successfully used at the pilot plant, the Clinton Engineer Works, in Tennessee and the production plant, the Hanford Engineer Works, in the state of Washington.

Plutonium-238 has become the energy source powering satellites and other projects of our national space program. Plutonium-239 is the main explosive ingredient for nuclear bombs and an important energy source of nuclear power reactors.

(http://isswprod.lbl.gov/Seaborg/hits.htm)



Glenn T. Seaborg
19 April 1912-25 February 1999
arq.lanl.gov/.../99spring/newsmakers.html

XIV [11-24-2003]

"XIV [11-24-2003]"

Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 11" x 8.5"

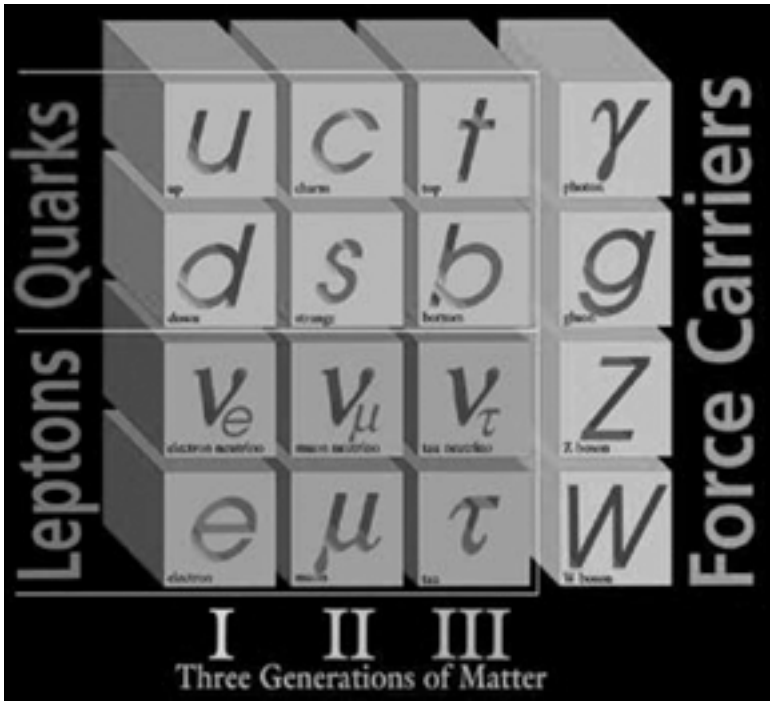


Photo Courtesy of Fermilab

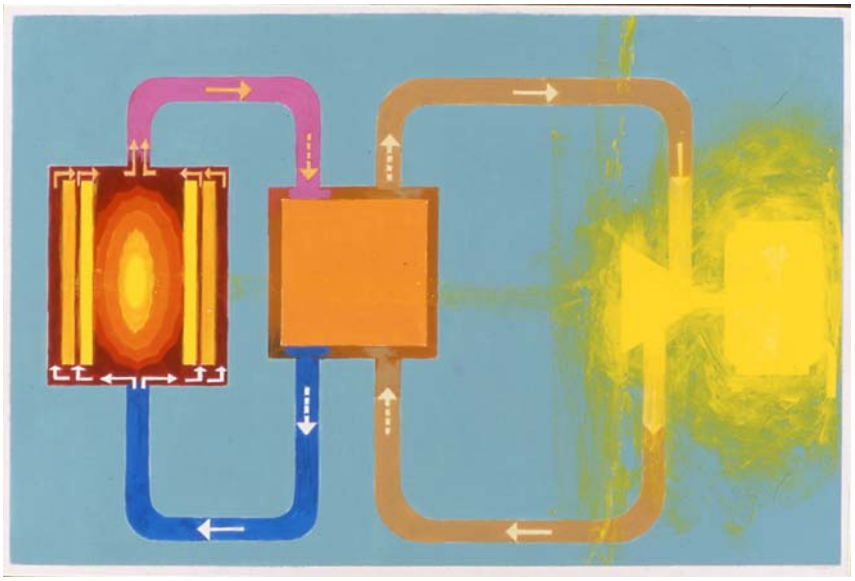
According to this Standard Model of the Atom, matter can be divided into the following building blocks:

- Fermions—subatomic particles that make known matter and antimatter
    - Matter
        - Leptons (the 6 squares in the lower left)—elementary particles that do not participate in holding the nucleus together (electron—electron neutrino, muon—muon neutrino, and tau—tau neutrino)
        - Quarks (the 6 squares in the upper left)—elementary particles that do participate in holding the nucleus together (down [d], up [u], strange [s], charm [c], bottom [b], and top [t])
    - Anti-Matter—counter-particles of quarks and leptons (anti-quarks, anti-leptons)
- Hadrons—composite particles (examples—proton, neutron)
- Bosons (the 4 vertical squares on the far right)—particles that carry forces (gluon [mediates the strong force], W and Z [mediate the weak force], and photon [mediates electromagnetic force])

The Mysterious Smiley in XIV [11-24-2003]

The smiley face in the lower right corner is from the "Microsoft Word" font named "Wingdings." I had repeatedly bypassed it since I began "The Daily Bread." Why? I was afraid that if I ever put it in a piece, people wouldn't take the work (not my work) seriously. Yes, I caught myself caring about what others think. The solution? The smiley must be painted in—for this fear to be painted out.

XVI [11-28-2003]



"XVI [11-28-2003]"

Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 8.5" x 11"

Princeton Plasma Physics Laboratory
Creating Innovations to Make Fusion Power a Practical Reality

In the most likely scenario for a fusion power plant, a deuterium-tritium (D-T) mixture is admitted to the evacuated reactor chamber and there ionized and heated to thermonuclear temperatures. The fuel is held away from the chamber walls by magnetic forces long enough for a useful number of reactions to take place. The charged helium nuclei which are formed give up energy of motion by colliding with newly injected cold fuel atoms which are then ionized (The state in which an atom is missing one or more of its electrons, and is therefore positively charged.) and heated, thus sustaining the fusion reaction. The neutrons, having no charge, move in straight lines through the thin walls of the vacuum chamber with little loss of energy.

The neutrons and their 14 MeV of energy are absorbed in a "blanket" containing lithium which surrounds the fusion chamber.

14 megaelectron volts = 2.24304705 _ 10^{-12} joules
1 joul (pronounced DJOOL) = 10,000,000 ergs.
An erg is approximately the amount of energy given off when a mosquito collides with a screen door.
Ouch.

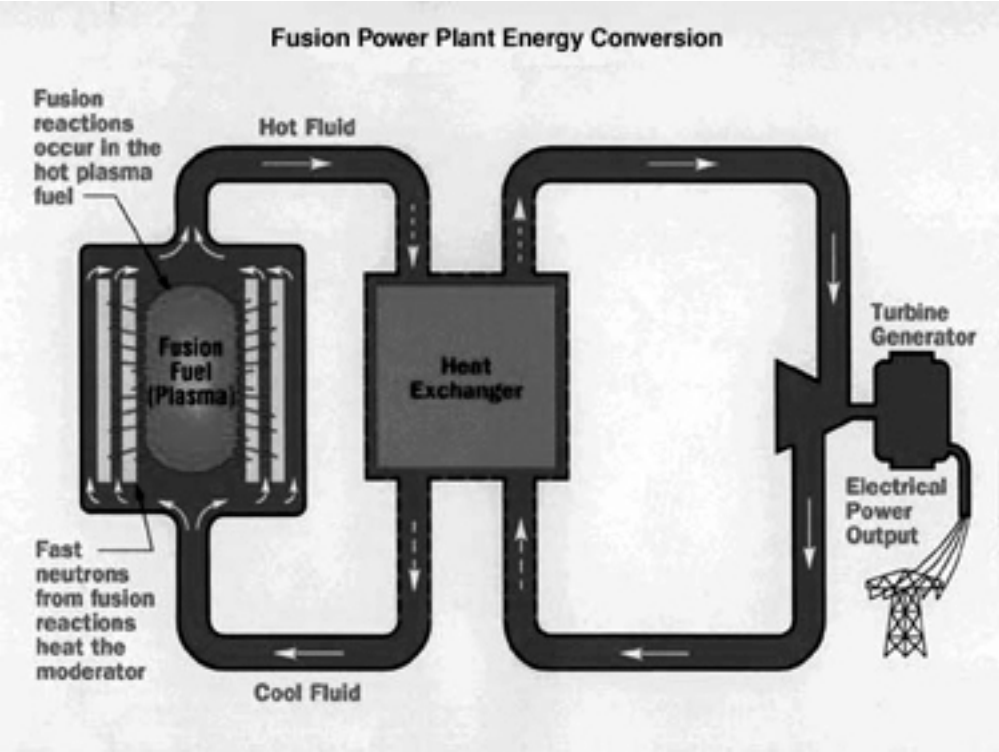


Diagram of Fusion Power Plant Energy Conversion
http://www.pppl.gov/fusion_basics/pics/power_plant.jpg

The neutrons' energy of motion is given up through many collisions with lithium nuclei, thus creating heat that is removed by a heat exchanger which conveys it to a conventional steam electric plant. The neutrons themselves ultimately enter into nuclear reactions with lithium to generate tritium which is separated and fed back into the reactor as a fuel.

The successful operation of a fusion power plant will require the use of materials resistant to energetic neutron bombardment, thermal stress, and magnetic forces. Additional work also needs to be done on the design of systems for the removal of spent gas.

The preceding passages are from "Creating Innovations to Make Fusion Power a Practical Reality," Princeton Plasma Physics Laboratory (PPPL is funded by the U.S. Department of Energy and managed by Princeton University). Updated: 04 November 2004. Dec. 25, 2006.
http://www.pppl.gov/fusion_basics/pages/fusion_power_plant.html

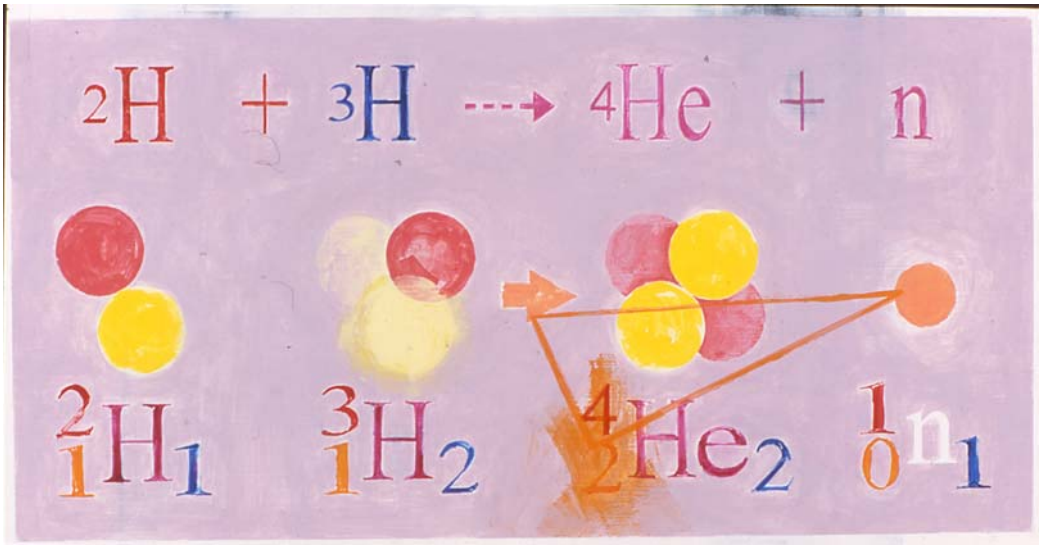
XVII [11-30-2003] and XVIII [12-1-2003], a.k.a. Order and Chaos

Purchase Date of Lansing Lamont's *Day of Trinity*

After completing "**XVII [11-30-2003]**," I went to lunch with one of my dearest friends, the writer Beverly A. Army (one member of **"The Quintrinity"**). Later that afternoon, we walked to Bruised Apple Books located two blocks up the street from where I live and work. I found a copy of Lansing Lamont's **"Day of Trinity"** in the World War II section. I began reading it on Monday, 1 December 2003.

I found this diagram of nuclear fusion on 24 November 2003. It's from the website named **"ABC's of Nuclear Science"**(produced by the Nuclear Science Division, Lawrence Berkeley National Laboratory). Six days later, it pushed its way into my studio and landed on the painting named **"XVII [11-30-2003]."**

http://www.lbl.gov/abc/Basic.html#Fusion



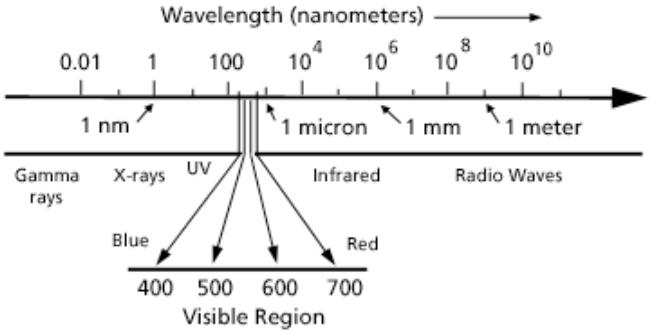
"XVII [11-30-2003]"

Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 8.5" x 11"

A fusion reaction involves three steps:

1. Two protons combine to form a deuterium (a stable isotope of hydrogen, meaning that it is not radioactive and has a very long life span) nucleus, which consists of one proton and one neutron. A positron (also called an anti-electron) and a neutrino (a particle with negligible mass but extreme penetrating power) are generated during this part of the process. [1]

2. The deuterium nucleus combines with another proton, forming a nucleus of helium 3, which consists of two protons and one neutron. An energetic photon (The quantum of electromagnetic energy, regarded as a discrete particle having zero mass, no electric charge, and an indefinitely long lifetime.) is produced during this part of the process, with a wavelength in the gamma-ray portion of the electromagnetic spectrum[2] (refer to the diagram of the electromagnetic spectrum for the location of its gamma-ray portion).



Electromagnetic Spectrum

http://acept.la.asu.edu/PiN/rdg/color/spectrum.gif

3. Finally, two nuclei of helium 3 combine to form a nucleus of helium 4, which consists of two protons and two neutrons. In this part of the process, two protons (ordinary hydrogen nuclei) are released. These protons can eventually become involved in another fusion reaction. [3]

"XVIII [12-1-2003]"

Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 8.5" x 11"

Fusion for the Layman

At the center of a star, hydrogen atoms, the primordial (fundamental) "stuff" of the physical world, are squeezed together so tightly by the enormous gravitational force of the star's dense mass that they fuse together, making a new element, helium. Every four hydrogen atoms become one helium atom. However, the mass of one helium atom is not the same as the mass of four hydrogen atoms. It is slightly less. This small difference in mass is released as radiant energy—heat and light. The process of fusing lighter elements into heavier elements is called, of course, fusion. The fusion of hydrogen into helium causes a hydrogen explosion. In other words, a (young) burning star literally is one huge, continuously exploding hydrogen bomb. [4]

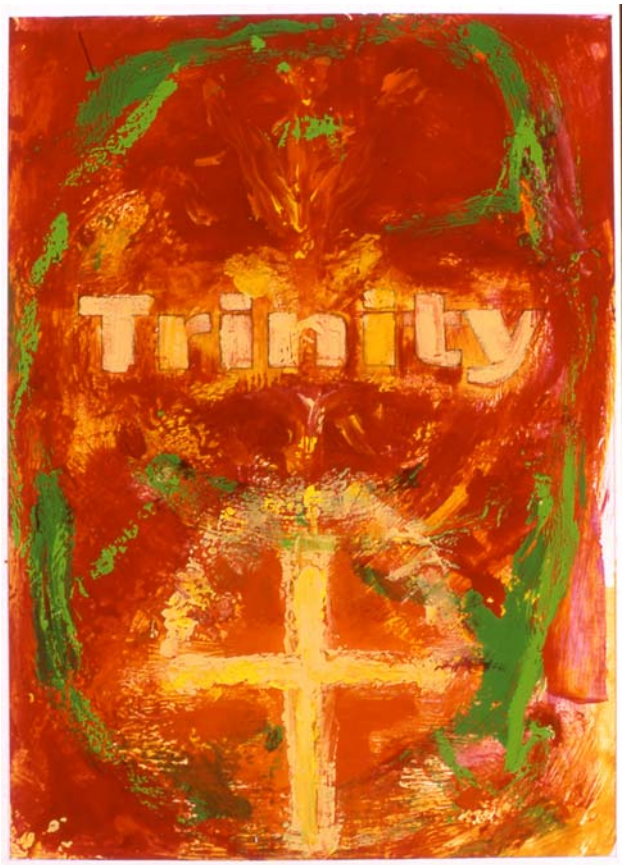
[1]"nuclear fusion." **Whatis?com.** All Rights Reserved, Copyright 2000-2006 TechTarget. **http://whatis.techtarget.com/definition/0,,sid9_gci1106731,00.html**

[2]Ibid.

[3]Op. Cit.

[4]Gary Zukav. **The Dancing Wu Li Masters: An Overview of the New Physics**. Bantam Books: New York, Toronto, London, Sydney, and Auckland. Copyright © 1979 by Gary Zukav. p. 155-156

XIX [12-4-2003]



"XIX [12-4-2003]"
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 11" x 8.5"

Trinity. Its name evoked thoughts of Easter and visions of soaring cathedrals. It spoke of hymns, hushed vespers, children's choirs and pealing anthems from invisible organs—all the legend, ritual and mystery of the Christian Church.

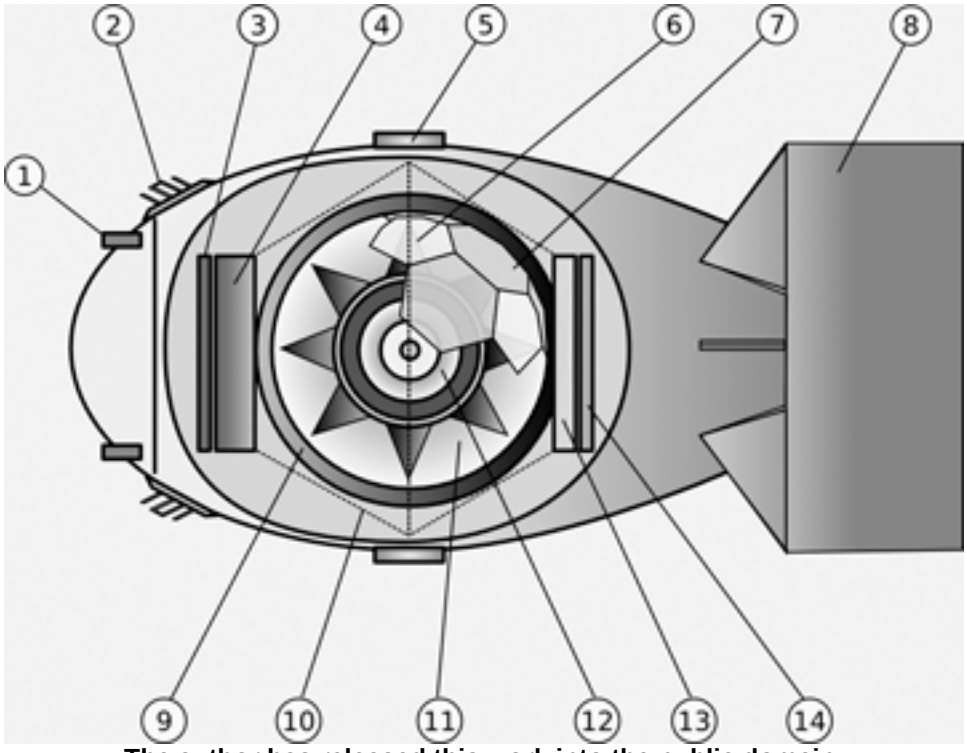
Was it blasphemy to christen with such a name the birthplace of the atomic bomb?

Perhaps. And yet there was a hint of holiness about the vast silent valley that was Trinity—something in its history that touched the indomitability of man's questing spirit; something in its ageless and primitive beauty that suggested man's earliest temples of prayer.

The 432-square-mile patch of desert that Trinity encompassed had known violence since the beginning of time. Cupped between two jagged mountain ranges, 150 miles from the southern border of New Mexico, it was part of the Jornada del Muerto—Journey of Death—the residue of centuries of volcanic fury dating from the pre-Cambrian era. Its thrusting peaks and massive lava flows testified to that. It was a place of deadening heat and drought, interspersed with fierce winds and thunderstorms. (**"Day of Trinity,**" Lansing Lamont, p. 73)

Got a match? [12-4-2003/12-5-2003]

"Got a match? [12-4-2003/12-5-2003]"
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 11" x 8.5"



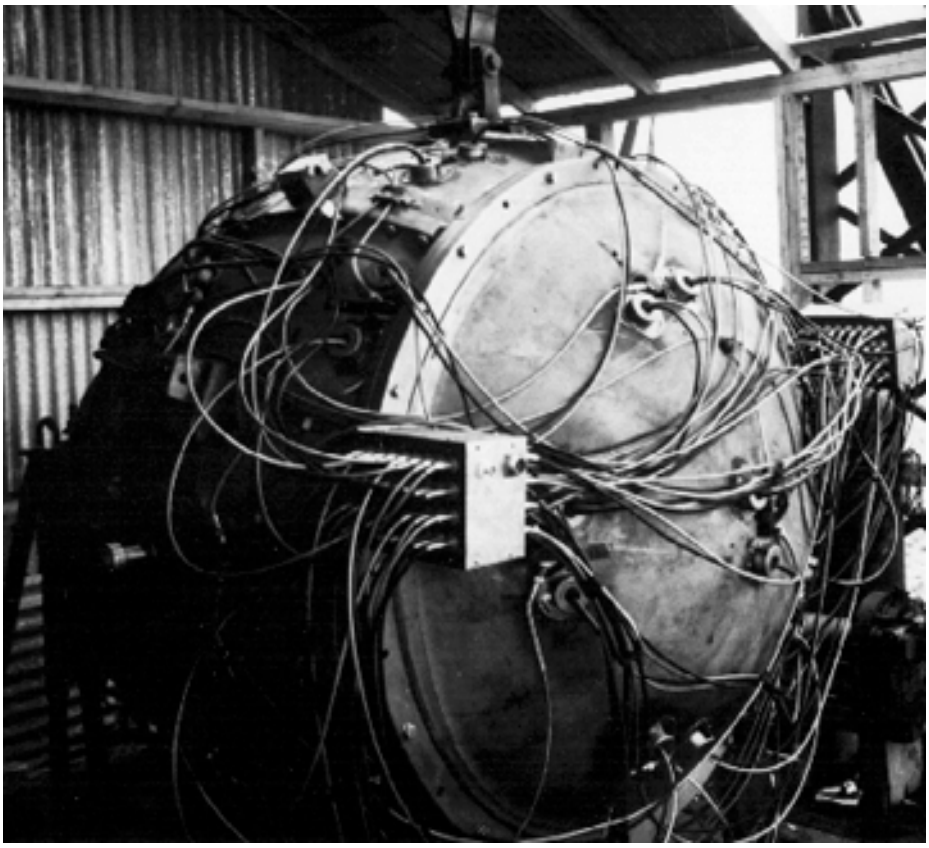
The Implosion-Triggered Fission Bomb List of Parts

1. **AN 219 destruct fuse**
2. ***Archie* radar antenna**
3. **Plate with batteries (to detonate charge surrounding nuclear components)**
4. ***X-Unit*, a firing set placed near the charge**
5. **Hinge fixing the two ellipsoidal parts of the bomb**
6. **High explosive pentagonal lens (12 units around the core, made of high and low velocity explosive)**
7. **High explosive hexagonal lens (20 units around the core, made of high and low velocity explosive)**
8. ***California Parachute* tail (aluminium)**
9. **Dural casing, ~140 cm inner diameter**
10. **Cones that contained the whole sphere**
11. **Explosive lenses (low and high velocity)**
12. **Nuclear material (see other figure for details about the different layers)**
13. **Plate with instruments (radars, baroswitches and timers)**
14. **Barotube collector**

At the dawn of the Manhattan Project, scientists recognized that compressing the sub-critical masses together into a sphere by implosion might be a good way to make a supercritical mass. There were several problems with this idea, particularly how to control and direct the shock wave uniformly across the sphere. But the Manhattan Project team solved the problems. The implosion device consisted of a sphere of uranium-235 (tamper) and a plutonium-239 core surrounded by high explosives.[1]

When the bomb was detonated, this is what happened:

The explosives fired, creating a shock wave.
The shock wave compressed the core.
The fission reaction began.
The bomb exploded. [2]



Government photo of the Trinity test "gadget."
This image is in the public domain.

