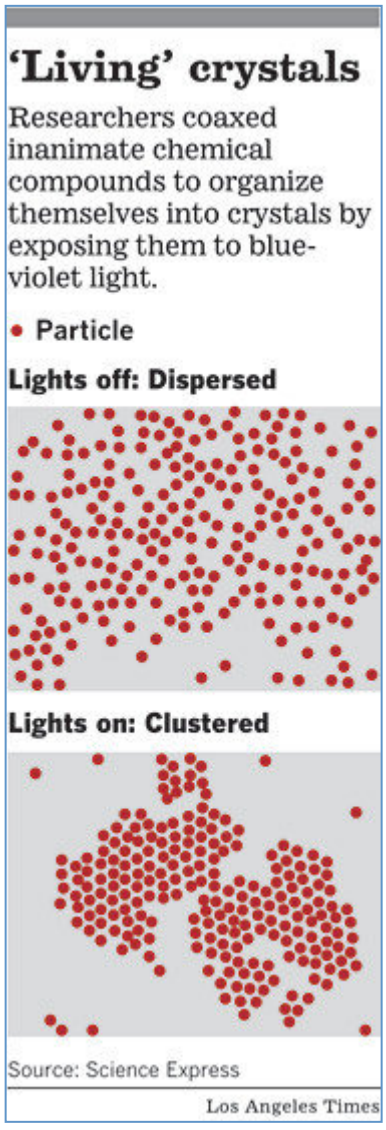
Directions:

1. Mark your confusion.
2. Show evidence of a close reading. Mark up the text with questions and/or comments.
3. Write a one-page reflection on your own sheet of paper.

Scientists Infuse 'Life' Into Inanimate Compounds

A study in which chemical compounds are prompted to self-form into crystals could be a step toward creating self-repairing smartphone screens, experts say, or even body armor.

Source: Joseph Serna/LATimes.com/February 1, 2013



Scientists have infused "life" into inanimate chemical compounds by flashing a blue-violet light that prompted them to assemble themselves into a crystal.

The feat, described in a study published online Thursday by the journal Science, marks an important step toward creating "active" materials that can repair themselves, such as a smartphone screen that fixes its own cracks or a Kevlar vest that fills a hole made by a bullet, experts said.

Showing that microscopic particles can be made to come together or break apart on their own "opens a new area for design and production of novel and moving structures," wrote the study authors, a team of physicists and chemists from New York University and Brandeis University in Waltham, Mass.

The researchers said they were inspired by the way flocks of birds and schools of fish are able to move as if they are a single living organism. The team wanted to see if they could duplicate — and control — that collective motion using non-living objects.

The objects they used were made of simple chemicals including sodium, iron, chloride, oxygen and hydrogen. Roughly the size of a single bacterium, they included a piece of the mineral hematite that jutted out, like the front of a car.

The researchers placed hundreds of these particles into a drop of a liquid solution on a glass slide. One of the ingredients in the solution was hydrogen peroxide, which is like fuel to a piece of hematite when it's exposed to blue-violet light.

Without the specialized light, the particles pretty much vibrated in place like so many tiny idling engines. When the scientists turned on the light, the hydrogen peroxide and hematite began a chemical reaction that propelled the particles forward.

The scientists watched under a microscope as, at first, the particles moved about at random. Then, about 25 seconds into the chaos, the limited space and directionless driving produced a traffic jam of particles, said study leader Jeremie Palacci, a postdoctoral fellow at NYU.

The jammed particles forced themselves against each other in the pattern of a crystal, each dot surrounded by six others in a hexagonal shape. When they reached a certain size, some of the particles on the edge broke off and grew into other crystals, which slowly moved about.

When the blue-violet light was switched off, it took about 10 seconds for the crystals to dissolve.

In additional tests, the researchers induced a magnetic field in the liquid to see if they could steer the crystals in a particular way. They found that the iron in the particles was drawn toward the magnetic field, making it possible to control the crystals' movement.

Since the crystals are able to sense changes in their environment and move accordingly, they are alive in a fundamental way, the researchers said.

"They're flocking," just like birds, said Paul Chaikin, a coauthor of the study and an NYU physicist.

Creating materials that can respond to conditions around them is a long-held goal of scientists and engineers working in the field of active materials, said Aparna Baskaran, a physicist at Brandeis who wasn't involved in the study.

"Could it be possible to use this idea to make a material that shrinks to a very small volume when exposed to light and expands to fill a large volume in the dark?" she said. "Maybe."

Researchers have spent years coaxing particles to interact in new ways, but trying to influence the way they move is a much more recent endeavor, said Julien Tailleur, a theoretical physicist at the French National Center for Scientific Research in Paris who said he was impressed by the new study.

"This may seem a small change, but it is a fundamental one," he said.

The study was funded by the National Science Foundation, the U.S. Army Research Office and NASA.

Possible Response Topic(s):

- Explain this discovery of “infusing ‘life’ into inanimate chemical compound” to an audience of 6th graders.
- What are other possible applications can this new discovery have other than the ones mentioned?
- Comment on the quote: “This may seem a small change, but it is a fundamental one.” Why?