

## Workshop 45: Physics experiments at less than 1 euro

Dear colleagues.

Murcia and Alacant (Spain), 26 March 2007

As the chairman and chairwoman of the workshop we would like to briefly introduce ourselves and say a few words about the aim of this workshop.

We teach Physics at the university level (to Physics, Chemistry, Biology... students).<sup>1</sup> Besides our traditional activities of researching and teaching, we firmly believe in the need of spreading Physics knowledge among the society, showing that Physics is present everywhere and essential for a sustainable future. Therefore we also have organized science fairs and imparted seminars, workshops, etc. addressed to instructors, young people and the general public.

Among the many activities that can be done to stimulate the interest of people for Physics, we are absolutely certain of the excellent result of hands-on activities with cheap, simple and everyday materials, which have shown to be very successful both to catch the attention of people and to provide teachers with an excellent tool to complement their lectures.

We have prepared for this workshop a set of Physics experiments that are cheap, simple and, some of them, even fun and spectacular. Besides to have a nice time doing physics all together, the goal of these activities is to encourage you to prepare your own experiments, many of which can be found in the enclosed bibliography.

See you in Grenoble

Rafael Gancia Molina

Rafael Garcia-Molina (**rgm@um.es**) Departamento de Física – CIOyN Universidad de Murcia 30080 Murcia Spain

Real

Física

Sociedad

Española de

ABAS BO.

Isabel Abril (**ias@ua.es**) Departament de Física Aplicada Universitat d'Alacant 03080 Alacant Spain





<sup>1</sup> You can see our profiles by taking a look through our web pages: **bohr.fcu.um.es/miembros/rgm** (the material devoted to Teaching and Popularizing Physics appears at the end).

## We will bring most of the material needed for this workshop, but each participant should carry the following items for her/his own use:<sup>2</sup>

- Scissors (preferably) or cutter o penknife
- Crayons (a few colours are enough)
- Matches or cigarrete lighter (smokers can help with this item)
- Two (2) metallic and identical forks
- One (1) metallic spoon
- Anything else that could be useful for the "survival kit" of a teacher in a handcraft-physics workshop

<sup>2</sup> For those taking a plane, please be aware of the boarding security rules.

## BIBLIOGRAPHY (a personal selection)

- G. Barr, Science projects for young people (Dover, New York, 1964).
- G. Barr, Science tricks and magic for young people (Dover, New York, 1968).
- G. Barr, Fun with science. 46 entertaining demonstrations (Dover, New York, 1965).
- J. Breckenridge, A. D. Fredericks and L. V. Loeschnig, 365 More Simple Science Experiments with Everyday Materials (Black Dog and Leventhal, New York, 1998).
- R. J. Brown, 333 science tricks and experiments (TAB Books, New York, 1984).
- R. J. Brown, 333 more science tricks and experiments (TAB Books, New York, 1984).
- T. Cash, S. Parker and B. Taylor, More 175 science experiments to amuse and amaze your friends (Random House, New York, 1989).
- E. R. Churchill, L. V. Loeschnig and M. Mandell, 365 Simple Science Experiments with Everyday Materials (Black Dog and Leventhal, New York, 1998).
- V. Cobb and K. Darling, Bet you can't! Science impossibilities to fool you (Avon Camelot, New York, 1983).
- V. Cobb and K. Darling, Bet you can! Science impossibilities to fool you (Avon Camelot, New York, 1983).
- D. B. Conner (ed.), A Potpourri of Physics Teaching Ideas (American Association of Physics Teachers, College Park, 1987).
- J. Cunningham and N. Herr, Hands-on Physics Activities with Real-Life Applications (The Center for Applied Research in Education, West Nyack, NY, 1994).
- E. de Campos Valadares, Physics, fun and beyond (Prentice Hall, New York, 2006).
- M. Dispezio, Awesome experiments in force and motion (Sterling, New York, 1998).
- M. Dispezio, Awesome experiments in electricity and magnetism (Sterling, New York, 1998).
- M. Dispezio, Awesome experiments in light and sound (Sterling Publishing, New York, 1999).
- P. Doherty, D. Rathjen, The magic wand and other bright experiments on light and color (Wiley, New York, 1991).
- P. Doherty, D. Rathjen, The cool hot rod and other electrifying experiments on energy and matter (Wiley, New York, 1991).
- P. Doherty, D. Rathjen, The spinning blackboard and other dynamic experiments on force and motion (Wiley, New York, 1991).
- P. Doherty, D. Rathjen, The Cheshire cat & other eye-popping experiments on how we see the world (Wiley, New York, 1991).
- R. D. Edge, String and Sticky Tape Experiments (American Association of Physics Teachers, College Park, MD, 1987).
- R. Ehrlich, Turning the World Inside Out, and 174 other simple Physics Demonstrations (Princeton University Press, Princeton, NJ, 1990).
- R. Ehrlich, Why Toast Lands Jelly-Side Down. Zen and the Art of Physics Demonstrations (Princeton University Press, Princeton, NJ, 1997).