"Fat Man" (the atomic bomb dropped on Nagasaki, Japan on 9 August 1945) was this type of bomb and had a 23-kiloton yield with an efficiency of 17 percent. These bombs exploded in fractions of a second. The fission usually occurred in 560 billionths of a second. [3] An implosion-triggered fission bomb is on exhibit in the **"Large Weapons Gallery"** located in the sub-basement of the **West Point Museum**. The safety plug removed from **"Fat Man"** before its fateful descent is also on exhibit in the museum. This artifact can be viewed in the **"History of Warfare Gallery"** on the first floor.

"Is it really big enough?"

When Niels Bohr arrived at Los Alamos in 1943, writes Robert Oppenheimer, "his first serious question was, 'Is it really big enough?'" The bomb, Bohr meant: big enough to end world war, big enough to challenge mankind to find its way beyond man-made death to a world more open and more humane. "I do not know whether it was," Oppenheimer adds; "it did finally get to be." By 1955, if not before, the bomb had worked an essential change upon the world. Oppenheimer had already found succinct metaphoric expression of that change in a commencement address he delivered early in 1946. "It did not take atomic weapons to make war terrible," he said then. "…It did not take atomic weapons to make man want peace, a peace that would last. But the atomic bomb was the turn of the screw. It has made the prospect of future war unendurable. It has led us up those last few steps to the mountain pass; and beyond there is a different country." [4]

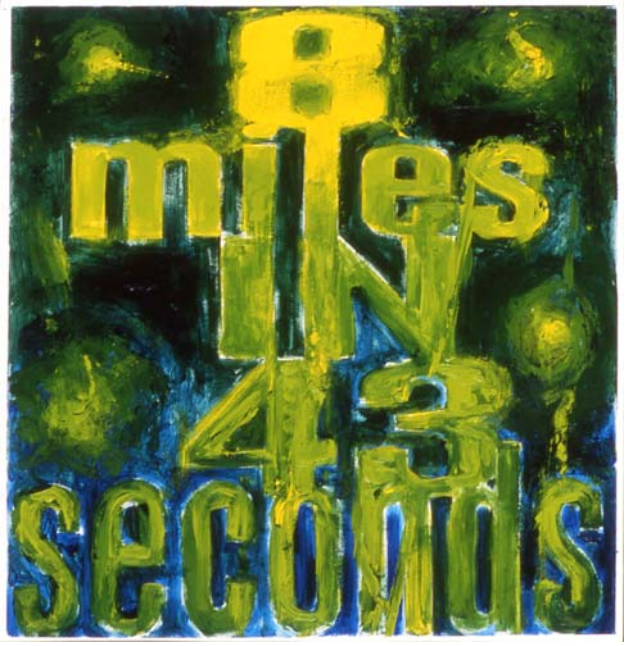
[1] "How Nuclear Bombs Work." © 1998-2006 HowStuffWorks,Inc. Dec. 18, 2006. **http://science.howstuffworks.com/nuclear-bomb.htm/printable**

[2]Ibid.

[3]Op. Cit.

[4]Richard Rhodes. The Making of the Atomic Bomb. Simon and Schuster, Inc. New York, London, Toronto, Sydney, and Tokyo. 1986. Page 778.

XX [12-5-2003]



"XX [12-5-2003]"
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 11" x 8.5"

They (airmen) practiced dropping the **"pumpkins"*** from their bomb bays and getting clear of the explosion fast. They made tight 158-degree turns and nosed their planes into shallow dives to gain getaway speed. Some of them thought the wings would rip from the fuselage. The bombers would need eight miles between them and the explosion in order to escape. They would have just forty-three seconds to make it. (**"Day of Trinity,**" Lansing Lamont, p. 88)

I used to commute 8 miles from my mother's residence in Montrose, N.Y. to The Art Barn in Ossining, N.Y. (where I've been employed as a custom picture framer since 3 October 1988). To remove the moisture from a photograph before drymounting it, I put it between two sheets of brown Kraft paper and place it in the drymount press (which is a little over 26" deep and 38" wide and opens and closes like a giant clam). I apply heat (180° F) for 43 seconds, open the press, and then close the press for an additional 30 seconds. I imagined traveling from my mother's house to work in 2 seconds less than the time it takes me to largely dehumidify a photo. I believe I'd pull up to The Art Barn without skin.

***These dummy bombs were actually teardrop models of the implosion weapon, bulbous up front and tapered back to the fins.**

XXI [12-6-2003]

"XXI [12-6-2003]"
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 11" x 8.5"
From the Collection of Fred Gillen Jr.

A pinprick of a brilliant light punctured the darkness, spurted upward in a flaming jet, then spilled into a dazzling cloche of fire that bleached the desert to a ghastly white. It was precisely 5:29:45 a.m.

Georgia Green felt the flash and a sudden loss of breath. "What's that?" she gasped and clutched the arm of her brother-in-law. The car shook and swerved off onto the shoulder of the road. In the floodlit control center Joe McKibben was aware of an even brighter light paling the instrument panels. Across the test site everything suddenly became infinitely tiny. Men burrowed into the sand like ants. Oppenheimer in that blinding instant thought of fragments from the sacred Hindu epic, **"Bhagavad-Gita":**

If the radiance of a thousand suns
Were to burst at once into the sky,
That would be like the splendor
of the Mighty One…
I am become Death,
The shatterer of worlds.

For a fraction of a second the light in that bell-shaped fire mass was greater than any ever produced before on earth. Its intensity was such that it could have been seen from another planet. The temperature at its center was four times that at the center of the sun and more than 10,000 times that at the sun's surface. The pressure, caving in the ground beneath, was over 100 billion atmospheres, the most ever to occur at the earth's surface. The radioactivity emitted was equal to one million times that of the world's total radium supply.

No living thing touched by that raging furnace survived. Within a millisecond the fireball had struck the ground, flattening out at its base and acquiring a skirt of molten black dust that boiled and billowed in all directions. Within twenty-five milliseconds the fireball had expanded to a point where the Washington Monument would have been enveloped. At eight tenths of a second the ball's white-hot dome had topped the Empire State Building. The shock wave caromed across the roiling desert.

Human response may have been the same as on that first dawn in the basement of time when Man discovered fire: fright at first, giving way to impetuous curiosity, then an awed realization of the phenomenon and finally, primitive glee.

Men turned to look at the fireball, inflated now a half-mile wide, and wondered if it would ever stop growing. In their excitement many threw off their dark glasses and instantly lost sight of what they had waited years to see. At Base Camp there were silent handclasps and murmurs of amazement; at South-10,000, a squabble of excited voices that rose to a deafening din; and on Compania Hill, a piercing whoop followed by a mad jig that suggested to one observer the fire rites of prehistoric savages. (**"Day of Trinity,"** Lansing Lamont, pp. 235-236)

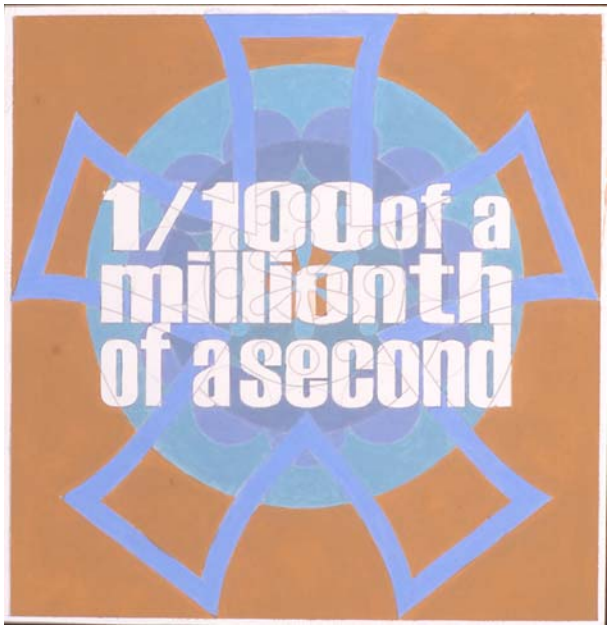
J. Robert Oppenheimer
22 April 1904-18 February 1967
This image is in the public domain.

"We waited until the blast had passed, walked out of the shelter and then it was extremely solemn. We knew the world would not be the same. A few people laughed, a few people cried. Most people were silent. I remembered the line from the Hindu scripture, the **"Bhagavad-Gita"**: Vishnu is trying to persuade the Prince that he should do his duty and to impress him he takes on his multi-armed form and says, 'Now I am become Death, the destroyer of worlds.' I suppose we all thought that, one way or another." Dr. J. Robert Oppenheimer

Isidor Isaac Rabi
July 29, 1898-January 11, 1988
This image is in the public domain.

"Naturally, we were very jubilant over the outcome of the experiment. While this tremendous ball of flame was there before us, and we watched it, and it rolled along, it became in time diffused with the clouds….Then it was washed out with the wind. We turned to one another and offered congratulations, for the first few minutes. Then, there was a chill, which was not the morning cold; it was a chill that came to one when one thought, as for instance when I thought of my wooden house in Cambridge, and my laboratory in New York, and of the millions of people living around there, and this power of nature which we had first understood it to be—well, there it was." I.I Rabi

XXII [12-8-2003]



"XXII [12-8-2003]"
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 11" x 8.5"
From the Collection of Paul Quinn

Bruno Benedetto Rossi
April 13, 1905 – November 21, 1993

By far the most important experiments were those diagnosing how the implosion assembly worked and those measuring the speed of the explosion itself. The Venetian Bruno Rossi directed this chore. His task defied comprehension. He would have to determine the velocity at which the energy of the blast multiplied in intensity. The faster it intensified, the more powerful would be the explosion. The problem was how to measure this prodigy: It all took place within 1/100 of a millionth of a second. (**"Day of Trinity,"** Lansing Lamont, p. 105)

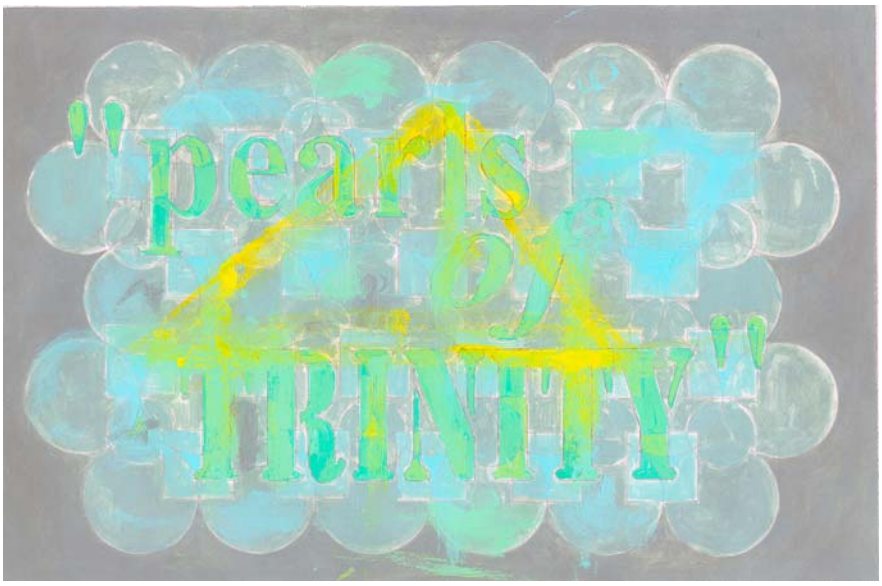
XXIII [12-11-2003] and boom [12-11-2003]

At 2,000 feet, still hurtling through the atmosphere, the seething ball turned reddish yellow, then a dull blood-red. It churned and belched forth smoking flame in an elemental fury. Below, the countryside was bathed in golden and lavender hues that lit every mountain peak and crevasse, every arroyo and bush with a clarity no artist could capture. At 15, 000 feet the fireball cleaved the overcast in a bubble of orange that shifted to a darkening pink. Now, with its flattened top, it resembled a giant mushroom trailed by a stalk of radioactive dust. Within another few seconds the fireball had reached 40, 000 feet and pancaked out in a mile-wide ring of graying ash. The air had ionized around it and crowned it with a lustrous purple halo. As the cloud finally settled, its chimney-shaped column of dust drifted northward and a violet afterglow tinged the heavens above Trinity. (**"Day of Trinity,"** Lansing Lamont, p. 239)

"XXIII [12-11-2003]"
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 8.5" x 11"

"boom [12-11-2003]"
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 11" x 8.5"
From the Collection of Amy Cabot

XXIV [12-12-2003]



"XXIV [12-12-2003]"

Acrylic on 65 lb. neutral pH cover paper
Un-Matted Dimensions: 8.5" x 11"

(Herbert) Anderson was unprepared for the sight that greeted him. A half-mile away he saw what looked like a great jade blossom amid the coppery sands of the desert. Where the shot tower had once stood, a crater of green ceramic-like glass glistened in the sun. The fireball had sucked up the dirt, fused it virescent with its incredible heat, then dumped the congealing particles back on the explosion point. They lay there inside a 1200-foot-wide saucer some twenty-five feet deep at the center. The bomb, even from 100 feet up, had so pulverized the earth that the tower's concrete stumps, which once stood above ground, had been crushed to a depth of seven feet beneath the sand. The tower itself had completely evaporated. Within a mile of the crater there was no sign of life or vegetation**.**

Anderson stopped his tank at the crater's edge and fired the rocket with its clawlike retriever. The dirt samples he recovered sent his Geiger counter soaring off scale. Even had he not witnessed the explosion, Anderson would have known immediately from the radioactivity in the samples that the bomb had been a fantastically powerful one. He lingered for a moment, gazing through his periscope at the thousands of emerald beads that would one day be known as the "pearls of Trinity," or trinitite. Then, wary of the danger of overexposure, he ordered the driver to head back to Base Camp. (**"Day of Trinity,"** Lansing Lamont, p. 246)

Herbert Anderson
Born: 24 May 1914
Died: 16 July 1988 (Forty-Third Anniversary of the Trinity Detonation)

XXV [12-15-2003], In Memory of Dr. Louis Slotin

"XXV [12-15-2003]"
IN MEMORY OF DR. LOUIS SLOTIN

Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 8.5" x 11"

The nuclear weapons industry, like any other large industrial enterprise, is subject to the normal range of accidents from vehicle wrecks to falls from a height. These accidents are by far the most common that happen. There is one class of accident that is unique to the nuclear industry: criticality accidents, where an amount of fissile material accidentally comes together into a supercritical amount. There is a sudden release of energy and deadly radiation.

The "Dragon Experiment" (a.k.a. "Tickling the Dragon's Tail)

A senior scientist (Louis Slotin) was demonstrating the technique of critical assembly and associated studies and measurements to another scientist (Alvin C. Graves). The particular technique employed in the demonstration was to bring a hollow hemisphere of beryllium around a mass of fissionable material which was resting in a similar lower hollow hemisphere.

The system was checked with two one-inch spacers between the upper hemisphere and the lower shell which contained the fissionable material; the system was subcritical at this time.

Re-enactment of Dr. Slotin "Tickling the Dragon's Tail"
http://www.cns-snc.ca/history/pioneers/slotin/slotin_re-enact.jpg

Then the spacers were removed so that one edge of the upper hemisphere rested on the lower shell while the other edge of the upper hemisphere was supported by a screwdriver. This latter edge was permitted to approach the lower shell slowly. While one hand held the screwdriver, the other hand was holding the upper shell with the thumb placed in an opening at the polar point.

At that time, the screwdriver apparently slipped and the upper shell fell into position around the fissionable material. Of the eight people in the room, two (Slotin and Graves) were directly engaged in the work leading to this incident.

The "blue glow" was observed, a heat wave felt, and immediately the top shell was slipped off and everyone left the room. Dr. Slotin who was demonstrating the experiment received sufficient dosage to result in injuries from which he died nine days later. Dr. Graves received sufficient radiation dosage to cause serious injuries and some permanent partial disability.

The other six employees in the room suffered no permanent injury. (*See* TID-5360, p. 4.)

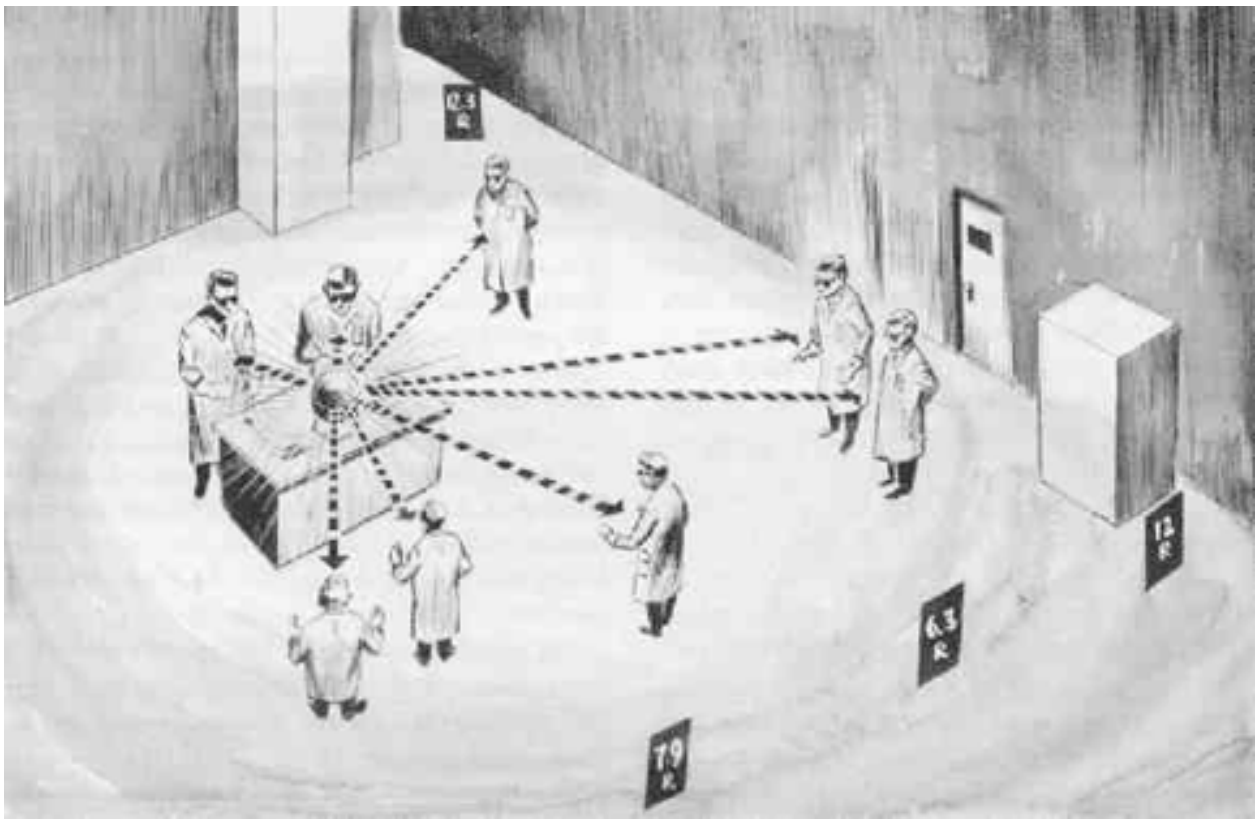


Diagram depicting Dr. Slotin’s Criticality Accident
http://www.cddc.vt.edu/host/atomic/images/slotin.jpg

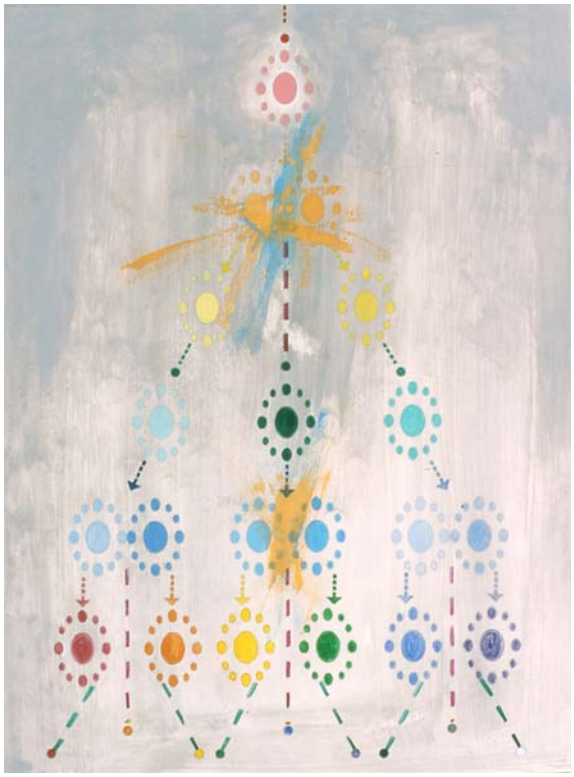
Painting a Tribute to "My Hero" on 15 December 2003

Dr. Louis Slotin at Work
Los Alamos, New Mexico 1945
http://nuclphys.sinp.msu.ru/experiment/neutr_gen/images/slotin_louis_alexander%20.jpg

I had first read about Dr. Slotin in the book **"Day of Trinity"** on Friday, 12 December 2003. I could not stop thinking about him. On Sunday, 14 December 2003, I spent a couple of hours on the Internet researching his life and looking at diagrams and photos depicting the event on 21 May 1946. I was beginning to get a sore throat and woke up Monday morning with the same virus my mother had just recovered from. I slept in the morning, and shortly before noon was forced out of bed by my need to paint a picture for Dr. Slotin. Out of all the stories of the people associated with the creation of the atomic bomb, Dr. Slotin's is the one that turned me inside out.

