



## Air and Water Movement

DaVinci was fascinated by water movement. He carried out studies of water movement as part of a larger project to alter water flow. His drawings show the eddies and vortices that form when an object is placed in a flowing stream. He likened water flow to the curls of human hair and some plants. (Isaacson, p 432.) He also observed how birds in flight and air turbulence demonstrate similar patterns to those of water eddies.

Spirals are a Jungian archetype and appear in many mythological tales. In his book *Sensitive Chaos*, Theodor Schwenk illustrates the many occurrences of the spiral in nature and in the physical world. Nicol Israel writes about the special significance of the spiral and vortices in literature and the visual arts in the twentieth century. For example, Marcel Duchamp motorized kinetic sculptures with spinning spirals in his *Rotoreliefs* piece. Robert Smithson constructed a large spiral on a salt lake in Utah. Other painters and sculptors also incorporated spirals in their works. The iconic painting of Van Gogh, *Starry night*, has the sky energized with moving spirals. Louise Bourgeois made a series of sculptures with different spiral shapes.

Unfortunately, fluid dynamics, the study of the movement of gases and liquids, is not a subject area that gets any attention at elementary, middle, and high school levels. However, it should get some attention in earth science because it would be helpful in understanding atmospheric and oceanic circulation. Common examples include the cloud movement seen on satellite photos on the weather forecast, or videos that you can check out on the NOAA website that show very large vortices spanning hundreds of miles.

Adults and students alike are quite fascinated with creating interesting patterns by dropping food color in a tray of water with highly diluted white paint. Some students spontaneously make comments of imaginary creatures or scenes when the various patterns occur. The patterns can be an inspiration for making drawings, paintings and sculptures as well as the writing of a short story. In art class, students can explore in an open ended manner how food color creates patterns in a tray of highly diluted white paint. Students can draw or paint these patterns, take photographs or videos, or use them as inspiration for any number of art projects. Some students might be interested in making up stories about the movement they observe. In science class, the investigation is of a more qualitative nature: for instance, they can compare and contrast air and water movement. Under the teacher's guidance they can characterize and explore the variables that determine fluid motion.

Students can look up pictures of *Starry Night* by Vincent Van Gough: these spirals show patterns of movement similar to what occurs in one of the activities suggested below.

Materials: dishwashing soap, trays, white latex paint, pearlescent paint or rheoscopic fluid

Detailed description of the science activities can be found in the curriculum guide *Air and Water movement* available at Kelvin, bernie zubrowski

## ART

### **Drawing smoke movement**

Students can closely observe videos of incense smoke on the internet and make drawings. This can be followed up with imaginary drawings of smoke patterns.

### **Drawing of spirals**

After completing the activity in science class with food color, students can be challenged to make drawings or paintings that incorporate spirals.

### **Marbling Paper**

An analogous activity to the food color activity in science class can be done where the spiral patterns can be copied to paper.

Instead of food color, drop diluted oil paints on the water. Carefully place paper on the surface and then peel off. The internet is a great resource for marbling paper techniques and variations on this method.

### **Drawings or sculptures of Fluid Patterns**

After observing how a special water solution moves around objects in science class, students can try to create imaginary constructions using clay, wire or other materials.

Students can study painting incorporating spiral movement such as Van Gogh's *Starry Night*.

## SCIENCE

### **Mapping outdoor air current**

Bubbles are a great way of seeing how air currents move around buildings.

### **Mapping indoor air currents**

Incense could possibly be used but will set off fire alarms. There is a device that puts out puffs of vapor which can demonstrate the ambient air currents in a classroom.

### **Observing smoke from incense**

There are on YouTube some videos of smoke from incense. This is a useful example because it shows three types of fluid movement-laminar flow, vortices, and chaotic movement.

### **Observing movement of a fluid**

Fill an eye dropper to the tip with food color and place at the top of a bottle of water. The food color will flow out of the eye dropper and forming an eye catching stream. It is an analogue to the smoke stream from the burning incense.

### **Exploring movement in water**

Partially fill a tray with highly diluted white latex paint. Students can carefully drop food color into this solution and very slowly move a stick through it. Interesting eddies and vortex patterns are created.

### **Viewing of Satellite photos**

The NOAA website is an excellent resources for photos of storm systems--from hurricanes to general atmospheric circulation--and various types of spirals in nature.

**Exploring movement in water-part 2**

Partially fill a tray with water and add some pearlescent paint liquid. Blow on the surface of the water and watch how patterns form because of the very fine particles from the pearlescent paint. Students can explore how the fluid moves around differently shaped objects made from modeling clay by blowing on the liquid in front of the object.