

Paper Plate Education

"Serving the Universe on a Paper Plate"



Historic Paper Devices 20th Century Paper Devices Current Efforts

Historic Paper Devices

Paper dials have been used for centuries as tools to illustrate complex principles. In the 13th Century, Ramon Llull of Majorca used several paper instruments in his manuscript to support and to advocate his missionary arguments. Llull designed his inventive dials--essentially paper machines--to illustrate religious truths objectively.

(Source: *What Was Llull Up To?*, Anthony Bonner,
<http://www.geocities.com/Athens/Forum/5284/compbon.html>)

Moveable dials called volvelles appeared in printed text as early as 1476, when Johannes Müller von Königsberg, also known as Regiomontanus, included four paper devices with his astronomical calendars.



Moveable dials appeared as volvelles in woodcut, such as this one created by Pacificus Maximus of Florence in 1485.

Image courtesy of University of Brighton, U.K.; used with permission.



Volvelles such as this 15th Century version were designed to aid in the calculation of the locations of the planets throughout the year. The Planet Pointer II activity from the Paper Plate Education collection performs a similar function.

Image courtesy of Chetham's Library, U.K.; used with permission.



Instrument-maker [Gemma Frisius](#) devised a fourth [volvelle](#) for inclusion in Peter Apianus' ambitious 1524 undertaking, *Cosmographia*, helping to propel the book to the 16th Century equivalent of a bestseller, being printed in at least forty-five editions in four languages. The [Moon Finder](#) dial from the Paper Plate Education [activities](#) performs a similar function. (View translated [text on the backside](#) of volvelle page.)

(Source: *A Student Virtual Exhibition at the Museum of the History of Science, Oxford*, <http://www.mhs.ox.ac.uk/students/98to99/>)

"On the evening of November 8, 1895, Wilhelm Roentgen found that, if the discharge tube is enclosed in a sealed, thick black carton to exclude all light, and if he worked in a dark room, a paper plate covered on one side with barium platinocyanide placed in the path of the rays became fluorescent even when it was as far as two metres from the discharge tube." Roentgen went on to discover X-rays, with the first image being of his wife's hand with a ring on it. (Okay, so it was a different kind of paper plate. Just having fun...)



(Source: Nobel e-Museum at <http://www.nobel.se/physics/laureates/1901/rontgen-bio.html>)

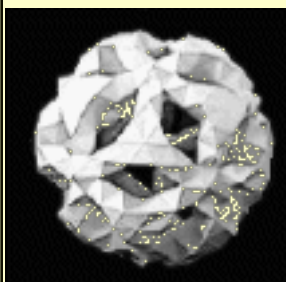
June Salzman writes that her "maternal grandfather, Frank (Pina) Chaikin, who came, originally, from Kiev, Russia, patented the first paper plates and egg cartons. Being a Socialist he 'sold' the rights to the Alfred Bleyer Company to manufacture them...in Long Island City, NY. I was born in 1931, and we ate from paper plates and paper soup bowls for years before other people. He eventually coated them for use as ashtrays." Since this is a non-smoking site, we'll move on.

20th Century and Recent Paper Devices



The use of paper plates to inspire creative thinking was demonstrated in the late 1950's when Max Faget, an engineer at Langley Research Center, reportedly taped paper plates together and launched them from a balcony overlooking a technician's shop. Faget, who is credited as being a founding figure in the American space program, used his observations of the plates in flight to conceive the "blunt body" design of the Mercury space capsule.

(Source: *Apollo, the Race to the Moon*, Charles Murray and Catherine Bly Cox, 1989. Image courtesy of NASA.)



Another noteworthy application came from Buckminster Fuller, who "used paper plates to demonstrate the pattern of the Vector Equilibrium, a 3-dimensional diagram of spherical order. Fuller would pass out paper plates to an audience and have them proportionally fold and join four circles into a complex patterned sphere."

(Source: *The Geometry of Wholemovement*, Bradford Hansen-Smith,

Wholemovement Publications, 1999.)



Paper plate astronomy was resurrected in 1992 when planetarian Wayne James created several plate-based activities as a back-up plan when poor weather threatened a group's scheduled stargazing picnic. James subsequently designed 21 paper plate activities and integrated them into the school district's existing curriculum, including lessons on the seasons, directions, retrograde motion, eclipses, angular momentum, planetary positions and black holes.



Since then, members of the [Great Lakes Planetarium Association](#) (GLPA) have created dozens of paper plate activities and have presented them to colleagues at GLPA state meetings and at the GLPA annual conference. Past issues of the *Proceedings of the Annual GLPA Conference* are available to GLPA members while supplies last.

<http://>



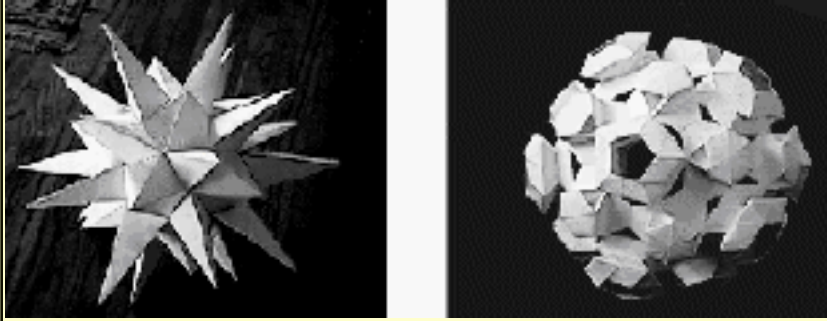
As the quantity of activities has grown, so has the realization that paper plate education is a useful constructive technique for supporting lessons in science, math, history, geography, social studies, art, music, and other disciplines. Paper Plate Education is an effort to illustrate and to promote haptic [activities](#) that can be experienced across a range of interests, at varying degrees of complexity, and at a low price – all with the humble paper plate.