The preceding passages are from "Criticality and Radiation Accidents," **Trinity Atomic Web Site** Copyright © 1995-2005 Gregory Walker (trinatomic at earthlink dot net), Creator of Trinity Atomic Web Site. Dec. 25, 2006. **http://www.cddc.vt.edu/host/atomic/accident/critical.html#cr082145**

XXX [12-24-2003/12-26-2003]



"XXX [12-24-2003/12-26-2003]"
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 11" x 8.5"
From the Collection of Joanne Hayes

To many of them Trinity was not only a means toward ending the war. It represented the climax of an intriguing intellectual match between the scientists and the cosmos. The prospect of solving the bomb's cosmic mysteries, of having their calculations proved correct, seemed far more fascinating and important to the scientists than the prospect of their opening an era obsessed by fear and devoted to control of those very mysteries. They were unbottling the atomic genie, but others would have to worry about its care and feeding. The scientists at Los Alamos felt they had every right to celebrate the end of a long endeavor and to toast their hopes for success at Trinity. (**"Day of Trinity,"** Lansing Lamont, p. 144)

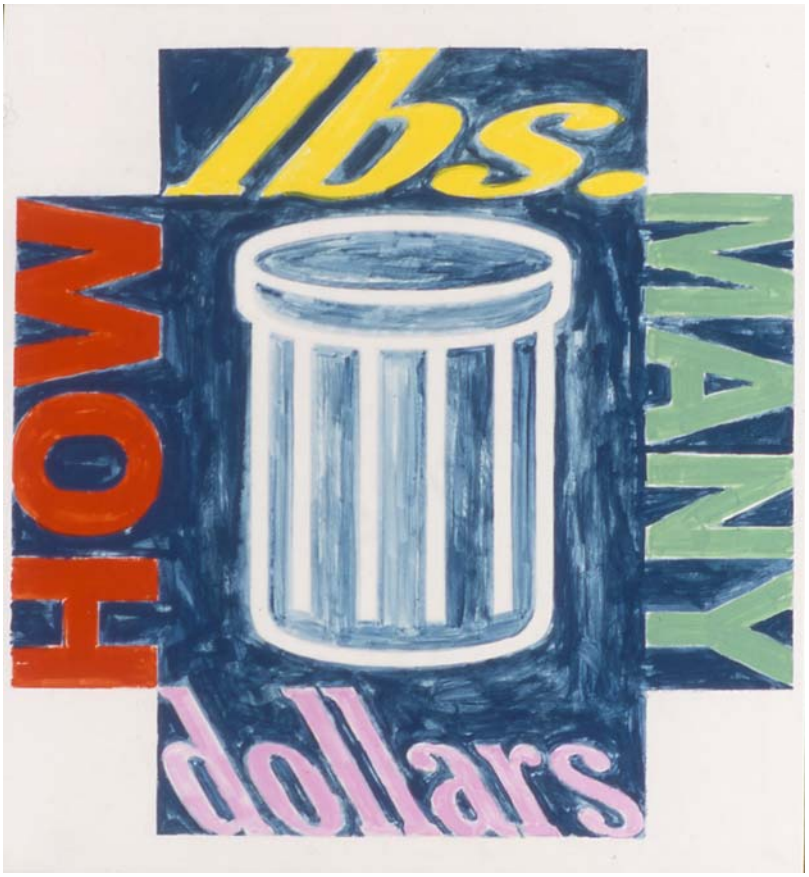
What is a nuclear chain reaction?

Atomic bombs and atomic reactors obtain energy from mass by the process of fission. The process of fission splits atoms of uranium, which are quite large, into atoms that are smaller.[1] This is done by firing a neutron (a subatomic particle) at an atom of uranium. When the neutron hits the uranium atom, it splits it into lighter atoms, but the mass of these smaller atoms together is less than the mass of the parent atom of uranium. The difference in mass explodes into energy. This process also produces additional neutrons, which fly off to strike other uranium atoms, creating more fissions, more light atoms, more energy, and more neutrons. The whole phenomenon is called a chain reaction. An atomic bomb is an uncontrolled chain reaction.[2]

[1]Gary Zukav. **The Dancing Wu Li Masters: An Overview of the New Physics**. Bantam Books: New York, Toronto, London, Sydney, and Auckland. Copyright © 1979 by Gary Zukav. p. 156

[1]Ibid.

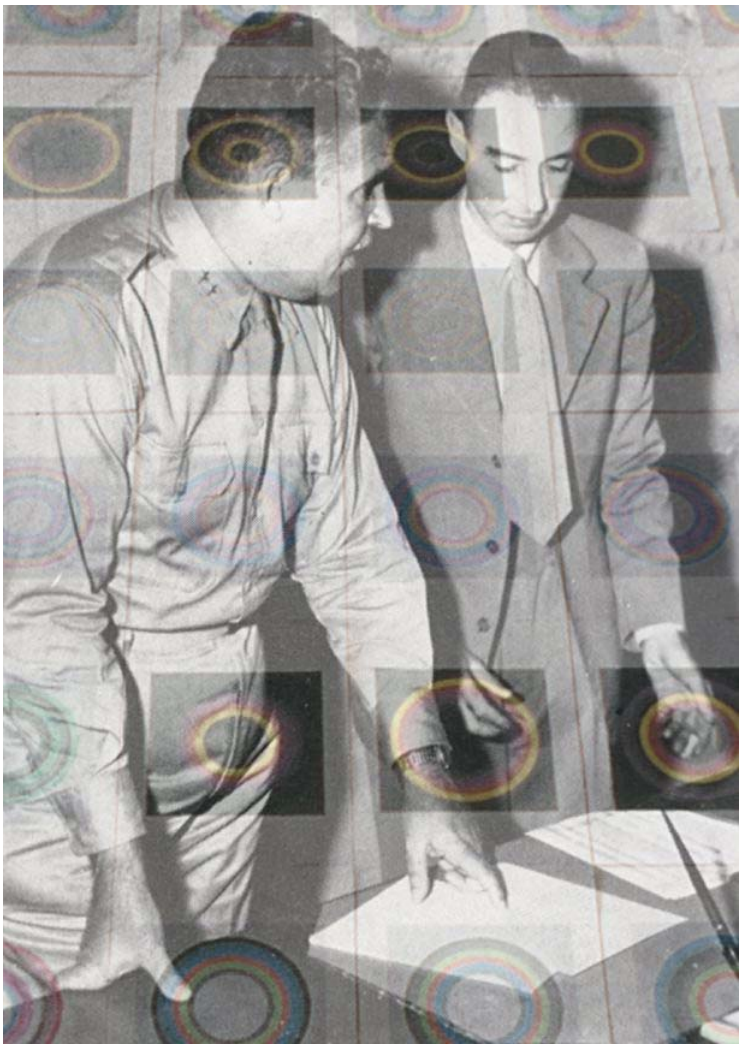
XXXII [12-28-2003]



XXXII [12-28-2003]"
Copyright © 2003 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Framed Dimensions: 11" x 8.5"

Major Robert Furman signed a receipt for a lead bucket that morning at Los Alamos. The bucket, slightly bigger than a large cookie can, had a handle. But Furman and his co-courier, Captain Nolan, couldn't budge it. It contained 200 pounds of lead insulation surrounding a core of enriched uranium that represented a cool $300,000,000 investment. Shortly after eleven A.M. Furman and Nolan started out from The Hill to deliver the bucket to Tinian. (**"Day of Trinity,"** Lansing Lamont, pp. 175 and 177)

End of Part I



The Color of Loyalty:
A Tribute to Dr. J. Robert Oppenheimer

A Painting Installation by Linda Jean Fisher

1929 Gallery
United States Military Academy
West Point, New York

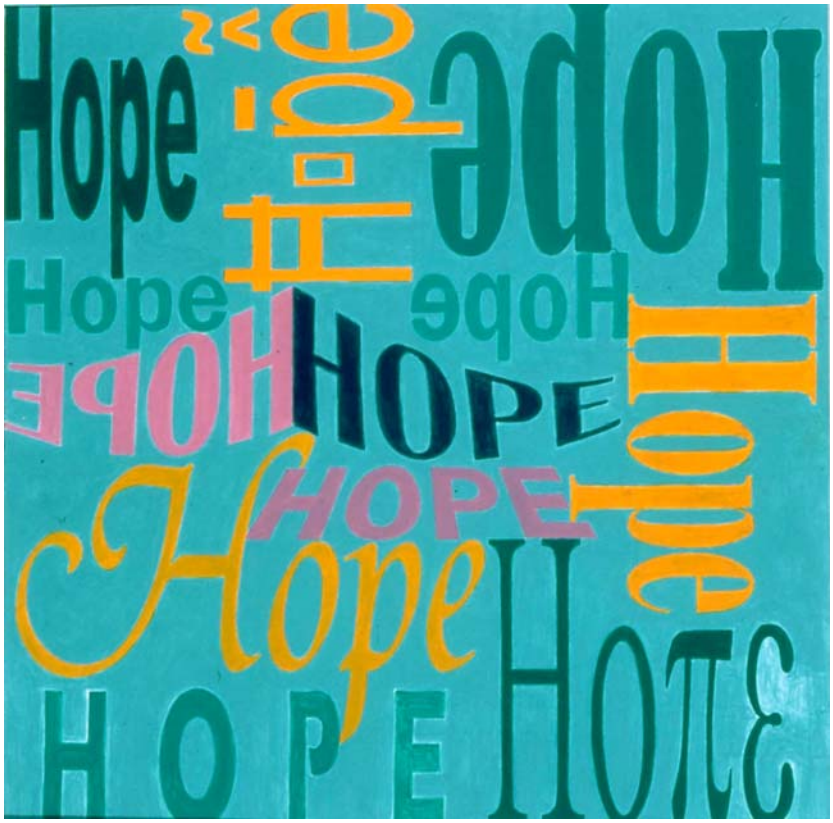
7 January 2007-11 February 2007

Exhibition Catalogue

Part II

Later Fission Bomb and Fusion Bomb Paintings: 2004

2004-31, In Memory of Dr. J. Robert Oppenheimer

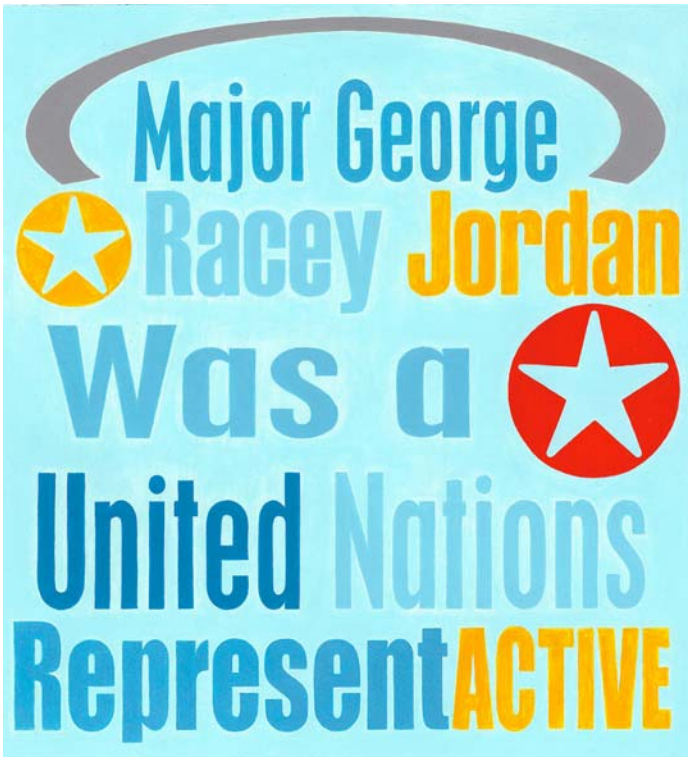


"2004-31"
IN MEMORY OF DR. J. ROBERT OPPENHEIMER
Copyright © 2004 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Matted Dimensions: 11" x 8.5"
From the Collection of Debbe Fisher

The following quote is the concluding paragraph of Dr. J. Robert Oppenheimer's lecture called **"The Encouragement of Science."** This address was made in Washington, D.C., on 7 March 1950, to the winners of the annual Westinghouse Science Talent Search. It directly influenced the creation of **"2004-31."**

And this brings me to my second wish for you. I wish you not only the joy of great discovery; I wish for you a world of confidence in man and man's humanity, a world of confidence in reason, so that as you work you may be inspired by the hope that what you find will make men freer and better—in which, working as specialists in what may be recondite parts of intellectual life of the time, you are nevertheless contributing in a direct and basic way to the welfare of mankind.

2004-36



"2004-36"
Copyright © 2004 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Matted Dimensions: 11" x 8.5"

7:54 p.m. Sunday 8 August 2004

Hi Kids, here is **"2004-36."**

Major George Racey Jordon started a diary in 1942 when he became suspicious of US-sanctioned air shipments to the USSR. But he never expected to uncover a secret American WWII deal to give the Russians the raw materials and know-who to make atomic bombs.

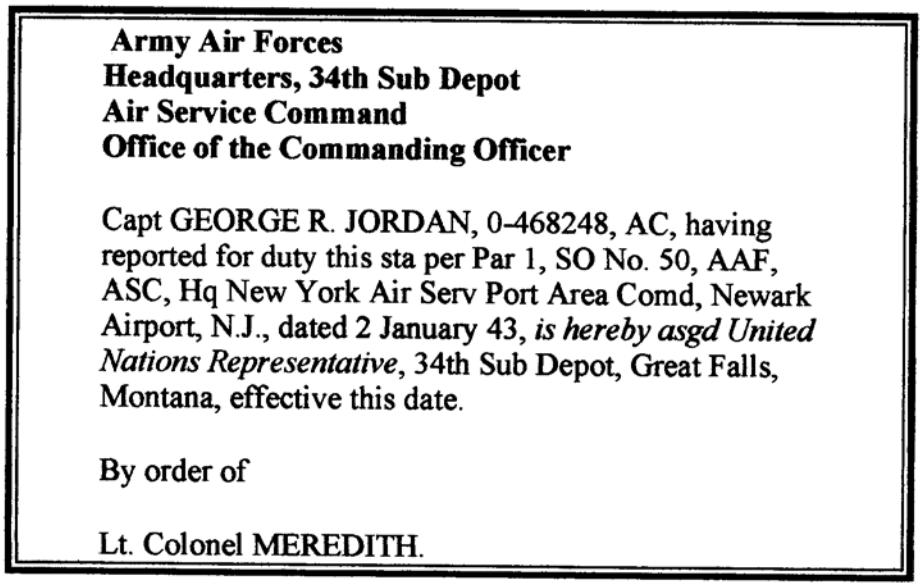
The following passage inspired this picture, which is dedicated to the very heroic Major George Racey Jordan:

Major Alexander Cohn arrived from Spokane to establish the 34th Sub-Depot for the Air Service Command. It was this depot that supervised the mountains of air freight that originated from all over the United States and poured into the funnel of this end of the Pipeline (Alaskan-Siberian Pipeline. The Army called it ALSIB).

Colonel Gardner arranged for my transfer from Newark to Great Falls. My orders designated me as 'United Nations Representative." Few people realize that although the United Nations organization was not set up in San Francisco until September 1945, the name 'United Nations' was being used in the Lend-Lease organization as early as 1942, as in my original orders to Newark.

For the record, I want to quote my orders to Great Falls, with one phrase italicized. One reason for this is that in 1949 the New York Times printed the following statement of a 'spokesman' for the United Nations: 'Jordan never worked for the United Nations.' I thereupon took the original copy of my orders in person to the Times, explained that this was an Army designation as early as 1942, and asked them in fairness to run a correction (which they did not do), since I never claimed to have 'worked for the United Nations' and their story left the impression that I was lying.

I have attached those orders to this email too.



Army Air Forces
Headquarters, 34th Sub Depot
Air Service Command
Office of the Commanding Officer

Capt GEORGE R. JORDAN, 0-468248, AC, having reported for duty this sta per Par 1, SO No. 50, AAF, ASC, Hq New York Air Serv Port Area Comd, Newark Airport, N.J., dated 2 January 43, *is hereby asgd United Nations Representative*, 34th Sub Depot, Great Falls, Montana, effective this date.

By order of

Lt. Colonel MEREDITH.

Major George Racey Jordan's Orders
Dated 2 January 1943

After reading this--I took the responsibility to paint a fact that the New York Times did not print. I simply stated that Major Jordan was indeed a United Nations Representative. Then I looked at the word Representative and noticed that if I inserted a **c** between the last **a** and **t**--it would spell Represent**active.** This made it even more fitting. Major Jordan was indeed a man of action (just like the GI Joe I loved so much when I was shorter...I took him everywhere...I wore his hair off in spots...which made him that much more alive...afterall, over time the hairline recedes and stuff...the scar on his face was quite sexy too).

I was able to find a copy of **"From Major Jordan's Diaries"** and will begin reading it when I'm finished with **"Dark Sun."**

Now it's back to the drawing for **"2004-37."** This piece is about Lavrenti Beria--"Stalin's Whip." It has to do with the number 10, 000, 000. The numbers in what I'm reading sometimes stops me in my tracks--words and numbers are very powerful. For some reason they always seem to find their way back into the work.

It was very difficult to paint this painting slowly. I nearly lost control a few times. But I felt that I was made to paint this so that people could read it very easily--there was not to be a question in anyone's mind what it said.

Thank you for letting me share this with all of you. I apologize for the informality of a blanket email. But when I have a lot to write about one of the paintings it's best if I do it this way--otherwise more than one of you would miss out on some of the important details.

In love and gratitude,
Linda Jean Oppenheimer

2004-40

"2004-40"
Copyright © 2004 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Matted Dimensions: 11" x 8.5"

6:58 p.m. Friday 20 August 2004

To My Six Dear Ones:

"2004-39" (Re: The Berlin Airlift) is going to have to wait. Attached you will find **"2004-40."** After I read this passage this painting spilled out. I designed it yesterday and painted it today. Now it's onto **"2004-41."**

"Heavy water piles," Alvarez testified, "would provide, we hoped, considerably more than a gram of neutrons. Therefore, we would have available either tritium or [if the thermonuclear proved unfeasible] radioactive warfare agents." In the midst of his

Sunday radwar discussions, Lawrence learned that his wife had just given birth to their sixth child. (p. 384, **"Dark Sun: The Making of the Hydrogen Bomb"** by Richard Rhodes)

Thank you for taking your time to look at this painting.

Love,
Linda Jean Oppenheimer

2004-41

"2004-41"
Copyright © 2004 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Matted Dimensions: 11" x 8.5"

5:57 p.m. Monday 23 August 2004

Hello My Sweets:

Here is **"2004-41"** and it's history:

David E. Lilienthal was the first chairman of the US Atomic Energy Commission.

For an hour, the minutes report, the committee discussed "the super-bomb program" with the commissioners. "Campbell's," Lilienthal coded the Super in his diary ("standing for 'soup,' that is, 'super,' he explains). (p. 397)

Tokutaro Hagiwara (TOE-KU-TAR'-OH HAH-GEE-WAHR'-AH) was the first scientist

on record to notice that an explosive fission chain reaction might generate enough energy to force hydrogen to fuse to helium, with the potential for producing a far larger nuclear explosion than fission could yield alone. (p. 247) If Hagiwara was the first, his insight fell on fallow ground--Japan in wartime lacked the resources even to develop an atomic bomb, much less to explore a thermonuclear. But the idea occured to Enrico Fermi (EN-REEK'-O FAIR'-ME: Italian theoretical and experimental physicist; co-inventor of the nuclear reactor; Nobel laureate) at Columbia University and he passed it along to young Edward Teller (Hungarian-born theoretical physicist; co-inventor with Stanislaw Ulam of the staged, radiation-imploded hydrogen bomb) in September 1941. (p. 248)

Teller made the realization of Fermi's idea the focus of his life. (p. 248)

It came to be called the "Super" and the "classical Super" to distinguish it from the booster and other, later designs. (p. 252)

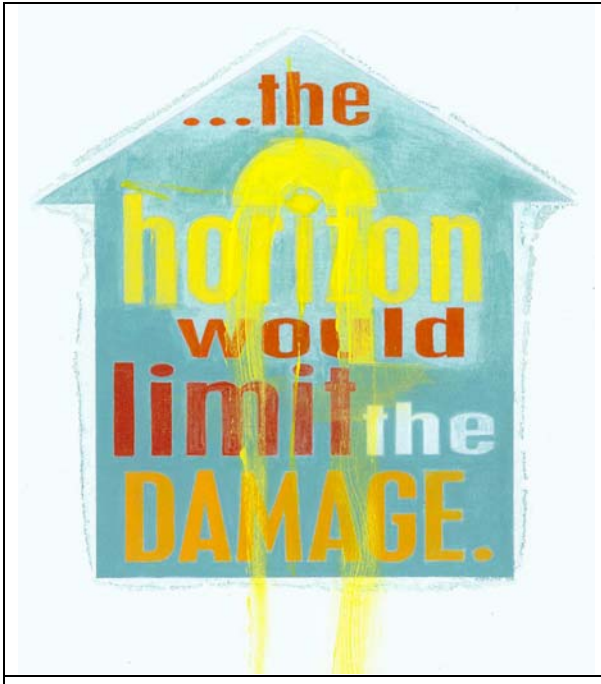
(The passages sited above are taken from **"Dark Sun: The Making of the Hydrogen Bomb,"** by Richard Rhodes)

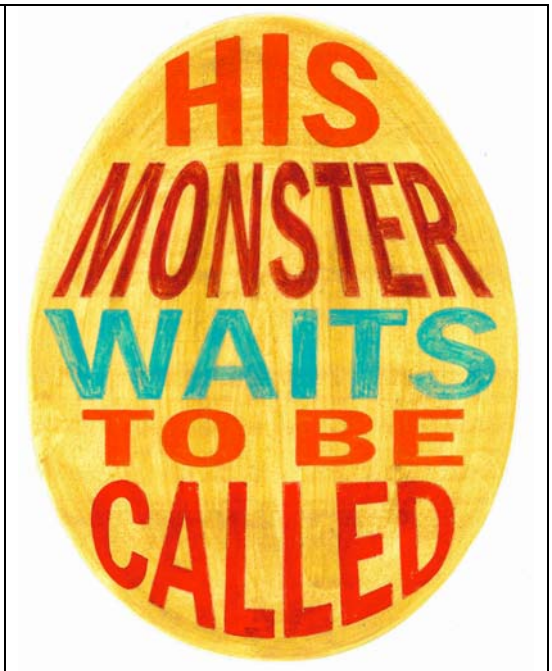
Yield: 13.5 Megatons (**"How Stuff Works"**)

Thank you for reading this information and looking at this painting. I designed **"2004-42"** before I wrote this to all of you. **"2004-39"** (The Berlin Airlift piece) will still have to wait. It told me that it wanted to. As a matter of fact, when I'm done with **"From Major Jordan's Diary,"** I start reading a book exclusively on the Berlin Airlift. I'm very excited.

