

## Technical Report

In 1992 SciTech received a three-year grant of \$113,062 to originate and construct a museum exhibition to explain the equation  $E=mc^2$ .

We asked for and received four no-cost extensions:

Until September 1995

until March 1997

until September 1997

until September of 1998.

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On March 4, 1998 we sent a letter to Peter Waldman, DOE Field Office, Chicago announcing completion of the  $E=mc^2$  Exhibition and inviting him to the Grand Opening ceremony on March 26. (See attached.)

The finished product is a museum exhibition explain the meaning of Einstein's famous equation  $E=mc^2$ . The exhibition consists of three exhibit elements, a colorful surround with explanations, diagrams and photos and a video production to explain the equation and how to use the Matter into Energy exhibit.

Volunteers from Fermilab worked two years to build a circuit board to run the exhibit element called Matter into Energy. A Physics Assistant from Argonne worked one day per week on a volunteer basis for two years on the design and construction of the exhibit element. Other physicists, experimental and theoretical from Argonne and Fermilab contributed their time to the scientific accuracy of the project. We estimate the value of these contributions of these volunteers from Argonne and Fermilab to be approximately \$100,000.

An Advisory Panel met and reviewed our prototyped exhibit elements. See attached list of the members of the Advisory Panel. They all could have charged us \$500 per day for their time but chose to donate it. Based on their feedback we made changes, which were mainly to simplify our message. We attempted with talented volunteers for one year to accomplish a technically challenging effect to capture on videotape events in a cloud chamber produced by a weak radioactive source. This proved to be too difficult at the time (1994/1995) without a huge investment of professional time and money so we dropped it.

We then wrote a script for a dramatic production and animation that explained the equation and how to use the main exhibit element, the "Matter into Energy." The finished video was transcribed onto a laser disk, which is played on a laser disk player and monitor in the exhibition. A button box allows the visitor to choose the production in either English or Spanish.

The Matter into Energy exhibit was improved, finalized and placed in the exhibition as the main piece. A cloud chamber was purchased from a company named Phye and placed in the

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exhibition. It represents Energy into Matter and shows tracks of cosmic rays through a medium of alcohol vapor.

Staff and volunteers wrote original text explaining the equation and the phenomenon the equation explains. The text was critiqued by the Advisory panel and then edited and produced onto large graphic panels mounted on walls constructed around the exhibition. The video disk player is mounted in a giant letter "E" that forms part of the surrounding walls. A life-sized photograph of Einstein riding a bicycle is mounted on another wall. The entire exhibition forms the nucleus of a larger exhibition at SciTech called Gateway to the Microworld.

SciTech receives approximately 60,000 visitors each year. It is one of a small number of museums that have attempted to explain the micro world using the medium of hands-on exhibits. Since this is a complex topic, the Advisory Panel advised us to use some visual aids to explain the concepts to the audience. The exhibition was designed for a junior high to adult audience.

Matter into Energy was displayed at Argonne's Open House in 1994, 1995 and for its 50<sup>th</sup> Anniversary Open House in 1998.

In order to reach a larger audience, SciTech features the  $E=mc^2$  exhibition on its Web Page, which is at <http://scitech.mus.il.us/> That site receives an average of 1,000 hits per day from all over the world.

## $E=mc^2$ Advisory Panel

Dr. Peter Anderson,  
Vice President for Programs  
Museum of Science and Industry  
57<sup>th</sup> Street at Lake Shore Drive  
Chicago, IL 60637

Mr. Chris Chiaverina  
High School Physics Teacher  
4111 Connecticut Trail  
Crystal Lake, IL 60013

Dr. Don Cossairt, Head  
Environment, Safety and Health Section  
Fermilab  
Box 500  
Batavia, IL 60510

Dr. Alan Friedman, Director  
New York Hall of Science  
Rolling Meadows  
Queens, NY

Mr. Daniel Goldwater  
Retired Head of Exhibits of Franklin  
Institute  
308 Rutgers Avenue  
Swarthmore, PA 19081

Professor Marc Ross  
University of Michigan  
Randall Laboratory  
Physics Department  
Ann Arbor, MI 48109-1120

Dr. John P. Schiffer  
Argonne National Laboratory  
Physics Building 203  
Argonne, IL 60439

Mr. David Weaner  
COSI  
280 E. Board  
Columbus, OH 43215

Mr. Chuck O'Connor  
Vice President  
COSI  
280 E. Broad  
Columbus, OH 43215

Dr. Greg Snow  
University of Michigan  
Physics Department  
Randall laboratory  
Ann Arbor, MI 48109-1120