INVESTIGATION 1
Notes for the Instructor

PURPOSE

To allow students to gain some knowledge about the behavior of ferrofluids.

METHOD

Supply the students with a small amount of a mineral oil-based ferrofluid and allow them to experiment with the magnetic properties of the fluid. **CAUTION! Ferrofluids cause stains that are very difficult to remove from skin and fabrics. It is also imperative that the fluid be kept off of the magnet. It is almost impossible to remove the ferrofluid from a strong magnet.**

MATERIALS

Mineral oil-based ferrofluid (See Supplier Information)

Strong magnet (cow magnet, bar magnet, or rare earth magnet)

Petri dish

ANSWERS TO THE FOLLOW-UP QUESTIONS

1. What factors would affect the distance observed in (b)?

   Student responses will vary, but should include: the strength of the magnet, the magnetic strength of the fluid, and the orientation of the magnet as it approaches the dish.

2. For any given spike in the final pattern observed in (c), how many nearest neighbors does it have? Why do you think this particular pattern forms?

   The pattern of spikes is formed as the fluid is dispersed along the field lines of the magnet. In doing so, the magnetite particles behave like iron filings would in the presence of a similar field. There often will be six nearest neighbors if the magnet is strong enough, and this arrangement represents a close-packed arrangement. The spikes are a reflection of the fact that the system tries to lower its energy in this way in the presence of the magnet.

3. How do you explain the behavior of the penny? How would this behavior be different if the penny were magnetic?

The formation of the spikes along the magnetic field lines forces the penny up and out of the fluid, giving it bouyancy. If the penny were magnetic, its attraction for the magnet would prevent it from being forced upward.