Love,
Linda Jean Oppenheimer

2004-42 and 2004-43





"2004-42"
Copyright © 2004 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Matted Dimensions: 11" x 8.5"

"2004-43"
Copyright © 2004 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Matted Dimensions: 11" x 8.5"

1:18 p.m. Friday 27 August 2004

Hello My Friends

Attached you will find **“2004-42”** executed between yesterday and today and **“2004-43”** the painting I gave myself until lunchtime to complete after I finished **“2004-42”** at around 10:00am. You will understand why after you read the book excerpt that inspired it. I mentioned something like this to Amy and Keith yesterday: I am compelled to paint these passages as quickly as possible. I'm not even thinking about the anatomy of the paintings themselves (whether I'm being innovative with their structure--so to speak). There's absolutely no time for that--there is no time for testing colors either. There is only time to paint these words very clearly so that they can be read easily by the viewer.

“2004-42”: Teller was willing to consider devising what he called "a one-billion-ton Alarm Clock," meaning a device with a one-thousand-megaton yield. Punching a hole in the atmosphere would come into play with such a device, however; "it seems to me likely that it will be difficult to destroy an area greater than approximately one thousand square miles by shock." Flash burns would be "very serious" at one hundred miles and "an area of 30 thousand square miles (An area 173 miles on a side--about the size of Pennsylvania.) would be affected"--but only if the weapon that no aircraft could deliver were somehow detonated more than a mile above the ground. Otherwise, the horizon would limit the damage. (p. 418)

“2004-43”: There is an old Jewish legend of a Frankenstein's monster, the Golem, created out of clay and animated with holy words to defend the Jews from anti-Semitic assaults. The creator of the Golem was reputed to be the great medieval scholar Rabbi Loew of Prague. In some versions of the myth, the Golem goes out of control and becomes destructive, like a robot run amok. **Ulam's** (stahn'-ees-laff oo'-lahm: Polish émigré mathematician; co-inventor with Edward Teller of the staged, radiation-imploded hydrogen bomb) Aunt Caro, he writes in his autobiography, "was directly related to the famous Rabbi Loew of sixteenth-century Prague, who, the legend says, made the Golem...." Ulam recalls mentioning this exotic connection once to MIT mathematician Norbert Wiener. "[Wiener] said, alluding to my involvement with Los Alamos and with the H-bomb, 'It is still in the family!' "

People called the rabbi's Golem "Dumb Yossel," one commentator notes. It sat in the room where the Rabbi held court, its head resting in its hands, without any mind or thought of anything at all, **waiting to be summoned. (p. 471)**

(These passages were cited from ***Dark Sun: The Making of the Hydrogen Bomb*** by Richard Rhodes)

Thank you for looking at these paintings and reading the passages I've included in the email.

Love,
Linda Jean Oppenheimer

2004-49 and 2004-56

	
"2004-49" **Copyright © 2004 by Linda Jean Fisher** **Acrylic on 65 lb. neutral pH cover paper** **Un-Matted Dimensions: 11" x 8.5"**	**"2004-56"** **Copyright © 2004 by Linda Jean Fisher** **Acrylic on 65 lb. neutral pH cover paper** **Un-Matted Dimensions: 11" x 8.5"**

5:10 p.m. Friday 26 November 2004

Hello My Lovelies:

Kerry Meehan--my dear neighbor and friend in 801 Unit 1--got my scanner going this afternoon. Hallelujah to that.

This painting was executed on Thanksgiving.

For reasons of secrecy, uranium was called "x-metal" or "tube alloy" and uranium hexafluoride was known as "working gas." p. 38, **"Klaus Fuchs, Atom Spy,"** by Robert Chadwell Williams

This is a shopping list--with all the food groups.

Sincerely,
LJO

2:25 p.m. Monday 13 December 2004

Hi Friends:

The following passage from **"Klaus Fuchs, Atom Spy"** by Robert Chadwell Williams inspired "**2004-56"**:

"If he was a spy," Bethe (BAY-TUH) said later, "he played his role beautifully." "He worked days and nights. He was a bachelor and had nothing better to do, and he

contributed very greatly to the success of the Los Alamos project." Outside the lab Fuchs was known as a good dancer and a willing babysitter; he was popular with Los Alamos wives. (page 76)

Thank you for sharing the path.

Love,
LJO

P.S. I just finished (re) reading the first book on color I ever read. It's called **"Principles of Color"** by Faber Birren. I think it's about time for reconstruction. Next.

2004-57

"2004-57"
Copyright © 2004 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Matted Dimensions: 11" x 8.5"

3:11 p.m. Monday 27 December 2004

Hey Kids:

I do hope you all had a pleasant and festive weekend. Joyce (a.k.a. Poofie, Cindy Lou Who, Mommie Fisher) and I had lots of fun. Ernie and I slept over 24-25 and 25-26. She just couldn't get enough of us. We don't take up much space and we don't complain. Just give us a layer of 12" wide big bubble bubble wrap and a sheet of 36" x 48" kraft paper and we're snug as two bugs in a rug....Bev....do you remember my "bubble wrap bed days?" Anyway, here's the scoop on **"2004-57."** All book excerpts are italicized. They come from Faber Birren's **"Principles of Color"** (the first color theory book I ever read...and re-read a couple of weeks ago....to begin a process of reconstruction).

The three primary forms of color are pure hue, white, black. All three go well together and are perhaps most dynamically expressed where the hues employed are also simple, such as red, yellow, blue, orange, green, violet. (page 64)

I solved this "color problem" (not as is "Gee, there's a problem with my hair dryer"--more like "This is one way I have solved this problem regarding the density of neutron stars." Where the h-e-

double toothpick did *that* come from?) as follows: I chose Primary Cyan as the simple hue to surround with both Carbon Black and Titanium White. I used the masstone for security and the undertone for secrecy. Rather than using architectural order (that is--going from top to bottom--white, gray, black) I used typographical order (that is--going from top to bottom--black, gray, white). I always seem to think architectural--even though I use text--so I got myself to break that habit.

The secondary forms, tint, shade, tone, gray, also blend concordantly and are more refined and restrained. With them, and to hold to a tasteful spirit, it may be well to plan arrangements of the intermediate hues red-orange, yellow-orange, yellow-green, blue-green, blue-violet, red-violet. (pages 64-65)

Now for this part of my "color problem" I turned to the academic harmony of the following split-complements: Blue (fulfilled with Primary Cyan instead) with red-orange (CP Cadmium Red Light) and yellow-orange (CP Cadmium Yellow Dark). The primary color forms were used already (Primary Cyan, Carbon Black, and Titanium White)--now I needed to find a way to work in the secondary color forms--that's why I used split-complements (the primary hue cyan--and the intermediate hues red-orange and yellow-orange). The moon/star (which does appear on the Turkish flag--I knew it looked familiar--I found my answer in one of my old dictionaries) in a red-orange tint and tone. The cross and circle is a uniform chroma scale (tint, tone, shade).

Then I realized I needed to represent gray. So I used the old architectural order--and going from top to bottom--went N8, N6, and N4.

That's where my head was for this piece. I do hope it all comes together for all of you--from my head and heart--to your heads and hearts.

Now it's on to **"2004-58."**

Love,
LJO

Later Fission Bomb and Fusion Bomb Paintings: 2005

2005-3 (take more)

"2005-3 (take more)"
Copyright © 2005 by Linda Jean Fisher
Acrylic on 65 lb. neutral pH cover paper
Un-Matted Dimensions: 11" x 8.5"

9:01 a.m. Monday 10 January 2005

Hi Friends:

Greetings Tender Creatures:

The following passage is from Jeremy Bernstein's book **"Oppenheimer: Portrait of an Enigma."** He is referring to the Teller-Ulam idea for the fusion bomb.

What strikes me every time I study this is the incredible human ingenuity that went into it, both in the United States and presumably in the other countries that followed in our footsteps--ingenuity employed in the service of taking as many human lives as possible. (p. 126)

On Tuesday 4 January 2005 from 7:45a.m.-9:00a.m., I created the design for **"2005-2."** This was the piece I had mentioned in the email for **"2005-1 (square head)"** that has to do with a significant number in my 2004 recap. I went downstairs to read while having breakfast. After reading the aforementioned passage I immediately went upstairs and designed **"2005-3 (take more)."**

Number 2 must wait.

I painted on a colored ground. GAC Matte Fluid Hansa Yellow Opaque is layer one. GAC Matte Fluid Quinacridone Magenta is layer two (I believe the technical term for a colored ground or colored underpainting is imprimatura. As a matter of fact--Rothko's assistants had to go to great lengths to apply his imprimaturas--there was "no monkeying around"--that's where that mysterious glow comes from.).

The physics of color subtraction created a primary red (that probably moves toward Yellow Red in Munsell Color Space). I chose cyan, turquoise, and red as my hues.

Why?

Well for the background I used a low chroma cyan with a value at about 5--this way I'd get flames of the imprimatura peaking through--the phenomena caused from the simultaneous contrast of complementary hues. Then I chose to put the reds in the middle (more [value 4]-lives[value 6]-with [value 7]). The blue green Take [value 3] and the blue green Invention [value 8] (plus the cyan background) intensify the reds (once again thanks to simultaneous contrast). The value structure is typographical (darkest value on top). So I took different areas of color input that I've gathered over the years and played with them in this peace--oops--I mean piece.

This color arrangement is also a thank you gift for Edie. I went with the Red/Blue contrast because she loves those two colors together. This book was a wonderful surprise gift from her (as I mentioned in an earlier message).

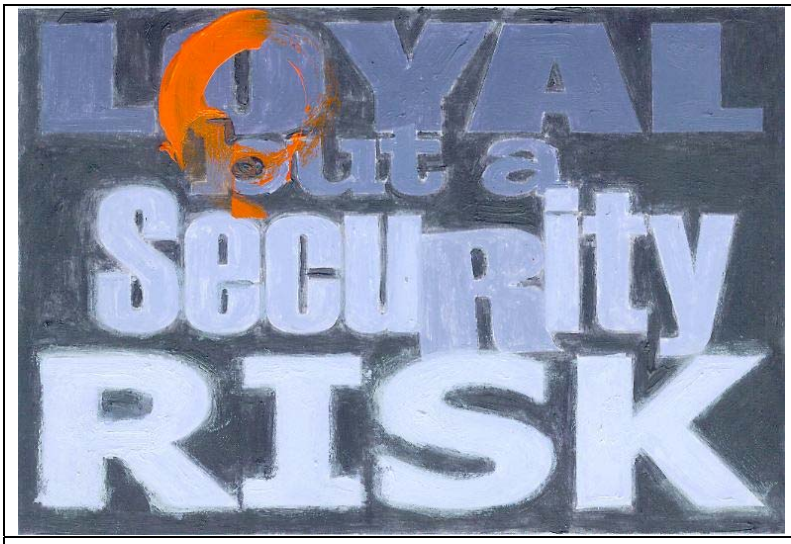
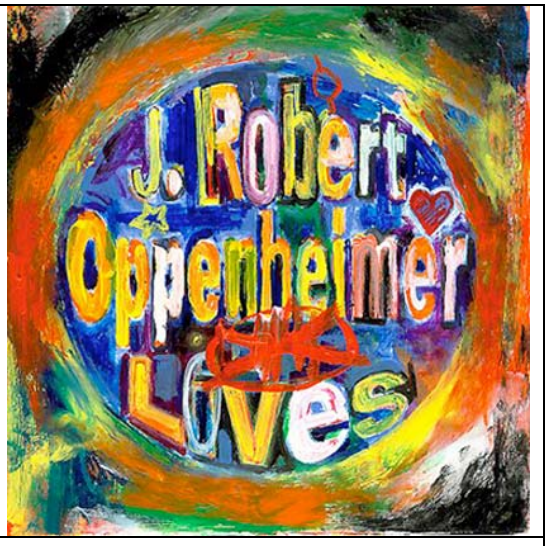
"**2004-4"** is also from this book. I finished priming it before I wrote this to all of you. Number two still has to wait...but I told it that good things come to those who wait....and if I wasn't listening to the voice of the work and proceeding with number 4....number two would end up an untruthful portrait of my will.

Sometimes I have to be a bug who got out of line.

Have a great day.

Love,
LJO

2005-4 (loyal) and 2005-71 (101)

	
"2005-4 (loyal)" **Copyright © 2005 by Linda Jean Fisher** **Acrylic on 65 lb. neutral pH cover paper** **Un-Matted Dimensions: 11" x 8.5"**	**"2005-71 (101)"** **Copyright © 2005 by Linda Jean Fisher** **Acrylic on 65 lb. neutral pH cover paper** **Un-Matted Dimensions: 11" x 8.5"**

2:02 p.m. Friday 14 January 2005

Hi:

This is **"2005-4."** I painted it for Dr. Robert Oppenheimer. It started out too "pretty perfect." Then **"2005-5"** liberated the work. I don't know where that orange came from...or if it works...I don't really care (don't care, don't care). Maybe it's all that feeling behind his blue eyes...it had a color we couldn't see.

Maybe I'll do **"2005-2"** finally.

Live.

LJO

8:13 p.m. Friday 22 April 2005

Good Evening:

Today J. Robert Oppenheimer would have been 101. I had a button that said "Jim Morrison Lives." This originally said "J. Robert Oppenheimer Lives." I wonder who changed it? Happy Birthday Oppie....we love you too.

LJO

"The Color of Loyalty: A Tribute to Dr. J. Robert Oppenheimer"
Walls Four and Five of the Painting Installation

General Technical Statement Regarding Painting Process

I push paint around a lot because I believe that in order to continue developing the work to the work's fullest potential I must invest my time in dedicated practice. This work explores my self-directed investigation of quantum physics. How? 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. Sometimes I push together and intermix my viscous stuff on a substrate with stainless surface knives, my fingers, or worn down paintbrushes. The hue families that could possibly form are never-ending. Other times I split a painting into parts like a physicist splits the atom into parts. The number of paintings could be never-ending like the levels of matter could be never-ending. It is possible that there are no "bottom line" paintings like it is possible that there are no "bottom line" particles. The notion of a "bottomless pit" used to scare me. I didn't want to stumble into one and fall forever and ever. But now I am different and the thought of things or places with no bottom makes me giddy.

“2005-39 (Newton)”
Copyright © 2005 by Linda Jean Fisher
Acrylic on .125” Plexiglas
9.0625 x 11.0625”

“2005-66 (trap door)”
Copyright © 2005 by Linda Jean Fisher
Acrylic on .125” Plexiglas
10.25” x 10.25”

2005-68 (day after trinity)

"2005-68 (day after trinity)"
Copyright © 2005 by Linda Jean Fisher
Acrylic on .125" Plexiglas
10.25" x 10.25"

9:36 a.m. Monday 18 April 2005

Hi:

I did this yesterday sometime between 5 and 6pm. Then I watched **"Day After Trinity."** I scraped the paint film while it was tacky.

Before the movie--I found this piece--well quite beautiful--a celebration of color interaction. After the movie--after seeing what "Little Boy" did to the people living in Hiroshima--it turned into burned...decaying human flesh....I wish I could remember exactly how it was put in the film....what people were reduced to...they were like proof of a successful experiment....Frank Oppenheimer was still alive when the film was made....I'll never--ever--forget his expressions when he talked about Hiroshima. Then of course there was the closing scene. It was JRO...he wasn't looking into the camera....he was talking about the "Destroyer of Worlds" quote from the sacred Hindu epic, **"Bhagavad-Gita"....**you could see the tears filling the bottom lids of his eyes...that space between the inside of the eyelid and the eyeball was gradually filling....he didn't break down...but it was all there....not only Trinity...not only **"Little Boy"** and **"Fat Man"...**not only that sinister security clearance fiasco

(that's my humble opinion that does not in any way have to be shared by anyone else)...but the part of him that he never set free that made his eyes so sad.

Science drew a line in the soil of Los Alamos and JRO (and so many other great scientists, machinists, metallurgists, etc.) crossed it. I've done things I've regretted that can't be undone. But I will never know what it must have been like to have "set the atomic genie free." I always talk about how the atom can be so beautiful (color science) and so ugly (weapons of mass destruction)--and yesterday they overlapped without my knowledge.

Perhaps it was very good that I didn't realize it--because I don't know if I could have ever mustered up the courage to do such a painting.

Before closing I want to make it clear that I am very sensitive towards the people who developed Trinity--and I think I understand why now....I myself have gotten "trapped by a process"--I set a goal and work until that goal is reached in a tunnel vision sort of a way...I'm not thinking about anything but that goal...it can appear to be insensitive at times....I'm programmed to complete the mission...and block out all distractions...but I don't know if I'd have the strength to block out what the people who opened the atomic age (and tested the results of the bomb) had to block out.

That's all for now. Bev, I'm sure Strunk and White would like to put me over their collective knees...but I just sat down and this came out.

Love,
LJO

2005-69 (…pinprick of brilliant light…)

"2005-69 (…pinprick of brilliant light…)"
Copyright © 2005 by Linda Jean Fisher
Acrylic on .125" Plexiglas
10.25" x 10.25"

8:47 a.m. Thursday 21 April 2005

Good Morning Glories:

"A pinprick of a brilliant light punctured the darkness, spurted upward in a flaming jet, then spilled into a dazzling cloche of fire that bleached the desert to a ghastly white. It was precisely 5:29:45 A.M." (Lansing Lamont)

There is a vertical stroke of Cadmium Red Light. It's above the blue-green that was mixed using wet Phthalo Blue, Green Shade and wet Naples Yellow Hue. I saw this piece as the calm before the storm....the deadly silence that exists before an explosion....before any explosion....no one knows it's coming except for the force behind it...some forces are natural...some forces are given a little push by human hands....human hands driven by brilliant minds....."take more lives with invention"

LJO

2005-72 (atom Prometheus)

"2005-72 (atom Prometheus)"
Copyright © 2005 by Linda Jean Fisher
Acrylic on .125" Plexiglas
10.25" x 10.25"

3:14 p.m. Monday 25 April 2005

Oppenheimer--who, in fact, did have a first name (Julius, which he never used) and was the most famous physicist in the United States, if not the world--was known as the 'father of the atomic bomb.' This was both his blessing and his curse.

'The Bomb' was a poisoned benediction that brought Oppenheimer honors, acclaim, and glamour rarely associated with science and then brought him a downfall worthy of Greek tragedy, leavened with the ironic buffoonery associated with vengeful crusaders.

Thus, it is no accident that, in telling this remarkable story, authors Kai Bird and Martin J. Sherwin found inspiration in the Greek myth of Prometheus, who stole fire from Olympus and gave it to mankind in defiance of Zeus, the supreme deity of ancient Greeks. As punishment, Prometheus was chained to a rock and there an eagle tore at his iver until he was released by Hercules, the son of Zeus.

("Stealing Fire: The Tragic Journey of the A-bomb's Brilliant Inventor," Bill Bell, Sunday Now, p. 19)

Hi,

That was part of a book review for **"American Prometheus: The Triumph and Tragedy of J. Robert Oppenheimer."**

Someone did this painting through me yesterday before I went to Beacon to visit my dad and Grace. It started with marks that reminded me of a left eye and the left side of a nose....then it started....it was very frightening...the face...at first....it looked like death. As a matter of fact...I thought I was looking into the face of a dying Robert Oppenheimer. Before this though, I had to choose the color for the eyes. I reached for Cerulean Blue Deep. I wasn't thinking of Oppie's blue eyes either....and I mean that....the blue paint pulled my left hand. Then I had to stop...I felt like I was on the brink of re-creating **"2005-39 (newton)..."** I understood that if I didn't walk away....that I would get in there and make it a "See, I Know *My* Anatomy" painting...so I worked on my painting of my left-front burner (another story, another painting, another time).

Then I went upstairs.

I had to take a nap to recover from the "elf shift" (4-7am...without the proper amount of sleep the night before).

I went back downstairs and I walked passed this face...worked on the burner...and then got up and looked into those eyes...that was it...I brought it close to my paint box....then there was that explosion in his left cheek...it happened all of the sudden...the left eye is more complete...the right eye is flayed...now you see him now you don't...I had to set my stove for 1 hour...I had to leave at 4pm to head up to Beacon...before I knew it the stove timer went off....I walked into the kitchen to shut it off and picked up my keys...then I walked over to him to say good-bye...that was when I noticed that the painting was crying.

When I got to dad and Grace's house--dad hadn't gotten back from Treetops (he visits Gram-Slam on Sundays). Grace let me in and we went into the kitchen. The Bill Bell article was sitting on the table. Dad had cut it out for me. Kim (my cousin) called me on Thursday (21 April 2005) to tell me about this book--so I knew about it....knew the title...I was touched

that my dad clipped it for me. The picture of Oppie is great too...he's standing in front of an equation-filled black board...I never realized it until then...his eyes are sort of set far apart...like the eyes in the painting...it's him...both young and old....it's all there. This afternoon I named the piece **"2005-72 (atom Prometheus)."**

The sides are cropped. The last several pieces I've sent you executed on Plexiglas have also been cropped on the sides...but I know that you all don't mind...you can see the whole painting anytime you wish.

Thank you for reading this and for looking the painting.

Live, Love, LJO

"I paint, paint, paint.
Not to create a masterpiece, but to find the truth."

"2005-74 (primary)"
Copyright © 2005 by Linda Jean Fisher
Acrylic on .125" Plexiglas
10.5" x 9.5"

"2005-76 (bumble bee)"
Copyright © 2005 by Linda Jean Fisher
Acrylic on .125" Plexiglas
9.625" x 8.125"

"2005-77 (blue flame)"
Copyright © 2005 by Linda Jean Fisher
Acrylic on .125" Plexiglas
10.5" x 10.5"

The Volume Projects 2005

What is a "volume project?" What great story from the early postwar era influenced the creation of this art making system?

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.