- C. D. Freier and F. D. Anderson, A Demonstration Handbook for Physics (American Association of Physics Teachers, State University of New York, New York, 1981).
- M. Gardner, Entertaining science experiments with everyday objects (Dover Publications, New York, 1981).
- M. Gardner, Smart Science Tricks (Sterling, New York, 2004).
- K. Gibbs, The resourceful physics teacher. 600 ideas for creative teaching (Institute of Physics Publishing, London, 1999).
- P. G. Hewitt, Conceptual Physics (Addison-Wesley, Menlo Park, CA, 1992).
- Irish Team, Demonstrations and teaching ideas (Physics on Stage 2, 2002). Available on line at http://www.iop.org/activity/branches/Ireland/Our\_activities/Schools\_and\_Colleges/Science\_on\_St age/Physics\_on\_Stage\_2/file\_19481.pdf
- Irish Team, Demonstrations and teaching ideas (Physics on Stage 3, 2003). Available on line at http://www.iop.org/activity/branches/Ireland/Our\_activities/Schools\_and\_Colleges/Science\_on\_St age/Physics\_on\_Stage\_3/file\_19488.pdf
- T. Kardos, 75 Easy Physics Demonstrations (J. Weston Walch, Portland, Maine, 1996).
- E. Lanners, Secrets of 123 classic science tricks and experiments (TAB Books, New York, 1987).
- M. Mandell, Physics experiments for children (Dover, New York, 1959).
- A. J. McCormack, Inventors Workshop (Fearon, Parsippany, NJ, 1981).
- H. F. Meiners, Physics Demonstration Experiments (Ronald Press, New York, 1970).
- E. F. Provenzo, Jr. and A. B. Provenzo, 47 easy-to-do classic science experiments (Dover, New York, 1989).
- G. Reuben, Electricity experiments for children, Dover, New York, 1960.
- T. Robinson, The everything kids' science experiments book (Adams Media, Massachusetts, 2001).
- E. M. Rogers, Physics for the Inquiring Mind. The Methods, Nature, and Philosophy of Physical Science (Princeton University Press, Princeton, NJ, 1960).
- N. Shalit, Science magic tricks (Dover Publications, New York, 1981).
- J. C. Sprott, Physics Demonstrations. A Sourcebook for Teachers of Physics -with 2 DVDs- (University of Wisconsin Press, Madison, 2006).
- R. M. Sutton, Demonstration Experiments in Physics (McGraw-Hill, New York, 1938). Available on line at http://www.wfu.edu/physics/pira/Sutton/Sutton.htm
- UNESCO, 700 Science Experiments for Everyone (Doubleday, New York, 1958).
- J. VanCleave, Guide to the best science fair projects (Wiley, New York, 1997).
- B. Walpole, 175 science experiments to amuse and amaze your friends (Random House, New York, 1988).