Believing that the end users will have varied abilities and resources, Paper Plate Education presents its [activities](#) in multiple formats. In part to reach underserved populations that do not have ready access to computers and the Internet, the GLPA produced a how-to [Paper Plate Astronomy video](#) showing nine technical activities from the collection. Paper Plate Education received a [PLATO grant](#) from the Office of Space Science Center for Education and Outreach at DePaul University to edit the video and to make 200 copies. Distribution began at the joint SEPA-GLPA conference in June, 2001. Clips of individual activities from the video are also available as a [DVD and free streaming video](#).



In 2001 Paper Plate Education received support from an [IDEAS grant](#) administered by the Space Telescope Science Institute for teacher workshops that incorporate paper plate activities and for support of this website. The [Astronomy Foundations Through Art & Paper Plates \(AFTAPP\)](#) project was a collaboration between participating scientists at the NASA Glenn Research Center, the Cleveland African American Museum, selected teachers of the Cleveland Public Schools, and Paper Plate Education. In studying the night sky, participants fused the lore of past civilizations with modern astronomical discoveries and then created their own artistic renderings of the respective constellations.



Taking the art of manipulating paper plates to a new height to create multidimensional geometric forms is Bradford Hansen-Smith (see www.wholemovement.com). In his text, *The Geometry of Wholemovement*, Hansen-Smith discovers personal truths about the circle while conjoining

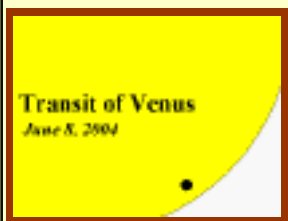
plates folded into the five Platonic solids and the thirteen Archimedean semi-regular polyhedra. The resulting forms are nothing less than exquisite. A sample of his craft is temporarily available as a Microsoft Word document entitled [Full Circle](#).

(Images courtesy of Bradford Hansen-Smith.)

On another front, the ambitious Universal Laboratory ([Unilab](#)) project at Cal Tech proposed to resurrect many of the ingenious, historic paper devices of previous centuries:

"One archival base for this investigation is provided by the corpus of printed books produced in the sixteenth, seventeenth, and eighteenth centuries that made paper itself into a physical instrument. The "volvelle" is a major example. Volvelles were rotating circular elements used to produce paper versions of epicycle systems, or of astrolabes, on the page itself...[The Universal Laboratory project] will make these paper instruments available by providing materials that a user can print out and employ in constructing copies of the original devices. In this way the system will restore to prominence a genre of representation that was once central to theorizing across a range of disciplines, but which has now vanished from view altogether."

(Source: *The Universal Laboratory, A future for past science*, August, 1998, <http://www.cco.caltech.edu/~winter/mission.html>)



In anticipation of the [Transit of Venus](#) on June 8, 2004, Paper Plate Education gathered related material (historical documents, images, activities, links, observing aids, quotes, diagrams, etc.) to produce a planetarium program and supporting resources. A 2003 Toyota TAPESTRY grant established a [clearinghouse for transit of Venus resources](#) on this website. The program, simply entitled [Transit of Venus](#), is funded by [Toyota Motor Sales, U.S.A., Inc.](#) and is administered by the [National Science Teachers Association \(NSTA\)](#). The Project Director was Art Klinger of the [Penn-Harris-Madison Planetarium](#) in Mishawaka, Indiana. The information is available to multiple users, including teachers, planetarians, librarians, and other educators.

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Current Efforts



Paper Plate Education asserts that anything worth teaching ought be reducible to a paper plate-- Paper Plate Reduction. While welcoming and soliciting plate-based lesson plans from various fields of study, we ask scientists in particular to put their research into laymen's terms and to develop paper plate activities that illustrate their respective pursuits. In reducing various notions of interest, individuals have created over 88 engaging paper plate [activities](#), including lessons in space

science, music theory, archeology, celestial navigation, African-American history, geometry, and art.

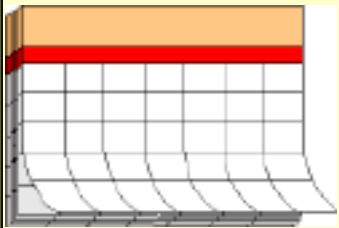


To provide fluidity and flexibility to the dissemination effort, whereby the collection of activities can be augmented, enhanced and updated, elements of the visual aid are posted here on the Internet. This website, provided by DePaul University in Chicago through its broker/facilitator affiliation with the Office of Space Science, contains a collection of activities, references, and images, again depicting the construction and use of the paper plate devices.



Light pollution abatement has become a personal priority, so you can look forward to more effort put into preserving the night sky from encroaching light. Some preliminary Lighting Issues webpages are at www.nightwise.org and on this website at [lights.htm](#). In the meantime, we look forward to your contributions to Paper Plate Education. Thank you in advance.

Future Events



Check out stuff *you can do* that ties in with [Upcoming Events](#).

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