The story from the early postwar era that influenced the creation of the "volume project" is the Berlin airlift. I read **"Berlin in the Balance"** by Thomas Parrish in December 2004. I used a flatbed scanner to reproduce a paragraph from this book. I printed out two copies. One is hung at eye level on the door of my refrigerator, which is located in the kitchen of my live/work co-operative apartment. The other is hung just above eye level on the wall to the left of my worktable at the custom frame shop to which I'm employed. I work a

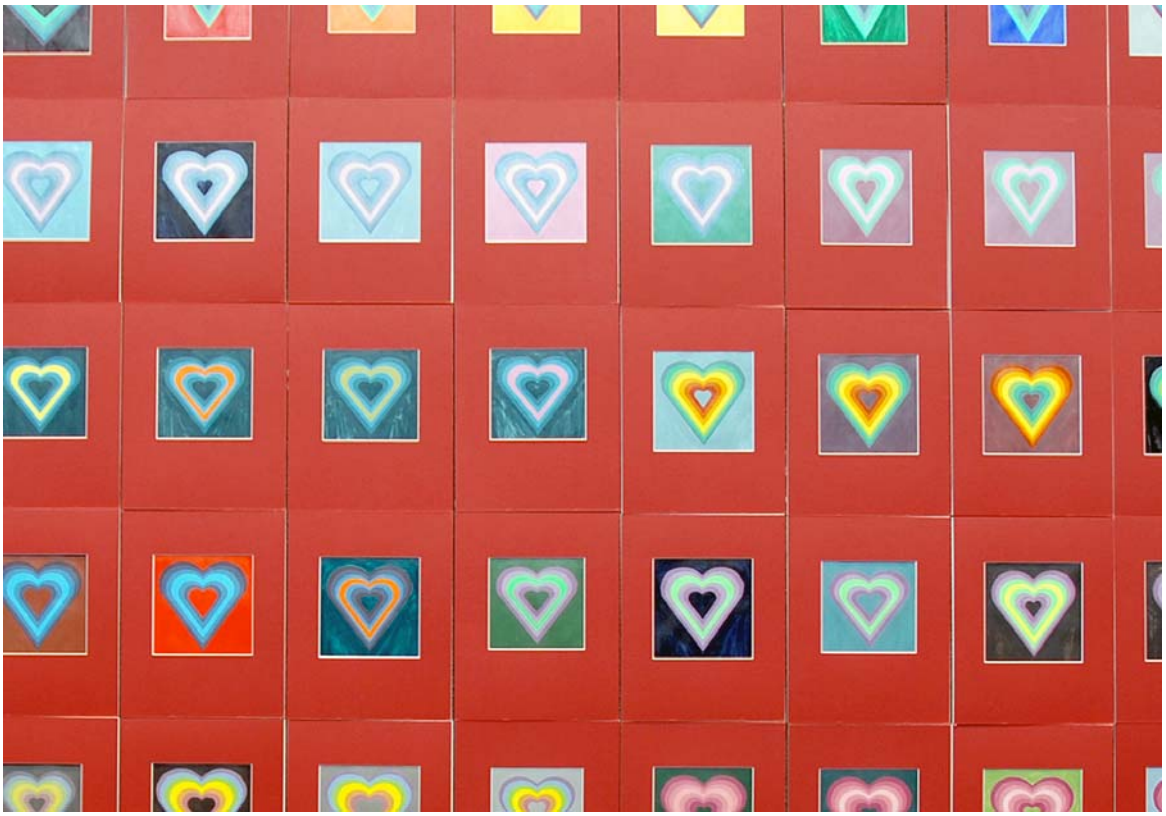
minimum of 40 hours at both places. This means I am coerced by the tone of this passage a minimum of 80 hours a week. ±80 hours a week x ±52 weeks in a year = ±4, 160 hours.

The actual operation of a successful airlift is about as glamorous as drops of water on stone. There's no frenzy, no flap, just the inexorable process of getting the job done. In a successful airlift you don't see planes parked all over the place; they're either in the air, on loading or unloading ramps, or being worked on. You don't see personnel milling around; flying crews are either flying, or resting up so that they can fly again tomorrow. Ground crews are either working on their assigned planes, or resting up so that that they can work on them tomorrow. Everyone else is also on the job, going about his work quietly and efficiently. The real excitement from running a successful airlift comes from seeing a dozen lines climbing steadily on a dozen charts—tonnage delivered, utilization of aircraft, and so on—and the lines representing accidents and injuries going sharply down.

This small part of **"Berlin in the Balance"** made me understand that I work for "the work" and not for "the me" in many aspects of my life. The "volume project" was my solution for getting the job done when it comes to my creative process.

Hundred Hearts

"Hundred Hearts"
Wall Three of the Painting Installation
Copyright © 2005 by Linda Jean Fisher
Acrylic on 100 sheets of 65 lb. letter size neutral pH cover paper;
each matted to the outside dimensions of 12" x 9.5"
5' x 15' 10"



“Hundred Hearts” [DETAIL]
Copyright © 2005 by Linda Jean Fisher
Acrylic on 100 sheets of 65 lb. letter size neutral pH cover paper;
each matted to the outside dimensions of 12” x 9.5”
5’ x 15’ 10”

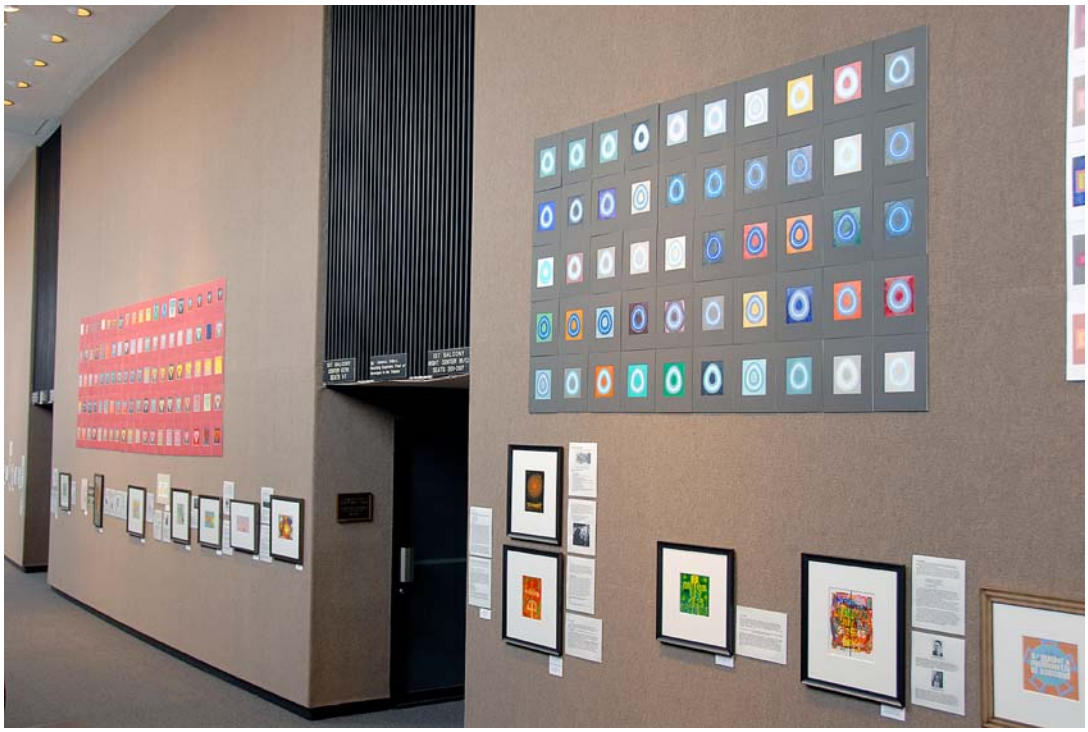
“Hundred Hearts” is a single work consisting of ten rows of ten 11” x 8.5” paintings on paper. I danced around the color wheel and experimented with the following things: color arrangements, color mixing procedures, variations within hue families as defined by The Munsell Color Standard, and color effects including luster, luminosity, and iridescence.

For this “volume project” I made the commitment to paint one hundred hearts in ten weeks. I decided to focus on the heart shape because I felt the need to “get to the heart of my matter.” The sum of hearts was decided simply because of how the word “hundred” sounded with the word “hearts.” The duration of time I allotted for the execution of the pieces was purely numeric. The following configurations went off in my mind:

100 ÷ 10 = 10, 10 x 10 = 100, 10 ↔ 0 forms 100

I fully concentrate on my artwork four days per week and my standard work session is twelve hours. I was capable of executing between three and four hearts per sitting and my average weekly quota ranged between nine and twelve paintings. This fluctuation in the number of paintings was due to one of the three following things: the thickness of the paint film I was applying to the pieces, whether I needed to mix a fresh palette of colors, or my responsibility to carry out arts-related administrative tasks. I have eliminated distractions such as talking, music, television, and pets to maintain silence and increase productivity.

Fifty Eggs



"Fifty Eggs"
Copyright © 2005 by Linda Jean Fisher
Top: Wall Four of the Painting Installation
Bottom: Detail
Acrylic on 50 sheets of 65 lb. letter size acid-free cover paper;
each matted to the outside dimensions of 12" x 9.5"
5' x 7' 11"

Fifty Eggs, A History

33 Days = 4 weeks and 5 days
1 week has 4 work sessions
Work sessions average 12 hours and fall on Mondays, Thursdays, Fridays, and Sundays
Total number of work sessions from 21 August 2005 until 22 September 2005: 19

1: "I bet I can paint fifty eggs."
2: "Nobody can paint fifty eggs."
(silence)
2: "Did you ever paint fifty eggs?"
1: "Nobody ever painted fifty eggs."
(silence)
3: "Yeah, but in how long?"
(silence)
1: "Thirty-three days."

In 1998, Dan Bern teamed up with fellow Folk troubadour and guest producer Ani DiFranco for his third CD called "Fifty Eggs." While I was working on "Hundred Hearts" I started thinking about "Fifty Eggs" simply because 100 ÷ 2 = 50. Dan Bern is one of my favorite people. He is a voracious songwriter and committed to his responsibility as a live performer. He is also a highly sensitive observer who gives reports that may disquiet the careful listener. I decided that painting fifty eggs would be an appropriate way to pay tribute to him. For this "volume project" I wanted to hone in on my ability to be a one-person assembly line. I decided to use one design, limit my color for the eggs to one hue family, and apply the paint as fast as physically possible. But then I asked myself, "What color is Dan Bern?" I thought of a story about a teenage boy I read in "Israel, A History" by Martin Gilbert. He was part of a group of Palestinian-born Jewish youth who founded the first tower-and- stockade village named Maoz (Stronghold). He volunteered to crush out a path with a tractor before the date of the actual settlement. He worked the tractor at night because he had a job during the day and was urged not to draw attention to the coming settlement of this area. Dan Bern has his work cut out for him in 2005 just like that teenager did back in 1937. Testifying in the name of the truth is as risky as operating a tractor at night in a region favored by looting Bedouin. The courage I see in these young men made me think about the movements a person's body makes when they wave a flag. I decided to use the colors in the flag of Israel to represent Dan Bern. The flag of Israel is white. It features the Star of David in the center and has two horizontal blue stripes—one near the top and one near the bottom. I chose to paint each egg in the blue or purple-blue (most of my blue paints have purple-blue Munsell Notations) hue families and feature a white band through the central loop of color.

I painted seventeen eggs during the first seven days of the production period. This accelerated rate of picture making made me think of a conversation I had with the painter Neil Berger. Neil told me that when he used to take exams like the Iowa Test he randomly colored in the numbered dots because he didn't care. But it wasn't so much what he said. It was the gestures that went along with it. He thrashed his arms in the

air with an imaginary number two pencil in his right hand and shouted, "I don't care! I don't care! I don't care!" From that moment on, I wondered if the day would come that I didn't care. Let me explain. Neil builds such things as landscapes and still lives out of thick and viscous oil paint. I believe that Neil doesn't care how his paintings are going to come out while he is painting them. This is my perception and the kind of fearlessness I deem necessary to bust through all the barricades that can possibly stand between the artist and their practice. After recapping this encounter with Neil, and the realization that followed, I understood that as a result of painting so much and so fast—the day had finally come that I too didn't care.

On 2 September 2005 I told this story about Neil and my newfound freedom to my friend Fred Gillen Jr. He thought for a moment and said; "Now you are being reckless."

RECKLESS.

Then Fred asked, "Do you know where Dan got the title for "Fifty Eggs?"
"No," I replied.
"He got it from the egg-eating contest scene in "Cool Hand Luke."

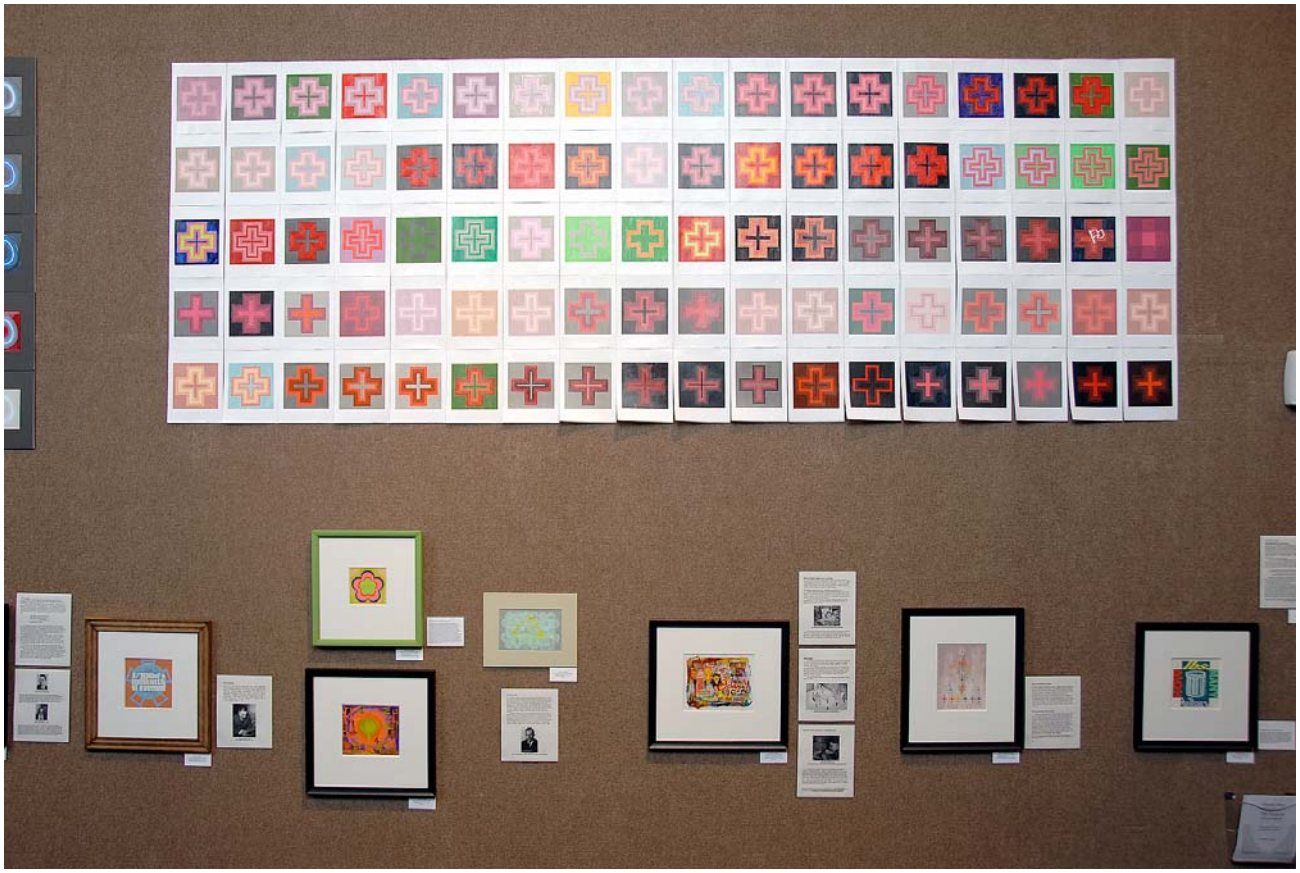
I saw "Cool Hand Luke" in 1984 during one of Professor John Cuniberti's "History of Modern Film" classes at Westchester Community College. I remember Professor Cuniberti discussing the Christ-imagery in the film's egg-eating contest scene. The number fifty is significant because there are fifty prisoners' souls and fifty eggs. Luke's ingesting of the eggs corresponds to Christ taking the sins of the world upon Himself and bringing about a rebirth. Eggs, the celebration of Easter, and the resurrection are symbolically linked together. The Christ-image that had the greatest impact on me was in the segment after Luke's victory. Luke is seen from overhead lying on a table scattered with eggshells. He is by himself with his arms outstretched and his legs are crossed at the ankle in a Christ-like crucifixion pose. Upon remembering this moment in "Cool Hand Luke," I recalled the last verse of "Monica" from "Fifty Eggs." This song is about Monica Seles. In 1993 Seles was stabbed between the shoulder blades by a deranged fan of Steffi Graf during a changeover at a tennis tournament in Hamburg, Germany. She did not play competitively for more than two years after the incident.

And oh, Monica
There you are, Monica
On the cross with Jesus
And Martin Luther King
Just like John Lennon by that hotel
You have to pay for our sins
Just like Jesus by that hotel
You have to pay for our sins

I can't help but wonder if the title "Fifty Eggs" came to Dan Bern's mind because he feels that Monica Seles *took the sins of the world upon herself* like Luke. But then again sometimes things connect themselves by accident and elapsed time reveals the tie.

After I summed up the data pertaining to "Fifty Eggs," I documented that the project was executed over a thirty-three day period. Jesus Christ was thirty-three years old when he was crucified. Sometimes things connect themselves by accident and elapsed time reveals the tie.

Ninety Red Crosses



"Ninety Red Crosses"
Copyright © 2005 by Linda Jean Fisher
Wall Four of the Painting Installation
Acrylic on 90 sheets of 65 lb. letter size neutral pH cover paper
4' 7" x 12' 9"

The Actual Catalyst For This "Volume Project"

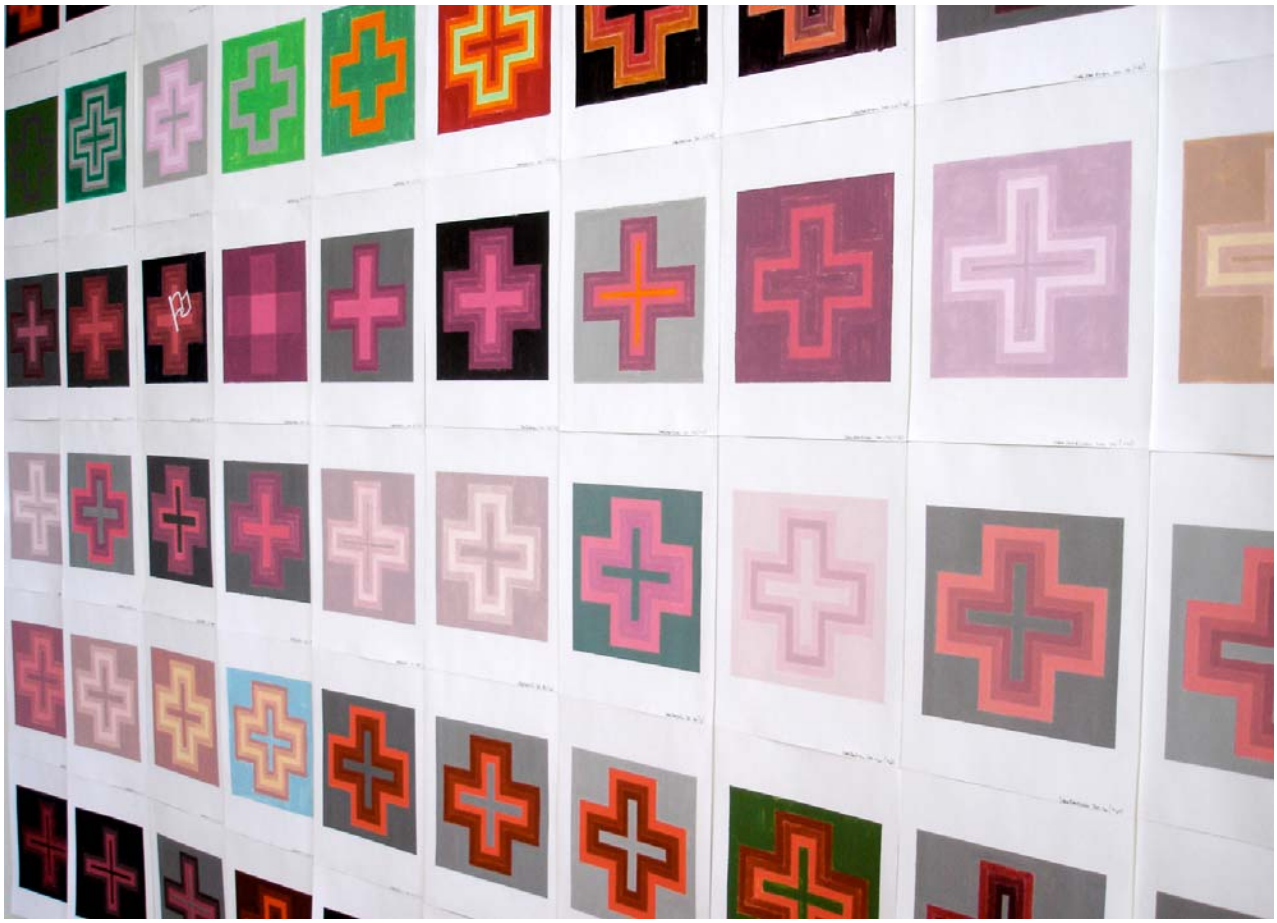
That summer of 1928, Robert was also reading the 1922 novel **"The Enormous Room,"** an account by e. e. cummings of his four-month incarceration in a French wartime prison camp. **He loved cummings' notion that a man stripped of all his possessions can nevertheless find personal freedom in the most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

A Brief Description of "Ninety Red Crosses"

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.

He loved cummings' notion that a man stripped of all his possessions can nevertheless find personal freedom in the most spartan of surroundings.

Though stripped of his direct political influence, Oppenheimer continued to lecture, write, and work in physics.



"Ninety Red Crosses" [DETAIL]

Wall Four of the Painting Installation
Acrylic on 90 sheets of 65 lb. letter size neutral pH cover paper
4' 7" x 12' 9"

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" 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.

For further information regarding this "volume project," please refer to "Appendix A."

576

"576"

Wall Five of the Painting Installation
Acrylic on 120 sheets of 65 lb. letter size neutral pH cover paper;
each matted to the outside dimensions of 12" x 9.5"
5' x 19'

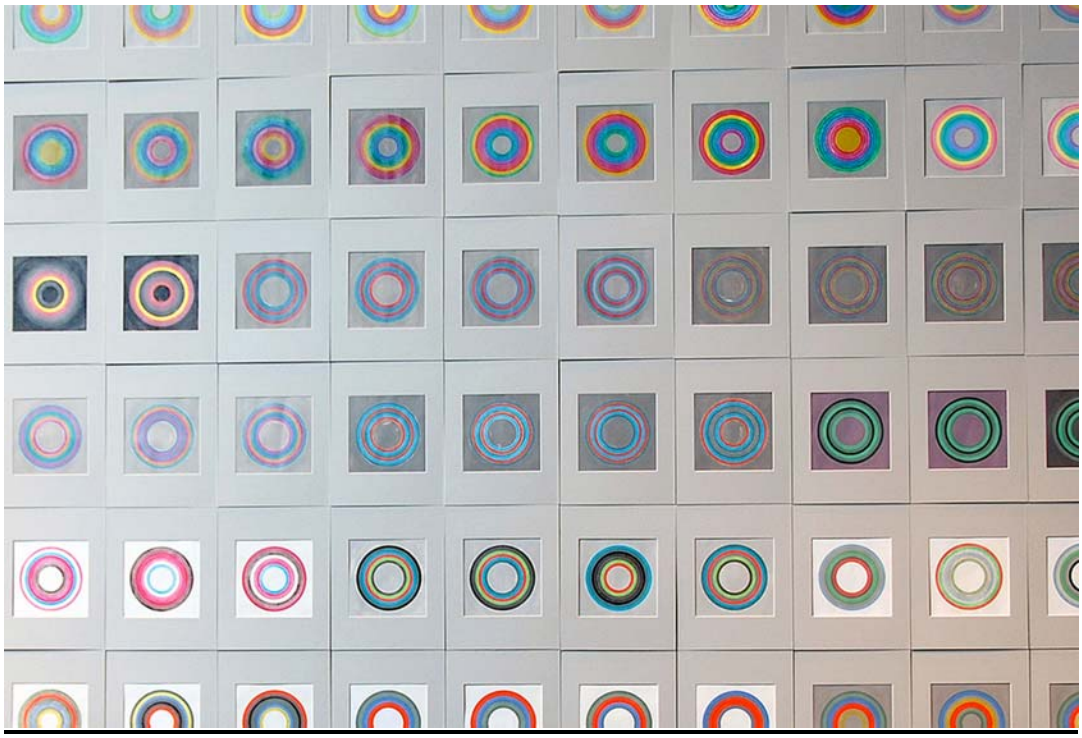
A Brief Description of 576

"576" is one of my current **"volume projects"** and the first 120 pieces are an integral part of this show. Each of the 576 11" x 8.5" paintings on 65 lb. acid-free cover paper features a 6.5" x 6.5" square with a series of .25" wide concentric bands centered within its boundaries. The disks measure up to 5.5" in diameter and the sum of the rings divides equally into the number 24. This configuration also provides a means to explore the 24 colors in Wilhelm Ostwald's color system as well as his principles of color organization and color harmony.

