

Exploratorium Cookbook II

A Construction Manual for Exploratorium Exhibits

by Ron Hipschman and the Exploratorium staff

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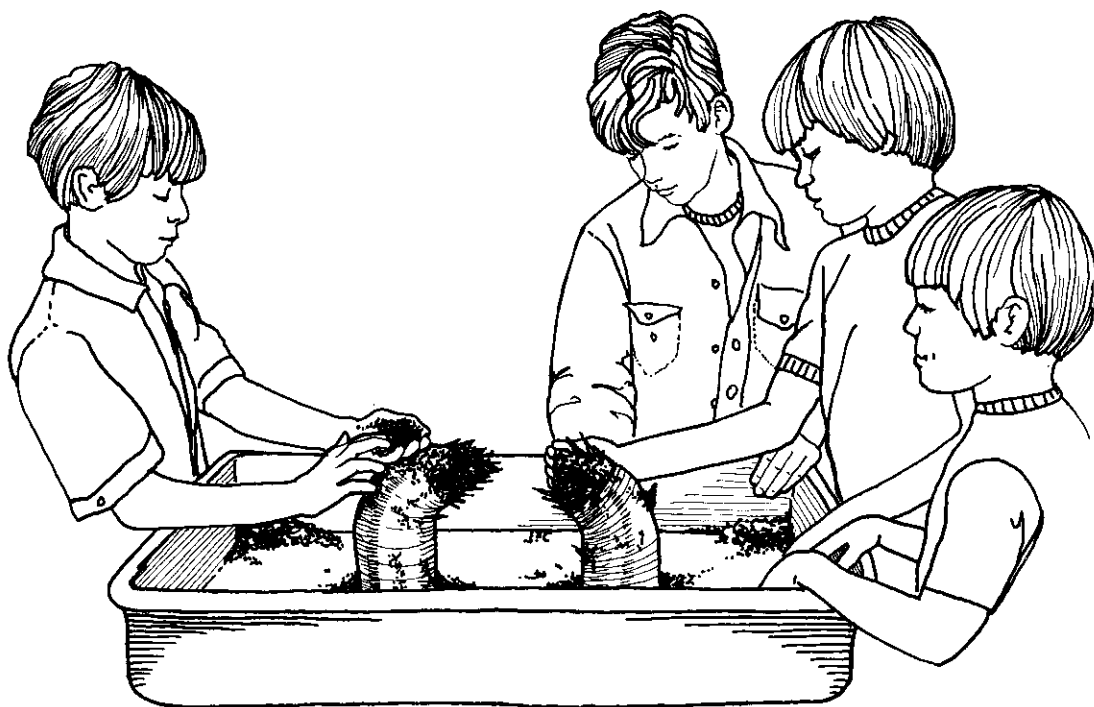
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Black Sand



Description

Magnetic lines of force can be seen and felt using a large magnet and several pounds of black sand (magnetite) or iron filings. The sand follows the magnetic lines of force and can be made to form images of the magnetic field. The sand, (without dirtying one's hands) provides a very pleasant and unusual tactile sensation because of its attraction to the magnet. Magnetic "castles of sand" can also be built.

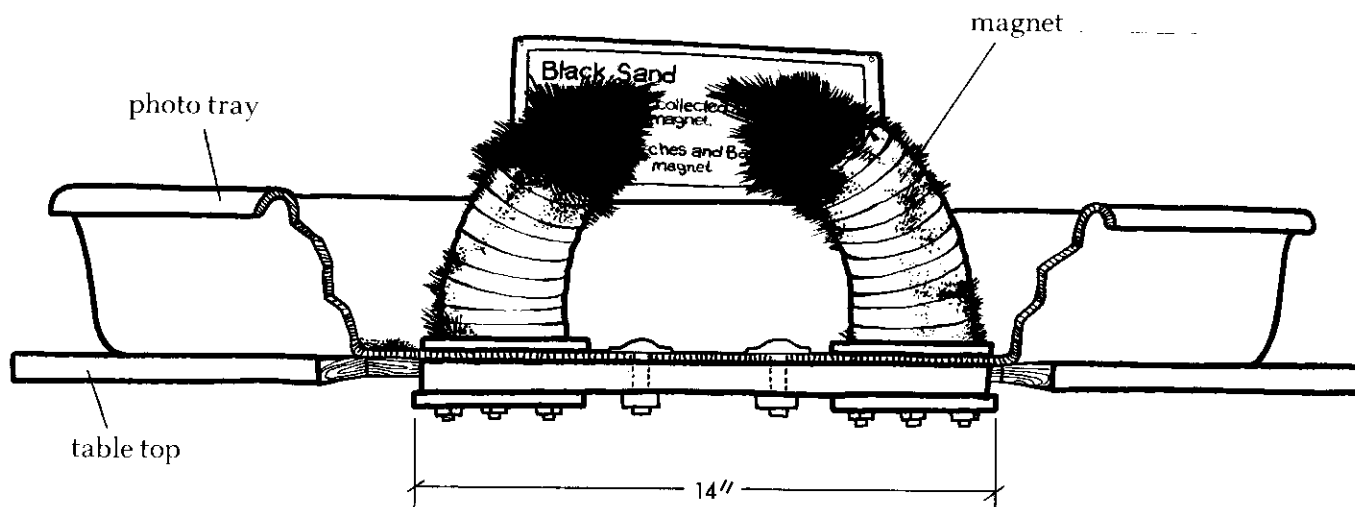
Construction

A large 24"x28" photographic tray is bolted onto a table and the magnet is firmly bolted through holes cut in the tray and table to its iron base. We have increased the distance between the pole pieces to about 5" to allow better

access to the strongest part of the field. The magnet is a large war surplus radar gap magnet. We have also obtained similar magnets that were used to bend beams of particles from the former California Institute of Technology Synchrotron. The sand is obtained from a local beach and is sorted to rid it of non magnetic material with an electromagnet made from an iron bar and wire coil. The proportion of black sand to normal sand varies seasonally with more black sand appearing during stormy weather.

Critique and Speculation

The type of magnet used in this exhibit is getting very difficult to find as surplus supplies dry up. It might be possible to substitute one of



the newer types of rare earth magnets which are very powerful for their weight (we have not researched this possibility). The only problem with the exhibit itself is that the sand tends to get thrown around and ends up on the floor (and hence needs replenishment now and then). This can make quite a mess and must be cleaned up often if it shows on the floor (our floor is asphalt so it isn't too bad). Perhaps a large tray could be built with raised edges (that wheelchairs can roll over) to catch the wayward sand. This would allow recycling of it at the end of the day. This tray would have to be rather large (at least 8'x8') to catch most of the sand.

Additions and Changes (1990)

We have added a ledge around the inside of the tray, and it helps keep the sand in. But you should be careful to keep this exhibit away from computers, aquariums, and electronic exhibits that might be harmed by iron sand.

If you don't have access to black sand, David Sprankle of the

Louisville Museum of History and Science reports successfully substituting the small steel shot used in sandblasting. He used the smallest size available. Sprankle reports that the feel of the steel shot is different than the sand, but that it seems to work fine. We haven't tested this ourselves.

Related Exploratorium Exhibits

ELECTROMAGNETIC FIELDS

Circles of Magnetism I, II, III, IV

MAGNETS PERMANENT

Magnetic Lines of Force

Exploratorium Exhibit Graphics

This sand was collected at Ocean Beach with a strong magnet.

Keep your watches and Bart tickets away from the large magnet!

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