What is the significance of the numbers 576 and 24?
12 April 1954 through 5 May 1954→24 days The block of time Dr. Oppenheimer endured his security hearing.
24 days x 24 hours = 576 hours

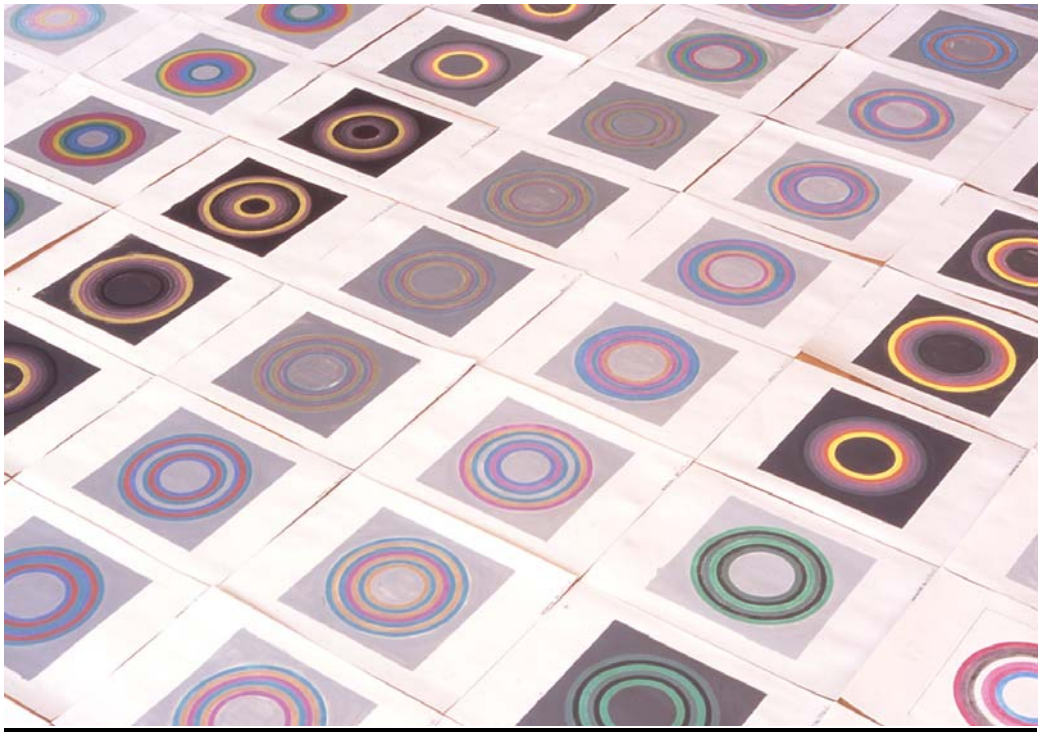
How does 576 benefit others?

I began studying Dr. Oppenheimer's life and life's work on Monday, 13 October 2003. I understood on Thursday, 16 October 2003 that he was more than **"The Father of the Atomic Bomb."** On the morning of Friday, 17 October 2003 I promised to educate as many people as possible about his contributions as a teacher, physicist, national hero, and public servant. **"576"** is a work of art that honors my declaration to Dr. Oppenheimer. Therefore it teaches us the value of maintaining our loyalty to others by following through on the commitments that we make to others.



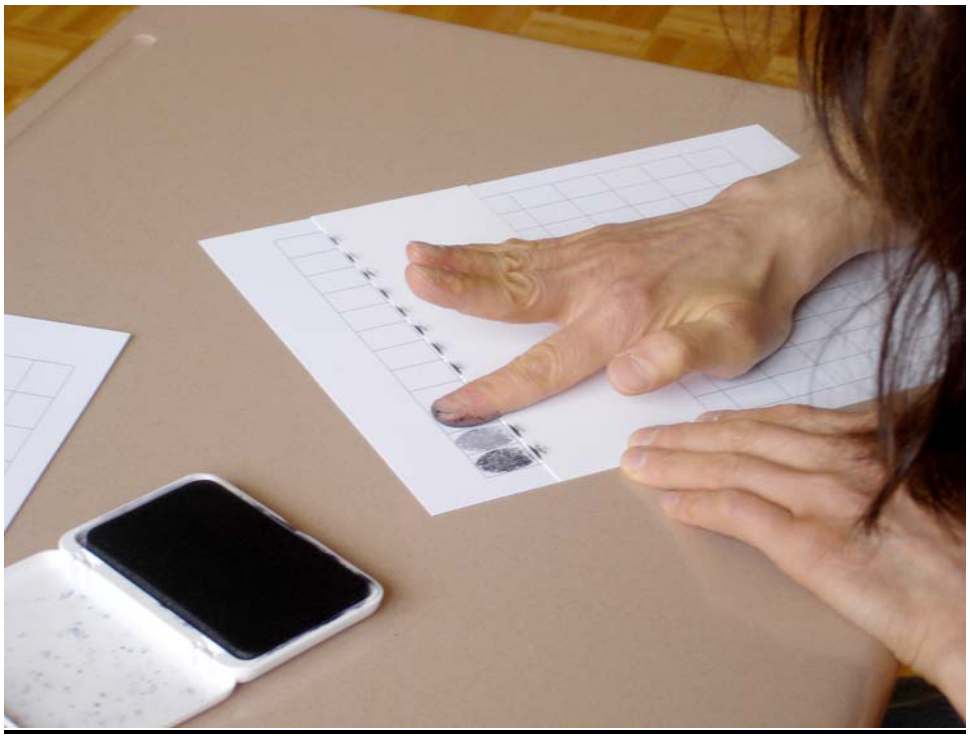
"576" [DETAIL]

Acrylic on 120 sheets of 65 lb. letter size neutral pH cover paper;
each matted to the outside dimensions of 12" x 9.5"
5' x 19'



“576” [DETAIL]
Copyright © 2005, 2006 by Linda Jean Fisher
Acrylic on 101 sheets of 65 lb. letter size neutral pH cover paper
Dimensions of This Arrangement in the Artist’s Studio: 8’ 3” x 8’ 6”

Six Million



“Six Million”
The Fingerprinting Process 10 June 2006

Brief Description of Six Million

"Six Million" amounts to 50, 000 letter size pages containing 120 fingerprints made with my right index finger. Each 11" x 8.5" sheet features a cross-sectioned area printed with black UV resistant ink. Every grid is 8.75" x 7.5" and divided into 120 .875" x .625" sections. I make the fingerprints with non-toxic archival black ink. I brand each completed page with the date in the lower left and the number in the lower right. After each work session I scan my finger and create a JPEG file. I have a contact group named **"Witnesses of the Six Million"** to whom I email the updated sum of fingerprints at the end of the day. I also have a sign on my front door documenting the current sub-total of fingerprints that I update without fail.

"18 February 2007 Page 2601"
Copyright 2007 by Linda Jean Fisher
11" x 8.5" 65 lb. neutral pH cover paper with pigmented black UV resistant ink and Ranger Jet Black Archival Inks™

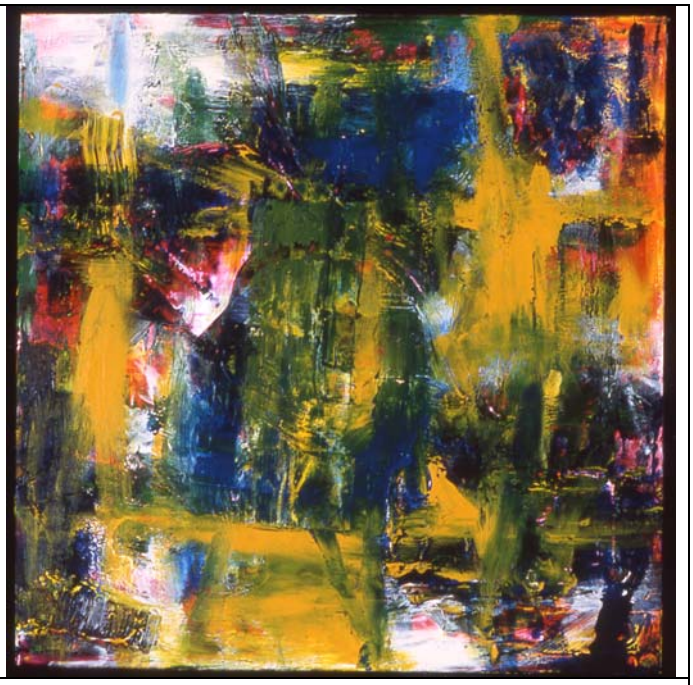
How does “Six Million” benefit others?

When I write a number greater than one down on a piece of paper I begin to lose sight of its true value. So many times I see a penny on the ground and I pass it by. Imagine if I had faithfully collected every penny I found since I was five years old? I wonder how many dollar bills they would be worth? After all, there *are* one hundred pennies in a single dollar bill. I can write, or say, that six million members of the Jewish population were exterminated during The Holocaust. But what does six million really look like when I divide it by the number one? The installation **“Six Million”** teaches us the true value of human life by re-teaching the true value of a number greater than one.

“576” and “Six Million” are linked together.
For a thorough explanation regarding this connection, please refer to “Appendix B.”

The Burkes

“Burke I”
Copyright © 2006 Linda Jean Fisher
12” x 12”
Acrylic on .25” Plexiglas



“Burke II”
Copyright © 2006 Linda Jean Fisher
12” x 12”
Acrylic on .25” Plexiglas

I E-mailed the following correspondence to a group of friends at 8:40 p.m. on 28 September 2006. (I chose not to edit this letter for the sake of its integrity.) JPEG files documenting the paintings named “Burke I” and “Burke II” were attached. I followed up this E-mail with two more that included the other four paintings exhibited here.

Hi:

Ed Burke visited my art loft for the first time in 2005. I believe that it was between February and March. (Addendum: Thursday, 24 March 2005, 11:00 a.m.) I remember it had snowed and he took his shoes off before walking up the staircase into my workspace. Anyway, I don't think he will ever realize just how important that visit was (or what a great inspiration he's been to the work).

When we discussed things like practical color theory, paint application, and anatomical studies--he said that such stuff "gets stored in muscle memory."

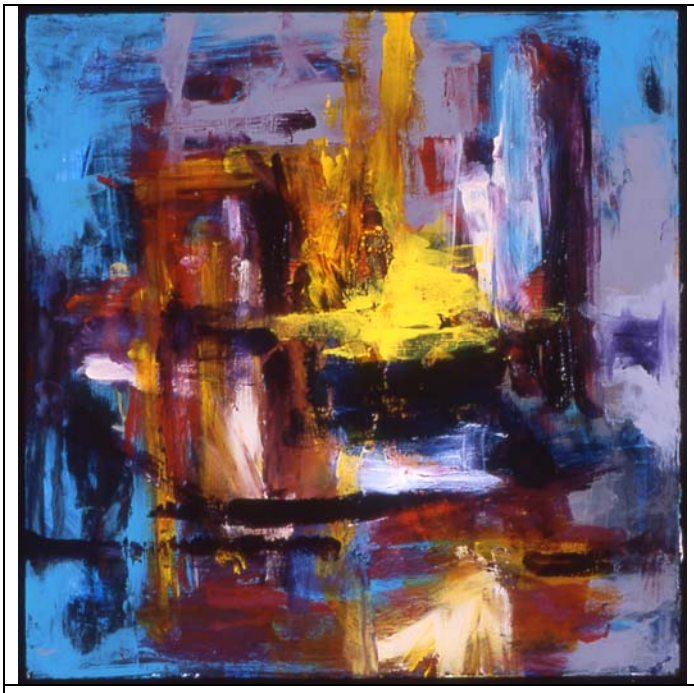
He also said something like this: "painters need to push paint around a lot."

I also remember him telling me how he will have his students wipe their paintings off the substrate after they've finished (finished?)

There were other things that he said too. As a matter of fact--he just seems to keep saying things that I learn something from. Then I put all of these learned "somethings" into action.

So I take, take, take,.....and use, use, use.

Then I figured out a way to give "somethings" back.



"Burke III"
Copyright © 2006 Linda Jean Fisher
12" x 12"
Acrylic on .25" Plexiglas

"Burke IV"
Copyright © 2006 Linda Jean Fisher
12" x 12"
Acrylic on .25" Plexiglas

As most of you know, I'm working on two rather large "volume projects" that are linked together by Dr. J. Robert Oppenheimer and the number 24 (but I won't go into all of that). One consists of 6,000,000 fingerprints on 50,000 sheets of letter size paper and one consists of 576 spherical rainbows (or halos, or Bohr's model of the atom....it depends on the life of the brain behind the eyes) painted on letter size paper.

I use the paintings to explore the 24 colors in Wilhelm Ostwald's color system as well as his principles of color organization and color harmony.

Let's call them "the order."

But out of "the order" comes "the chaos."

You see--if Ed had not come up to my studio that morning--and talked about data being stored in muscle memory, pushing paint around a lot, and eradicating entire works of art--I would not have seen that some "high-load chaos" could come out of all these intense studies in "orderly color organization."

That's when I started painting the "Burkes." These paintings are my way of thanking and recognizing a "real deal" artist. Yep....that be Ed.

"Burke V"
Copyright © 2006 Linda Jean Fisher
12" x 12"
Acrylic on .25" Plexiglas

"Burke VI"
Copyright © 2006 Linda Jean Fisher
12" x 12"
Acrylic on .25" Plexiglas

This is the first of three emails. It's also the only one with an actual piece of correspondence. The other three will just have attachments. I have made them reasonably small. I also think that you all have broadband--so we should be cool.

Please feel free to share the paintings with other "Burke Fans."

I consider myself very fortunate. Three visual artists who have had great influence on me either live and work or work in Peekskill. Ed Burke, Carla Rae Johnson, and Marcy B. Freedman. So I can look at their work and talk with them. Yes....they are alive. They are not only alive--they are in Peekskill USA.

The third email will include the first 101 paintings in **"576."** This way you can see both "the order" and "the chaos."

Toodles.

Linda Jean Oppenheimer

Edward A. Burke's Biography

Born in Brooklyn, NY, 1945 he established a reputation as a representational and abstract painter in the 1980's, particularly regionalist landscapes represented in his series **"Reflective Still Water"** in and around northern Westchester New York.

Edward A. Burke

He was raised in Brooklyn, attended The High School of Art & Design in Manhattan and graduated in 1964. He continued his art education at the School of Visual Arts while working as a full time commercial artist in small advertising agencies around New York City. His serious pursuit of painting began in 1970. Simultaneously he was also developing his career as a book designer and art director for educational publishers.

Edward Burke's paintings are well represented in private collections and in corporate commissions, as well as publications.

Appendix A

Ninety Red Crosses, The Support Document

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.

He loved cummings' notion that a man stripped of all his possessions can nevertheless find personal freedom in the most spartan of surroundings.

Though stripped of his direct political influence, Oppenheimer continued to lecture, write, and work in physics.

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

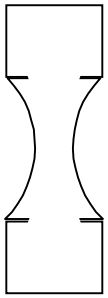
Color Equation	White Content	Black Content	Hue Content	Sum
pa	3.5%	0	96.5%	100%
na	5.9%	0	94.1%	100%
la	9.9%	0	90.1%	100%
ia	15%	0	85%	100%
ga	24%	0	76%	100%
ea	38.8%	0	61.2%	100%
ca	62.5%	0	37.5%	100%
a	100%	0	0	100%

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)

Appendix B

Six Million and 576, The Support Document

Introduction
What is a "volume project?" What great story from the early postwar era influenced the creation of this art making system?

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. Each project is divided into three parts: the works themselves, the production schedule, and the paper called "The Support Document."

The story from the early postwar era that influenced the creation of the "volume project" is the Berlin airlift. I read **Berlin in the Balance** by Thomas Parrish in December 2004. I used a flatbed scanner to reproduce a paragraph from this book. I printed out two copies. One is hung at eye level on the door of my refrigerator, which is located in the kitchen of my live/work co-operative apartment. The other is hung just above eye level on the wall to the left of my worktable at the custom frame shop to which I'm employed. I work a minimum of 40 hours at both places. This means I am coerced by the tone of this passage a minimum of 80 hours a week. ±80 hours a week x ±52 weeks in a year = ±4, 160 hours.

The actual operation of a successful airlift is about as glamorous as drops of water on stone. There's no frenzy, no flap, just the inexorable process of getting the job done. In a successful airlift you don't see planes parked all over the place; they're either in the air, on loading or unloading ramps, or being worked on. You don't see personnel milling around; flying crews are either flying, or resting up so that they can fly again tomorrow. Ground crews are either working on their assigned planes, or resting up so that that they can work on them tomorrow. Everyone else is also on the job, going about his work quietly and efficiently. The real excitement from running a successful airlift comes from seeing a dozen lines climbing steadily on a dozen charts—tonnage delivered, utilization of aircraft, and so on—and the lines representing accidents and injuries going sharply down.

This small part of **Berlin in the Balance** made me understand that *I work for 'the work' and not for 'the me'* in many aspects of my life. The "volume project" was my solution for ***getting the job done*** when it comes to my creative process.

How I Got the Idea for *Six Million*
On Saturday, 25 June 2005 I was working at my job as a custom picture framer. After I eat a meal, I must thoroughly clean my teeth because of conditions that exist in my mouth that are conducive to accelerated tooth decay. During this nine-minute forty-second process, I may think about various art projects I'm working on or come up with ideas for new ones. On this particular afternoon, I asked myself the following three questions: "What is enough? Will I ever feel like I've done enough work? What is too much? Within seconds this inquiry brought back a brief conversation from the year 2001. I was on my way to see a performance by the singer/songwriter Dan Bern with my friends Beverly Army Gillen and Fred Gillen Jr. We were all discussing the prophetic content of Dan Bern's lyrics. Beverly added, "He's even referenced the number six million in several songs" and cited this verse from **"Ballerina"**:

Every day I seem to fire
Three more people
And every time I do
Eleven more show up
I can't fire 'em fast enough
If right now I fired every one I knew
I'd have 6 million employees by Christmas
Six million

Then I asked her, "Why does Dan Bern single out the number six million?" When she told me what story in history was behind this figure, I felt ashamed that I was thirty-six years old and didn't know how many Jews were killed during The Holocaust. The recollection of this experience answered my third question. The six million Jews killed during The Holocaust define too much. With that, a work of art began moving from the back of my mind to the front.

If I could represent each person with "a something," what would that be? I thought for a moment and recalled the time I spent in Hull, Massachusetts visiting my Uncle Joe Hanson in 1997. He had been a reconnaissance photographer during World War II and was one of the soldiers who liberated Dachau concentration camp near Munich. It was an experience that he had never talked about, so I was hearing his account for the first time. He said that after the troops penetrated the gates, he frantically moved from building to building, taking pictures, and collecting documents. Then he showed me a palm-sized identification card for an Italian seamstress. He gently put it into my hand and I carefully examined it. It included her photo, personal information, and a single fingerprint. At that instant I got the answer I was looking for: I would represent the six million Jews killed during The Holocaust with six million fingerprints.

Original Project Description for *Six Million*

Six Million amounts to 50, 000 letter size pages containing 120 fingerprints made with my right index finger. Each 11" x 8.5" sheet features a cross-sectioned area printed with pigmented black UV resistant ink. Every grid is 8.75" x 7.5" and divided into 120 .875" x .625" sections. I make the fingerprints with archival Jet Black ink that is both waterproof and non-toxic. I use this same ink to brand each completed page with a date stamp (character height: .157") in the lower left and a number stamp (character height: .157") in the lower right. After each work session I scan my finger on a flatbed scanner and create a JPEG file. This documents any significant changes visible to the naked eye. I have a contact group named ***Witnesses of the Six Million*** in my Outlook Express Address Book to whom I send the updated sum of fingerprints at the end of the day. I attach the JPEG of my fingertip to these emails to humanize the experience of the numeric statistic. I also have a sign on my front door documenting the current sub-total of fingerprints that I update without fail. The pages will be stored in TrueCore™ Drop-Front Boxes during the course of production and while they are not on exhibit.

I made the decision to use my right index finger because I generally point with that finger. I single out things when I point at them and the main reason for doing this piece is to individualize six million different human beings. I have set up a 27-month production schedule because that's how long it took to build the first atomic bomb during World War II. Almost everyone at Los Alamos thought that defeating Hitler was the only good reason for working on the bomb project. On 30 April 1945, Hitler committed suicide, and eight days later Germany surrendered. Now that the bomb could not be used against the Nazis, doubts arose amid the scientists. Then, when the bomb was exploded over Japan without discussion or some peaceful demonstration of its power to the Japanese some of the scientists felt betrayed. I feel that by connecting the 27 months that it took to build the first atomic bomb with the 27 months that it will take to execute "Six Million," I am giving those scientists another chance to fight the Nazis. The only difference is that this time the scientists are going to win.

I had planned to begin ***Six Million*** during the month of October 2005. I got the quote for the cost to print the grids on 20 September 2005 and made the decision to postpone the project until I could finance a lot of 5,000. During this time, I completed the "volume projects" called ***Fifty Eggs*** and ***Ninety Red Crosses*** and started another one called ***576***.

A Brief Description of *576*:

On Sunday, 9 October 2005 I was in the frame shop cutting 150 mats for the "volume projects" ***Hundred Hearts (2005)*** and ***Fifty Eggs (2005).*** The only time I listen to music is while I'm framing. On this particular morning, I was directed to Jeff Buckley's CD ***Grace.*** I used the remote control to set the CD player on "repeat disc." Track eight is called ***Corpus Christi Carol***. After several rotations, I said the following statement out loud: "This song is somehow connected to Dr. J. Robert Oppenheimer's 1954 security hearing." I immediately changed the setting to "repeat track 8" and listened to ***Corpus Christi Carol*** until I completed my mat cutting project. During each rotation, there was one verse toward the end of the song that I instinctually felt was the actual connection to Dr. Oppenheimer's security hearing. But I could not completely make out the words. As soon as I got home I did an Internet search, found the lyrics, and determined the verse in question.

And on this bed there lyeth a knight
His wound is bleeding day and night
By his bedside kneeleth a maid
And she weepeth both night and day

I instantly saw the knight as a metaphor for Dr. Oppenheimer and the maid as a metaphor for the United States. Why? Because since 23 November 2003, I have believed that if Dr. J. Robert Oppenheimer's security clearance had not been taken away on 29 June 1954, and had he never died from throat cancer on 18 February 1967, he would have been the one person who could have helped control overarmament in the United States. ***576*** represents all of the things in history, science, and the field of color that I have linked together to share this belief with others. Each of the 576 11" x 8.5" paintings on 65 lb. acid-free cover paper features a 6.5" x 6.5" square with a series of .25" wide concentric bands centered within its boundaries. The disks measure up to 5.5" in diameter and the sum of the rings divides equally into the number 24. This configuration also provides a means to explore the 24 colors in Wilhelm Ostwald's color system as well as his principles of color organization and color harmony.

What is the significance of the numbers 576 and 24?

12 April 1954 through 5 May 1954→24 days The block of time Dr. Oppenheimer endured his security hearing.
24 days x 24 hours = 576 hours

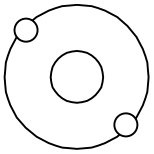
How does the design for ***576*** represent all of the things in history, science, and the field of color that I've linked together to share the belief I've stated in the preceding paragraph? **Table 1** through **Table 5-2** answers this question by dividing the meaning behind the design for ***576*** into five main categories and sub-dividing those categories where it is necessary.

Table 1

The Halo	
A halo is a ring of light that surrounds an object.	
In Eastern and Western churches, saints are depicted with a halo.	
Why do I feel that the life of Dr. Oppenheimer resembles that of a saint?	
I feel that his contributions as a teacher, physicist, national hero, and public servant are examples of how we should act.	His story has been recorded for the education of future generations.

Table 2

The Bohr Model of the Atom		
According to the simple Bohr model, the atom looks like a miniature solar system.		
How does this simple model of the atom relate to a halo and Dr. Oppenheimer?		
The nucleus surrounded by electrons in various orbits resembles a series of halos.[1]	As early as 1944, Bohr's concern about directing the power of nuclear energy led him to campaign for the control of nuclear weapons and world peace through the open sharing of knowledge among nations.	
	These two written documents support Bohr's concept of an open world	
	"The Acheson-Lilienthal Report" [2] Dated 16 March 1946	Dr. J. Robert Oppenheimer's lecture titled "The Open Mind" Dated 11 December 1948

①  The basic structure of The Bohr Model of the Atom

② Prepared for The Secretary of State's Committee on Atomic Energy by a Board of Consultants: Chester I. Barnard, Dr. J. R. Oppenheimer, Dr. Charles A. Thomas, Harry A. Winne, and David E. Lilienthal, Chairman

Table 3

The Sun		
What does the sun have to do with Dr. Oppenheimer, halos, or the Bohr Model of the Atom?		
During the Trinity test Dr. Oppenheimer spoke fragments from the Hindu epic, ***Bhagavad-Gita*** that compare the "splendor of the Mighty One[1]" to "the radiance of a thousand suns."	The phenomenon referred to as a halo: the circular band of colored light around the sun that is caused by the refraction and reflection of light by hexagonal ice crystals suspended in the atmosphere.	Sometimes I use one of the designs[2] for ***576*** to paint a portrait of the sun. This visually connects the sun to the Bohr Model of the Atom.
Fusion and the Sun		
Fusion is the basic reaction that drives the Sun.		
Let's compare fission with fusion		
Nuclear Fission	**Nuclear Fusion**	
A heavy atom, such as uranium, can fall apart, that is, go through fission. When this happens, a little of the mass of the original atom is turned into energy.	It is also possible to turn mass into energy by taking less massive atoms, such as hydrogen, and squeezing them together to form another type of, and heavier, atom. This process is called nuclear fusion.	
Scientists have been able to produce fusion reactions for about the last 60 years. In the beginning, there were small studies in which a few fusion reactions actually occurred. But, these first experiments later lead to the development of thermonuclear fusion weapons (hydrogen bombs).		
Edward Teller + Thermonuclear Bomb + Dr. Oppenheimer's 1954 Security Hearing		
Teller's interest in the hydrogen bomb dated to 1941. He was involved in making possible the first successful U.S. explosion of the device on 1 November 1952.	Dr. J. Robert Oppenheimer had opposed the development of the bomb on technical and moral grounds.	During the 1954 security hearing, Teller called for Dr. Oppenheimer's removal from positions involving national security, an act that alienated many within the scientific community.

①In Hinduism, Indra (the Mighty One) is god of weather and war, and Lord of Heaven.

②This design has a 2" diameter circle in the middle and 7 bands. I purposefully choose it when I want to paint a sun. I color the central circle Yellow 2 and then count out like this: "Orange 5, Red 8, Purple 10, Ultramarine Blue 14, Turquoise Blue 17, Seagreen 20, and Leafgreen 23."

Table 4

The Rainbow						
A rainbow is actually round. On the ground, the bottom part is hidden, but in the sky, it can be seen as a round shape.						
The rainbow has been used as a symbol for peace and the environment in the past few decades. In many cultures the rainbow stands as a symbol of people's hope for a better world.						
In Christian Tradition: It symbolized God's forgiveness, as it was placed in the sky as the arch of peace after the Biblical flood—a symbol of the covenant between God and mankind.	**Greek Mythology:** Links it with Iris, the goddess who brought messages from the gods of Mount Olympus to the mortals below.	**Ancient China:** It was often drawn as a symbol of the sky dragon, connecting heaven and earth.	**The Incas of Central America:** Associate it with their sun god.	**Norse Mythology:** It was a bridge built by the gods between earth and their home in Asgard.	**Johannes Itten:** *…the colors of the rainbow and the northern lights soothe and elevate the soul. The rainbow is accounted as a symbol of peace.*	**In *576*:** It symbolizes Dr. J. Robert Oppenheimer's legacy of hope for peace and a freer world.

I chose the colors of Wilhelm Ostwald's system to paint the 576 rainbows because it consists of 24 hues. They can all been formed by the 8 principal colors. Here is a chart that lists the the colors of the visible spectrum (or what we also identify as the colors of the rainbow), Ostwald's 8 Principal colors, and the 8 colors available today that are consistent with Ostwald's system:

Table 5-1

The Basic Colors of the 576 Rainbows		
The Visible Region of the Electromagnetic Spectrum in Terms of Wavelength (ROYGBIV)	**Ostwald's 8 Principal Colors Then and Now**	
	Ostwald's 8 Principal Colors	**8 Colors[3] Available Today That Are Consistent With Ostwald's System**
Violet (380-420 nm)	Yellow 2	Primary Yellow or Hansa Yellow Opaque*
Indigo[1] (420-440 nm)	Orange 5	Vat Orange + Napthol Red Light
Blue (420-490 nm)	Red 8	Primary Magenta*
Green (520–570 nm)	Purple[2] 10	Quinacridone Magenta
Yellow (565-590 nm)	Ultramarine Blue 14	Ultramarine Blue*
Orange (585-620 nm)	Turquoise Blue 17	Primary Cyan
Red (630-760nm)	Seagreen 20	Turquoise (Phthalo) *
	Leafgreen 23	Permanent Green Light

①Indigo is the color of light between blue and violet. The human eye is relatively insensitive to indigo's frequencies and often can not distinguish it from blue and violet.

②Technically, violet is a **spectral color**, while purple is an **extraspectral color**. There is no such thing as a "wavelength of purple light": it only exists as a combination of red and blue spectral lights. Purple is the only color on the color wheel that is an extraspectral color. Purple was not present on Newton's color wheel but is present on modern ones like Ostwald's.

③Sarah Sands, an artist who works in the Technical Support Department at Golden Artist Colors, Inc. in New Berlin, New York recommended the set of colors in the far-right column as being consistent with Ostwald's system (the 4 primary colors are designated with an asterisk).

Each of Ostwald's 8 principal colors are split into three equidistant steps. If I follow his model of the color circle and call them first, second, third yellow, first, second, third orange, etc., I can draw the following table:

Table 5-2

The 24 Hues That Complete Ostwald's Color Circle							
Hue Name	1st	**2nd**	3rd	Hue Name	1st	**2nd**	3rd
Yellow	1	**2**	3	Ultramarine Blue	13	**14**	15
Orange	4	**5**	6	Turquoise Blue	16	**17**	18
Red	7	**8**	9	Seagreen	19	**20**	21
Purple	10	**11**	12	Leafgreen	22	**23**	24

How I discovered that Dr. J. Robert Oppenheimer unites *Six Million* and *576*:

On 30 January 2006 I decided to begin ***Six Million*** on 18 February 2006, the 39th Anniversary of Dr. Oppenheimer's death. I had purchased the first 5,000 grids on 5 January 2006. On 9 February 2006, my family offered to pay for the necessary drop-front boxes and interleaving paper I needed for storage purposes. I found that ***Six Million*** and ***576*** were connected. Not only because I am working on them simultaneously, but because of the following two Oppenheimer quotes on page 114 in ***American Prometheus: The Triumph and Tragedy of J. Robert Oppenheimer*** (Kai Bird and Martin J. Sherwin):

①"Beginning in late 1936," Oppenheimer would explain to his interrogators in 1954, "my interests began to change… I had had a continuing, smoldering fury about the treatment of Jews in Germany. I had relatives there [an aunt and several cousins], and was later to help in extricating them and bringing them to this country."

②"I began to feel the need to participate more fully in the life of the community."

This is the little "word picture" I drew in my head after I read these statements:

Persecution of the Jews in Germany ⇉Deterioration of the value of human life
⇊
Dr. Oppenheimer's need to act in behalf of human life
⇊
The "volume project" ***Six Million*** acts in behalf of human life
by teaching us the true value of human life

I add The Six Million Desk to the project's plan:

On 10 February 2006 I thought that it would be more efficient to set up a small desk in my workspace that I would exclusively use while filling the grids with my fingerprints. This way I could rotate between ***Six Million*** and ***576*** without having to break down one project and set up the other. I felt the ideal desk would be a fully adjustable lift lid school desk and began my search. I found a company in Geneva, Ohio called **Top Seat Supply, Ltd.** Their ***Adjustable Leg Lift Lid Desk Model #774*** had a 5" deep book box which would provide me plenty of room to store stamp pads, brayers, re-inkers, boxes of grids, and other supplies. They usually sell these desks in bulk. But after I explained why I needed only one, they made an exception to this rule and shipped the desk Federal Express so that I would have it before February 18.

I Begin Six Million

I began ***Six Million*** on time but soon realized that I was going to have to make some adjustments to my original plans in order to complete the project.

Adjustment #1: The characters made by the date and number stamps were inconsistent and sloppy. Even with practice I could not get legible impressions with uniform opacity. I created a ***Microsoft Word Document*** that would date and number each grid in the correct locations at the bottom of the page.

Adjustment #2: I estimated the following fingerprint quota per work session in my original calculations for the production schedule:

Table 6

Number of Grids Per Work Session	Fingerprints Per Grid	Fingerprints Per Work Session
107	120	12,840

On 24 February 2006, after only 4 work sessions and 16,800 fingerprints, I noticed that my right forefinger was swollen. Two of the **"Witnesses of the Six Million"** had also noticed a disquieting change in its appearance while observing it on their computer monitors. Their remarks helped me to face the fact that my right forefinger could never build itself up to make 12,840 impressions with archival Jet Black ink in a work session. But, it could complete 3,600 impressions in a work session while maintaining "maximum fingertip health." I revised my calculations and came up with the following production schedule per work session:

Table 7

Number of Grids Per Work Session	Fingerprints Per Grid	Fingerprints Per Work Session
30	120	3,600

I can execute 5 pages of grids in 25 minutes. This gave me the idea to spread out 6 stamping sessions during each work session, which runs an average of 12 hours in length.

The following production schedule provides me with plenty of time to rest and moisturize my fingertip between stamping sessions.

Table 8

Number of Grids Per Stamping Session	Number of Stamping Sessions Per Work Session	Number of Fingerprints Per Grid	Fingerprints Per Work Session
5	6	120	3,600

Then I had to figure out the number of years it would take me to make 6,000,000 fingerprints. I began this process by figuring out the number of fingerprints I am able to make over a 1-year period.

Table 9

Number of Fingerprints Per Work Session	Estimated Number of Work Sessions Per Week	Number of Weeks Per Year	Number of Fingerprints Per Year
3,600	4	52	748,800

After I came up with that figure, I worked out the following two equations:

6,000,000 Total Fingerprints ÷ 748,800 Fingerprints Per Year = 8.012820512 Years
748,800 x 8.012820512 = 5,999,999.999

The "bottom line?"
Close enough.

According to this amended production schedule, ***Six Million*** will be done over an 8-year period. At 4:15 a.m., 26 February 2006, I made the calculations illustrated below in my journal while painting ***2006-29 (576-33).***

$$\sqrt{3600} \div \sqrt{24} = 150$$
$$\sqrt{576} \div \sqrt{8} = 72$$
$$24 \div 8 = 3$$
$$24 \times \sqrt{3} = 72$$
$$9 \times 8 = 72$$
$$3 \times 3 \times 8 = 72$$

I noticed that along with Dr. Oppenheimer, the numbers 3600, 24, 576, 8, and 3 connect ***Six Million*** and ***576***. I made a table for each of these numbers and listed how they link the projects together.

Table 10

3,600
The number 24 divides evenly into the number 3,600.
I will need to execute 3,600 fingerprints per work session over an 8-year period to complete the "volume project" ***Six Million***.

Table 11

8			
The number 8 divides evenly into the number ***576***.			
I will require 8 years to complete the "volume project" ***Six Million***.			
There are 8 principal colors in Wilhelm Ostwald's color circle:			
Yellow 2	Orange 5	Red 8	Purple 11
Ultramarine Blue 14	Turquoise Blue 17	Seagreen 20	Leafgreen 23
Each painting in 576 features a 6.5" x 6.5" square with a series of .25" wide concentric bands centered within its boundaries. ***576, Design #1*** consists of 8 such bands.			
I have been arranging the paintings making up 576 in rows of 8.			
The ***Corpus Christi Carol*** is track number 8 on Jeff Buckley's CD ***Grace***.			
In the dharmic religions (Hinduism, Buddhism, and Jainism), the ***wheel of life*** is a Mandala or symbolic representation of the continuous cycle of birth, life, and death. There are two basic forms of the ***wheel of life***. The more elaborate form usually has 6 spokes (sometimes 5). The simpler form, mainly used in Buddhism, has 8 spokes.			

What does this wheel of life have to do with *Six Million* and *576*?		
Connection #1: **Dr. Oppenheimer studied Sanskrit, an ancient language of India (the language of Hinduism)** Dr. Oppenheimer studied Sanskrit with Professor Arthur W. Ryder (1877-1938). He called the sacred Hindu epic, ***Bhagavad-Gita*** (BAH-guh-vahd GEE-tuh) "the most beautiful philosophical song existing in any known tongue." The name means "the song of God." It contains a discussion between the divine being Krishna and the Indian hero Arjuna on human nature and human purpose.	**Connection #2:** **The designs for *576*** The concentric bands in the designs for ***576*** can be interpreted as a continuous cycle of birth, life, and death.	**Connection #3:** **What my right forefinger may come to symbolize to others** On Saturday, 18 February 2006, my friend Edie Ellis looked at my ink-stained right forefinger and said, "…it is life."

Table 12

24							
The number 24 divides evenly into the number 3,600.							
The number 8 divides evenly into the number 24.							
12 April 1954 through 5 May 1954 Dr. J. Robert Oppenheimer had to endure his 24-day security hearing.							
There are 24 hues that complete Wilhelm Ostwald's color circle.							
Hue Name	1st	**2nd**	3rd	Hue Name	1st	**2nd**	3rd
Yellow	1	**2**	3	Ultramarine Blue	13	**14**	15
Orange	4	**5**	6	Turquoise Blue	16	**17**	18
Red	7	**8**	9	Seagreen	19	**20**	21
Purple	10	**11**	12	Leafgreen	22	**23**	24

Table 14

576
Once again, the number 8 divides evenly into the number 576.
24 Days x 24 Hours = 576 Hours

Table 15

3
Each letter size sheet in ***Six Million*** features a grid divided into 10 rows of 12.
12 ÷ 4 = 3
1 = Father, 2 = Son, 3 = Holy Spirit
I ink my finger, make 3 fingerprints, re-ink my finger, and continue this ritual until I fill all 120 sections of the grid. Before long, I was repeating the following formula: "One, two, three, re-ink."
Sunday 19 February 2006 6:23 a.m. The numbers transformed themselves and the formula was elevated to this repetitive prayer: "Father, Son, Holy Spirit, Re-ink."

The blessing of *The Holy Finger*, 8 April 2006:

What is a Blessing?
Blessing (Anglo-Saxon: *bloedsian*, redden with blood): From the custom of sprinkling the altar with blood in sacrifice, as used in the Scriptures, has several meanings: praise; expression of desire that good fortune go with a person or thing; dedication of a person or thing to a sacred purpose; and a gift. In a strictly liturgical sense a blessing is a rite of ceremonies and prayers by which an authorized minister sanctifies persons or things to Divine service or invokes Divine favor upon them. The prayer usually mentions the object of the blessing and is accompanied by the Sign of the Cross. In the Appendix of the ***Roman Ritual*** there are over 200 such blessings of everything imaginable: of the sick, fields, flocks, archives, libraries, food, cheese, beer, carriages, railroads, homes, airplanes, electrical machines, fire-engines, elevators, lifts, women pregnant and after delivery, organs, pilgrims, wells, schools, seismographs, horses, printing presses, vineyards, etc. In the Divine Office the blessing pronounced by the officiant upon the reader is known as the benediction. (from the ***New Catholic Dictionary*** online)

How *Six Million* amended the ritual I perform before entering a church for mass:
I regularly attend the 7:30 p.m. mass at St. Christopher's Roman Catholic Church in Buchanan, New York. After entering the vestibule, I stop at a wall-mounted vessel on the left side of the door that opens to the church. This vessel, called a **stoup** (st_p), contains holy water. In general, **holy water** is water that has been consecrated by a priest and is used for baptism and rites of blessing and purification. I will simply define **baptism** as a custom of cleansing by water. This rite calls upon the grace of God to renew a person, free them from sin, and make that person a part of the church. I tirelessly searched the Internet to find what I deemed to be a clear and simple definition of the **grace of God** (the underlined words are defined in simpler terms to ensure the clarity of this passage):

In Christianity, divine grace refers to the sovereign favor of God for humankind, as <u>manifest</u> (demonstrated) in the blessings bestowed upon all <u>irrespective of</u> (regardless of) actions ("deeds"), earned worth, or proven goodness. More broadly, divine grace refers to God's gifts to humankind, including life, creation, and <u>salvation</u> (deliverance from the power or penalty of sin). More narrowly but more commonly, grace describes the means by which humans are saved from original sin and granted salvation. (From ***Wikipedia***, the free encyclopedia)

I dip the fingertips of my right hand into the holy water contained by the stoup and make the **Sign of the Cross**. To perform this ritual, my thumb, forefinger, and middle finger are brought together to

form a pyramid shape. I place them on my forehead and then move them down to my breastbone. From this position, I move my hand to the left shoulder and then to the right shoulder. This is what I say out loud as I proceed through the Sign: at the forehead, “In the name of the Father”; at the breastbone, “and the Son”; and across the shoulders, “and of the Holy Spirit, Amen.” In making the Sign of the Cross I assert my belief in the union of three heavenly persons (the Father, Son, and Holy Spirit) in one God. I am also maintaining that I believe Jesus achieved forgiveness for our past sins, and protection from our everlasting punishment, by His death on the cross. By making the Sign of the Cross after wetting my fingers with holy water, I am blessing myself with holy water and renewing my **baptismal promises**.

The Baptismal Promises are made on behalf of the child by the parents. When the child has grown to adulthood it can choose to renew these promises for itself. The parents promise four things:

- **to reject evil**
- **to believe in God the Son, Jesus**
- **to believe in God the Father**
- **to believe in God the Holy Spirit**

(From ***A Thumbnail Guide to Christianity,*** re-xs.ucsm.ac.uk/gcsere/revision/romancath/rc1/3.html - 11k)

After I started ***Six Million***, I modified this ritual at the stoup by dipping only my right forefinger in the holy water a second time. I felt that this part of my being needed to be blessed more than once each week. Amy Cabot is one of the ***Witnesses of the Six Million***. She referred to my right forefinger as ***The Holy Finger*** in a reply she emailed after reviewing one of my fingerprint progress reports. Her nickname for my digit gave me an idea that would take this second blessing with the holy water a step further.

On 30 March 2006 I wrote a letter to Reverend Father Leonard J. DiNola. He is a priest at St. Christopher’s Roman Catholic Church. I asked him if he would bless my right forefinger before or after mass on a Saturday evening. On Saturday, 8 April 2006 I met my mother inside the church as usual. We have been sitting in the second row of pews (A **pew** [py_] is one of the long backed benches arranged in rows for the seating of the people attending mass.) on the right side of the church for as long as I can remember. We were celebrating Palm Sunday. **Palm Sunday** is the Sunday before Easter, the sixth and last of Lent, and the beginning of Holy Week. (The week before Easter.) The day marks the spreading of palm branches in Christ's path as He entered Jerusalem prior to being crucified a few days later. Palms are blessed at the beginning of the service and distributed to the parishioners. Old palms are saved in many churches to be burned later as the source of ashes used in Ash Wednesday services. **Lent** is a season of fasting and penance observed by Christians during the forty weekdays from Ash Wednesday until Easter Sunday. **Ash Wednesday** is the first day of Lent. On this day ashes are placed on the foreheads of the faithful to remind them of death, of the sorrow they should feel for their sins, and of the necessity of changing their lives. **Easter** marks the resurrection of Jesus Christ three days after his crucifixion. Reverend Father DiNola came out onto the altar before the mass and we made eye contact. He held up his right forefinger and I returned his gesture. Then he asked if my finger had been blessed yet (perhaps he thought I had also contacted Monsignor Donald Hendricks of the same parish). After I shook my head, he said he would get the holy water and meet me in the sacristy. (The **sacristy** is a room in the church, where vestments, church furnishings, sacred vessels, and other related belongings are kept. It is also where the clergy meet and dress for religious functions.)

I can't remember everything that he said. But I do remember that it was extemporaneous and heartfelt. Essentially he asked that I be given the strength, and my right forefinger the physical endurance, to complete ***Six Million***. He also asked that this finger be protected from harm while it is performing its assigned task. I interpreted what he said like this: *He asked God to transform ‘The*

Holy Finger' into a little superhero while it is fulfilling its mission. This way it won't get hurt while it is teaching us the value of human life while re-teaching us the value of the number one.

The significance of the palm on the floor in front of The Six Million Desk:
In general, the palm is a symbol of victory and triumph. I believe that my right forefinger was blessed before the mass that celebrated Palm Sunday as a sign that I will successfully execute all six million fingerprints. It is customary for people to take the palms they receive during Palm Sunday mass and place them around religious pictures, statues or other objects. They remain there until the next Palm Sunday when newly blessed palms replace them. I positioned the palm I received after my right forefinger was blessed on the floor in front of ***The Six Million Desk***. It will remain there until I receive the newly blessed palm in 2007. This cycle will continue until the six millionth fingerprint is made. This ritual of placing a palm branch "in my path" symbolizes my faith in fulfilling my promise to six million human beings.

Acknowledging *Fanny* on Easter Sunday, 16 April 2006:

Why did I initially choose to use a grid pattern in Six Million?
I decided to use a grid pattern in ***Six Million*** because it provides the ideal format for a neat and orderly progression of individual fingerprints.

How did the use of a grid pattern unexpectedly add two new elements to *Six Million*?
As I moved farther along on the project I found that the cross-sectioned design resembles sheet music and the "Arbeit Macht Frei" ("work will set you free") gate at Dachau.

What practice brings about the thoughts of sheet music while I'm making fingerprints?
The fingerprints are made in intervals of three. The density of the ink decreases with each impression. As a result, the pattern that forms on the page creates a rhythmic beat in my head as I'm working (refer to **Table 16**). This practice brings about the thoughts of sheet music while I'm making fingerprints.

Table 16

Fingerprint Triad	1	2	3
Ink Density	Dark	Middle	Light
Beat Volume	Loud	Medium	Soft

Why does the grid design remind me of the "Arbeit Macht Frei" Gate at Dachau?
I looked at **Philip Greenspun's** photographs of Dachau on the Internet when I first began working on ***Six Million***. The "Arbeit Macht Frei" ("work will set you free") gate at the entrance of the camp caused me the most discomfort. I interpret the phrase as a false promise stating that those who worked to exhaustion would eventually be released. Shortly after I began ***Six Million***, I noticed that **Mr. Greenspun's** pictures of the "Arbeit Macht Frei" gate frequently came to mind while I was filling the grids with fingerprints. This prompted me to conduct an experiment. I turned one of **Mr. Greenspun's** photographs of the gate 48° clockwise and found that it forms a pattern of regularly spaced horizontal and vertical lines forming squares. But what made me perform this action? Then I remembered that while I'm filling the pages with fingerprints, I turn the paper 48° *counter*-clockwise. This slight rotation transforms the vertically oriented rectangles of the grid into diamond shapes. The

This slight rotation transforms the vertically oriented rectangles of the grid into diamond shapes. The similarity between the diamonds on the paper and the diamonds on the "Arbeit Macht Frei" gate creates the presence of this gate in the project.

Table 17

Here are the two roles the grid has played in the two-dimensional and three-dimensional projects I've been producing since 1987:	
Role #1: It has been used in the "b through y" steps between the "a and z" steps of a piece.	**Role #2:** It has been a major detail in the "z" step of a piece.

Why did *Six Million* call to mind the work of Chuck Close?
Comparisons of my work to Chuck Close's work have been made since 1987 because of how I have used the grid design in various pieces **(refer Table 17)** and the diligent systems of operation I develop to produce a piece.

I originally attributed my decision to represent the victims of The Holocaust with six million fingerprints to the impression on the Italian seamstress's ID. Then on Easter Sunday a discussion with my family about the work of Chuck Close brought to mind one of his paintings and changed this first theory. Most of us had seen his pieces as well as reviewed comprehensive books or documentaries about his life and his work. As the conversation developed each of us began to elaborate on these experiences. It did not take long for me to recall the finger painting he did in 1985 called ***Fanny.*** I actually relived the first time I stood in front of ***Fanny*** at the Pace Gallery in 1986. I always make an effort to practice propriety in my daily life, but I disrupted our orderly dialogue with the following statement: "The ID of the Italian seamstress is not the only reason why I decided to use a fingerprint to represent each member of the Jewish population killed during the Holocaust—***Fanny*** also influenced this decision."

Three out of five dinner guests asked: "Who's Fanny?"

"Fanny is Chuck Close's grandmother-in-law. Chuck Close painted her portrait using his thumbprint. It's a large-scale black and white oil painting. If I remember correctly, Fanny was the only person in her family to survive World War Two. As a matter of fact, I don't think I have ever experienced a more loving painting to this day."

<u>What is the significance of the foot washing ritual I engage in while making fingerprints:</u>

I have been employed as a custom picture framer since 3 October 1988. In the beginning, I worked Monday through Friday, eight hours each day. Then I would work in the studio a minimum of three weekday evenings and all weekend. As I advanced my artistic career, I understood that I needed more time to develop art projects as well as fulfill the administrative responsibilities required to gain recognition for the work. How could I do this while maintaining the income required to cover my arts-related expenses and necessary living costs? My answer was derived from basic mathematics and principles of time efficiency. I would compress a standard full-time work schedule picture framing over a three-day period. This arrangement would provide me with a minimum of forty hours to focus on my art if I managed my time accordingly.

Here is a simple equation illustrating exactly what I mean:

4 work sessions x 10 hours = 40 hours

Over the last thirteen years I've honed in on my time management skills and gradually increased the number of hours that I dedicate to my artistic career.

Here is a simple equation illustrating my current average:
work session 1→13 hours + work session 2→13 hours + work session 3→10 + work session 4→10 = 46 hours

This has been wonderful for the work. But thirteen years standing upright for intervals of up to fifteen hours has not been great for the bunions that have formed on both of my feet.

A bunion is a sometimes painful structural deformity of the bones and the joint between the foot and big toe. Bunions develop via long-term irritation (inflammation) from arthritis, poorly fitting shoes, and heredity, any of which can cause this joint at the base of the big toe to thicken and enlarge. This causes the bones of the big toe to angle in toward the second toe, and leads to an often painful lump of bone which forms at the outside-edge base of the big toe. People with flat feet and laxity in their ligaments are prone to developing bunions, as well as those in professions which place excessive stress on the feet, such as ballet dancers. Bunions may be followed by painful calluses, resulting from a changed foot balance. (From ***Wikipedia***, the free encyclopedia)

Whenever something comes along that has the potential to impede the development of my artistic career I make the effort to either avert or eliminate it. There have been times that this process has transformed a possible threat to the work into a part of the work. The therapy I now use to relieve the pain caused by my bunions is an ideal model for this course of action.

How my bunion remedy got incorporated into *Six Million*:
In April 2006 the bunion on my right foot began to cause so much discomfort that I would need to periodically sit down to work while I was at the frame shop. I found this a nuisance due to the fact that my responsibilities are geared toward maintaining a steady output of finished work. I also perceived this as an impending obstacle to the work. If I can't physically endure long work periods in the frame shop then I can't maintain the number of hours I've managed to focalize into my artistic career.

I read about different home remedies used to lessen the irritation of bunions. A good hot soak in Epsom salts was the most popular. Some sources recommended that immersing your feet in hot water alone is enough to reduce inflammation and ease pain. The Lenten Season had just come to an end. The idea of
washing my own feet in a bath of hot water made me think about the foot washing ritual that is practiced during mass on Holy Thursday.

In the Christian calendar, Maundy Thursday (môn'd_), Holy Thursday, or Great Thursday is the feast or holy day which falls each year on the Thursday before Easter, and commemorates the day on which the Last Supper of Jesus Christ and the Apostles is said to have occurred.

Church services and masses held on this day typically include a reading from the gospel account of the Last Supper. In this context, the feast often highlights Christ's sharing of bread and wine with the Apostles, which take on new meaning as Christ's body and blood. Maundy or Holy Thursday also stresses the Washing of the Feet which also took place during the Last Supper, according to the Gospel of John, during which Christ washed the feet of the assembled Apostles. At services on this day, a minister, priest, or lay leader(s) may wash the feet of some members of the congregation to commemorate Christ's actions and command. (From ***Wikipedia*****,** the free encyclopedia)

I found the above passage to be a succinct source of facts regarding Holy Thursday. But it did not mention <u>why</u> Jesus Christ washed the feet of the Apostles. It took me approximately six hours spread

out over three work sessions to find a brief explanation of foot washing that I could grasp (I underlined *humility*, *dusty roads*, and *servant* in the encyclopedia entry I cited for this document).

Foot washing is a religious rite practiced by the hierarchy of the Roman Catholic Church on Maundy Thursday of Holy Week (preceding Easter) and by members of some other Christian denominations in their worship services.

The early Christian church introduced the custom to imitate the humility and selfless love of Jesus, who washed the feet of his disciples at the Last Supper (John 13:1–15), the night before his Crucifixion. The practice was originally an act of hospitality in Palestinian homes performed for guests (who wore sandals and walked on dusty roads) by a servant or the wife of the host. St. Paul refers to the custom in 1 Timothy 5:10, and St. Augustine mentions it in one of his letters about AD 400. The Maundy Thursday ceremony observed in Rome by the pope and locally in parish churches, first appeared in the Spanish liturgy of the 7th century.

In several European countries the monarchs or members of the royal family washed the feet of poor people and gave them gifts on Maundy Thursday. The royal practice was continued for a time in England after the Reformation but ended in the Church of England in 1754. Foot washing is generally still practiced in some Episcopal churches. Some Lutherans and other Protestants also practice the washing of feet. ("feet, washing of." **Encyclopedia Britannica.** 2006. Encyclopedia Britannica Premium Service. 23 June 2006)

The origins of foot washing as an act of hospitality encouraged my decision to ceremoniously wash my own feet during fingerprinting work sessions. Why? I see the dust on the roads as things I don't need. By washing this "dust" off my feet, I am ridding myself of the possessions, thoughts, and actions that could distract me from leading a purposeful life. The practice of washing my own feet also refers to the humble service of the foot washing religious rite and I perceive this practice as a metaphor for my vocation as a visual artist. What does the humble service of the foot washing religious rite have to do with my vocation as a visual artist? At the Last Supper Jesus Christ used foot washing as an example of the loving service that his followers must give to the community. I use works of art that foster the value of humanity, investigation, and openness to contribute to the community. I regard both the foot washing custom and the art making process as forms of service. In both instances here, they are used to teach something of great value to others. This commonality links the service of the foot washing religious rite to my vocation as a visual artist.

Closing comment regarding my vocation:
When I was "called" to be a visual artist I didn't pursue this occupation for reasons based on financial gain. I make every effort to achieve recognition for the work and earn income from the work; and I do so with zeal. But I do not redirect the true nature of the creative process to yield art that I know people will purchase or to please a prospect. I see the rewards for my vocation as a visual artist in more spiritual terms and will continue to fulfill my role in society with integrity and glee.

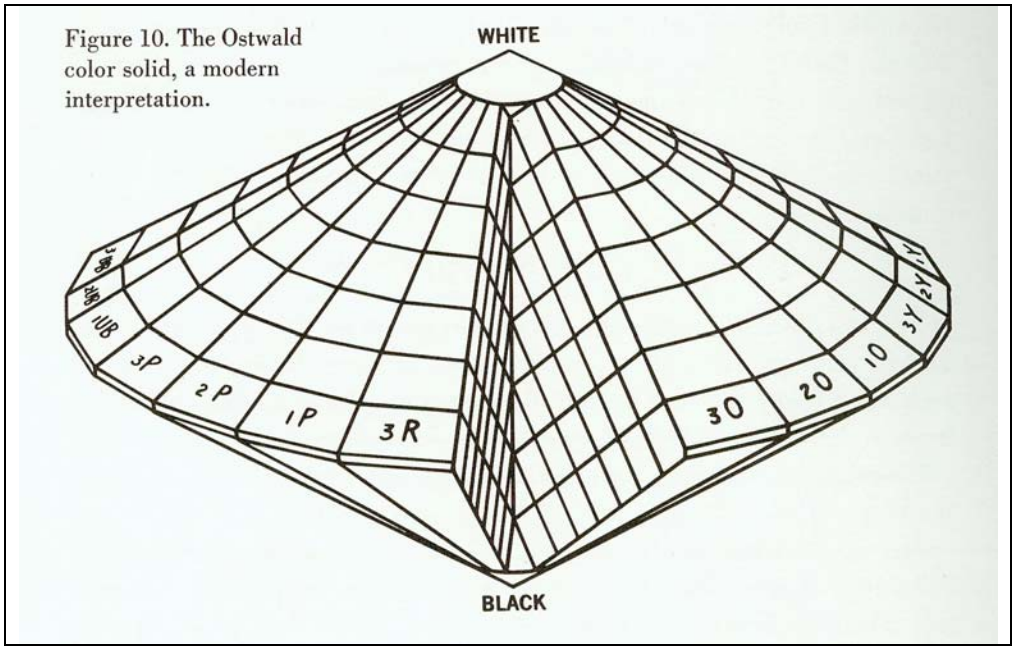
How does *Six Million* benefit others?
When I write a number greater than one down on a piece of paper I begin to lose sight of its true value. So many times I see a penny on the ground and I pass it by. Imagine if I had faithfully collected every penny I found since I was five years old? I wonder how many dollar bills they would be worth? After all, there *are* one hundred pennies in a single dollar bill. I can write, or say, that six million members of the Jewish population were exterminated during The Holocaust. But what does six million really look like when I divide it by the number one? The installation ***Six Million*** teaches us the true value of human life by re-teaching the true value of a number greater than one.

How does *576* benefit others?

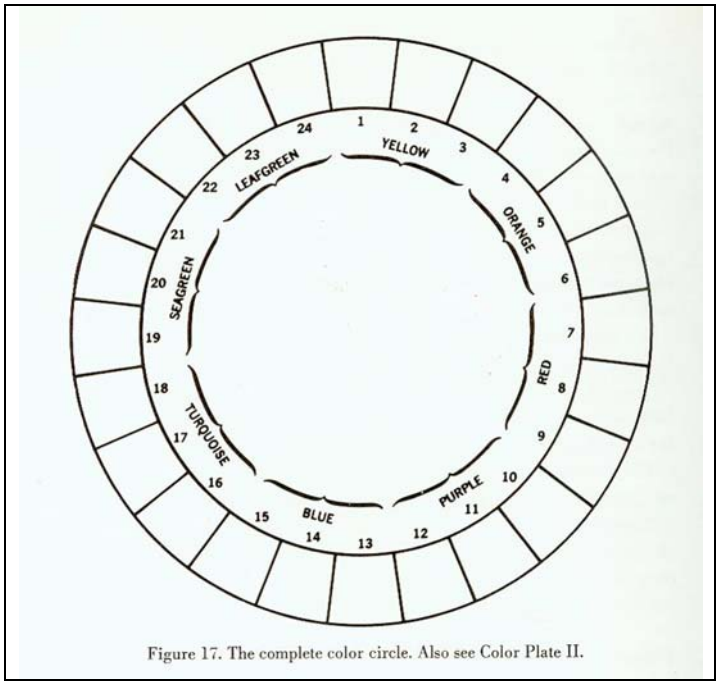
I began studying Dr. Oppenheimer's life and life's work on Monday, 13 October 2003. I understood on Thursday, 16 October 2003 that he was more than ***The Father of the Atomic Bomb.*** On the morning of Friday, 17 October 2003 I promised to educate as many people as possible about his contributions as a teacher, physicist, national hero, and public servant. ***576*** is a work of art that honors my declaration to Dr. Oppenheimer. Therefore it teaches us the value of maintaining our loyalty to others by following through on the commitments that we make to others.

Appendix C

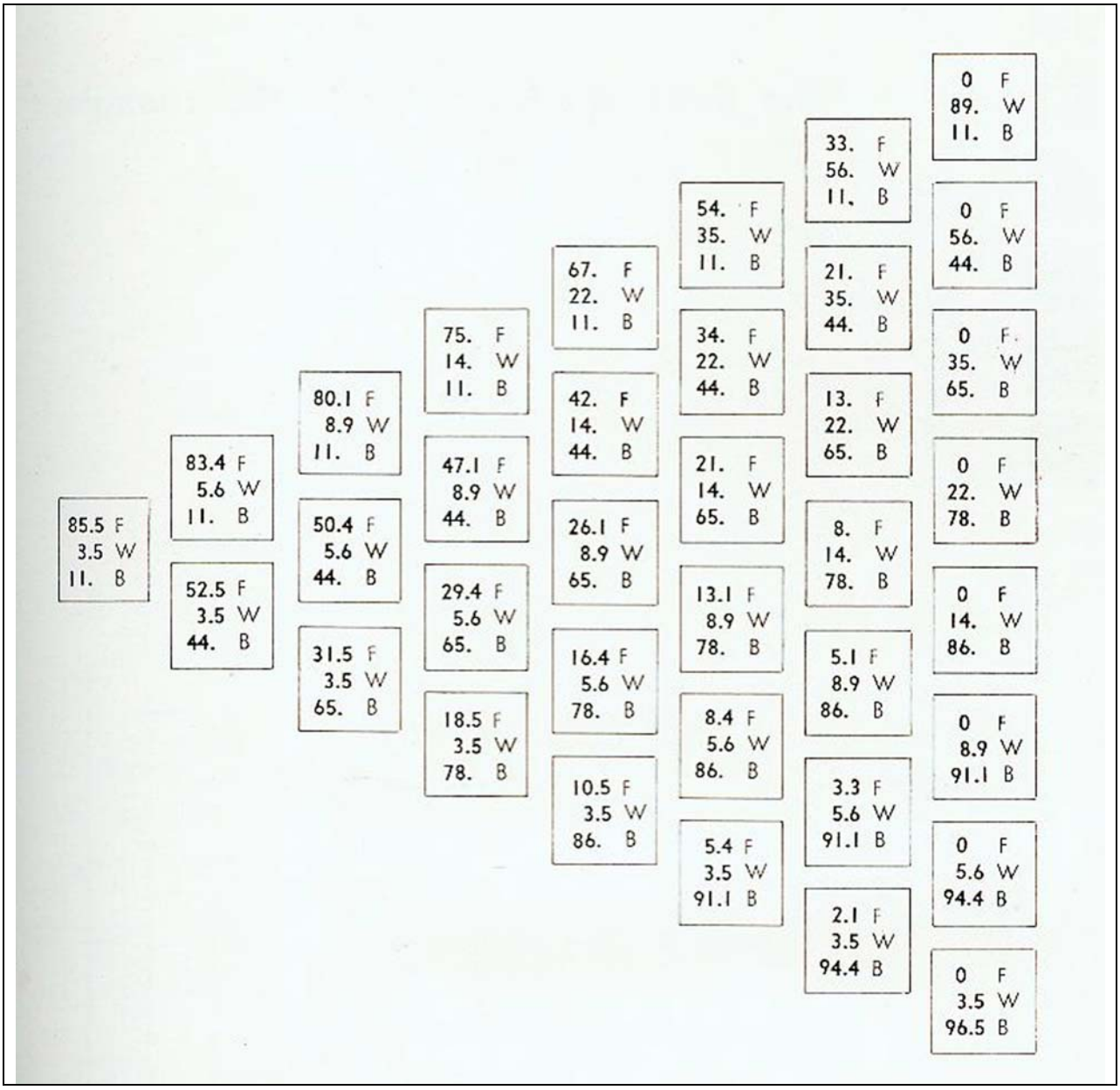
Wilhelm Ostwald's Color Solid, Complete Color Circle, and Monochromatic Triangle



The Ostwald Color Solid
The Color Primer: A Basic Treatise of the Color System of Wilhelm Ostwald
(Edited and with a Forward and Evaluation by Faber Birren)



The Ostwald Color Circle
The Color Primer: A Basic Treatise of the Color System of Wilhelm Ostwald
(Edited and with a Forward and Evaluation by Faber Birren)



The Ostwald Monochromatic Triangle
Basic Color: An Interpretation of the Ostwald Color System
Egbert Jacobson

Photo Credits

Part I

Kerry Meehan

"The Color of Loyalty: A Tribute to Dr. J. Robert Oppenheimer," Wall One of the Painting Installation, p. 1.

"Color Perception—After Faber Birren, Bright Luster" and "Color Perception—After Faber Birren, Modest Iridescence," p. 2.

"Paint Out Loud #1," p. 2.

"Paint Out Loud #4," p. 3.

"Paint Out Loud #5: Saved By Howard Goodman on 3-28-03 at 7:43 p.m.," p. 3.

"Paint Out Loud #6: Red and Blue (The Color Is In the Light)" and "Paint Out Loud #3," p. 4.

"The Color of Loyalty: A Tribute to Dr. J. Robert Oppenheimer," Wall Two of the Painting Installation, p. 5.

"Chromium," p. 5.

"Electron Orbital 3 Dz^2 #1," "Electron Orbital 3 Dz^2 #2," and "Electron Orbital 3 Dz^2, Color #1," p. 9.

"Hexagon Cure" and "Painting X," p. 12.

"Nine" and "Don't Try Too Hard," p. 12.

"Electron Jump" and "States of the Eleven," p. 13.

"144 89 3," p. 15.

"Conduction," p. 17.

"Symmetry," p. 18.

"S and P Orbitals" and "Depth Rows for Dr. Stowe," p. 19.

"Omega Minus #3," p. 22.

"The Color of Loyalty: A Tribute to Dr. J. Robert Oppenheimer," Wall Three of the Painting Installation, p. 23.

Howard Goodman

"VII [11-13-2003]," p. 24.

"XII [11-21-2003]," p. 27.

"XII [11-23-2003]," p. 31.

"XIV [11-24-2003]," p. 34.

"XVI [11-28-2003]," p. 36.

"XVII [11-30-2003]," p. 38.

"XVIII [12-1-2003]," p. 39.

Part II

Kerry Meehan
"The Color of Loyalty: A Tribute to Dr. J. Robert Oppenheimer," Walls Four and Five of the Painting Installation, p. 69.

"Hundred Hearts," Wall Three of the Painting Installation, p. 77.

"Hundred Hearts," Detail, p. 78.

"Fifty Eggs," Wall Four of the Painting Installation, p. 79.

"Ninety Red Crosses," Wall Four of the Painting Installation, p. 82.

"576," Wall Five of the Painting Installation, p. 84.

"576," Detail, p. 85.

Theresa Andre
"Ninety Red Crosses," Detail, p. 83.

"Six Million," The Fingerprinting Process 10 June 2006, p. 86.

Linda Jean Fisher
"2004-36, p. 58.

"2004-41," p. 61.

"2004-43, p. 62.

"2004-49" and "2004-56," p. 64.

"2004-57," p. 65.

"2005-3 (take more)," p. 66.

"2005-4 (loyal)" and "2005-71 (101)," p. 68.

"18 February 2007 Page 2601," p. 87.

Chris Burke
Edward A. Burke, p. 91.