DNA scissors cleave their comrades

The primary function of DNA is to bear information, but scientists have found that some DNA can act as enzymes to catalyze reactions. Now, researchers at Yale University have synthesized a DNA structure that can snip itself or other DNA strands in two. Functionally, these deoxyribozymes are cousins of protein enzymes known as restriction endonucleases. Nir Carmi, Shameelah R. Balkhi, and Ronald R. Breaker report their finding in the March 3 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

The researchers use a technique called in vitro evolution to screen sequences of DNA for catalytic properties. Starting with a pool of DNA molecules, each containing a random sequence about 50 bases long, they isolated groups of DNA that had the ability to cleave themselves. By purifying and amplifying those strands, then repeating the process many times, the researchers eventually found 27 molecules that efficiently clipped themselves in half. All of those DNA strands share a particular sequence, 21 bases long, that is essential to its enzymatic behavior, the researchers found.

They then took the experiment a step further and designed several DNA molecules to cut other ones at specific places. The molecules did so at the same rate as the original, self-cleaving DNA.

Scientists know that RNA molecules called ribozymes catalyze reactions. Establishing that DNA can also act as an enzyme is important in the study of how life on Earth originated. Presumably, the complete protein synthesis machinery now in cells did not exist initially, and nucleic acids had to perform some of the functions that enzymes do today (SN: 8/10/96, p. 87).

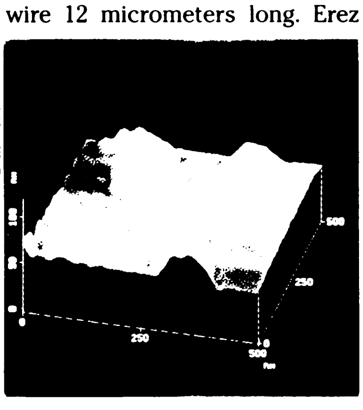
Also, the authors note, "catalytic DNAs may offer distinct advantages over natural protein enzymes for operation under nonbiological conditions." Engineered deoxyribozymes would not only be easier to synthesize than protein catalysts but could offer improved properties, such as stability at high temperatures. —C.W.

Grainy wire self-assembles along DNA

Researchers at the Technion-Israel Institute of Technology in Haifa have used DNA to synthesize a silver wire just 100 nanometers in diameter. The DNA acts as a scaffold for the silver, enabling the scientists to make thinner wires than they can with conventional techniques.

The group deposited two gold electrodes onto a glass plate, then bridged the gap between them with short strands of DNA. By dipping the glass plate into a silver solution, the scientists allowed the wire to assemble itself. Positively charged silver ions, attracted to the negatively charged DNA, arranged themselves along the strand. A chemical treatment then turned the deposited ions into neutral grains of silver metal. A second treatment added more silver to the grains, forming a wire 12 micrometers long. Erez Braun and his colleagues report their achievement in the Feb. 19 NATURE.

The wire conducts electricity, making it one of the first working electronic components constructed by self-assembly (SN: 8/17/96, p. 100). —C.W.



Braun *et al.*/NATURE

An image taken with an atomic force microscope shows the grains of silver that form a wire connecting two gold electrodes.

Chia for your pet—if it clucks

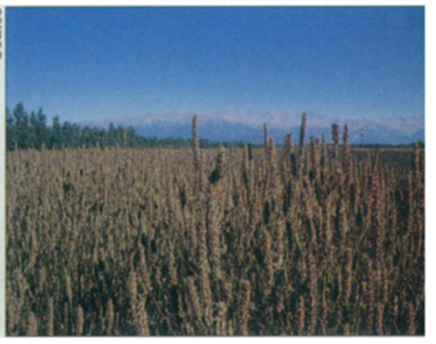
Most people know chia as the green stuff that sprouts from terra-cotta animals sold on late-night TV. Two researchers now believe they can bestow a lot more respect on this relative of the mint by putting it into some real animals—chickens.

Chia seeds contain plenty of omega-3 fats, which, unlike cholesterol-elevating saturated fats, appear to lower the risk of heart attack. The beneficial effects of these fats have spawned several efforts over the past decade to rehabilitate the image of eggs by feeding fish meal (SN: 5/7/88, p. 300), purslane (SN: 11/25/89, p. 351), or flax—all good sources of omega-3 fats—to laying hens.

While these doctored diets produced some favorable fat changes in egg yolks, they also tended to impart an objectionable taste or unusually short shelf life. Wayne Coates of the University of Arizona in Tucson and Ricardo Ayerza of the University of Catamarca in Argentina now think chia may be the solution.

They substituted chia seeds for 30 percent of the usual feed eaten by hens at a commercial egg production facility in Argentina. The birds seemed to like the seeds, and egg output and size remained normal.

The real benefit appears to be the yolks' heart-friendlier fat profile. Alpha-linolenic acid—a plant-derived omega-3 fat normally absent from chicken chow and therefore from eggs—constitutes 12 percent of the fat in eggs from chia-fed hens. The ratio of saturated to polyunsaturated fats in these eggs is half that in normal eggs. Best of all, Coates says, chia eggs don't taste unusual, "and there is every indication their shelf life will be good." —J.R.



Coates

Field of chia.

Another way alcohol may help the heart

Many studies have shown that moderate consumption of alcoholic beverages cuts a person's risk of heart attack (SN: 3/30/96, p. 197). Now, a team of Swiss researchers suggests a new reason why—alcohol may slow the growth of cells in blood vessel walls. Over time, these cells can narrow the passages through which blood flows.

Rudolf Locher and his colleagues at University Hospital in Zurich fed eight healthy young men a high-fat breakfast of zwieback toast, butter, and jam on two mornings, a week apart. On one of those days, the men also downed a glass of water containing an amount of ethanol equivalent to that in two glasses of wine or three beers. On the other day, each man drank an equal volume of tap water. The researchers then sampled the men's blood every 30 to 60 minutes over 8 hours.

Fats and other nutrients trigger a host of complex changes in the blood, including the unleashing of chemicals that affect the proliferation of smooth muscle cells in vessels, explains study leader Paolo M. Suter. By growing rat smooth muscle cells with the blood samples taken from the men, his team was able to quantify changes in cell growth triggered by the meals.

In the February AMERICAN JOURNAL OF CLINICAL NUTRITION, they report that the test breakfast stimulated a large increase in cell growth and that it persisted for more than 8 hours. However, the increase was 20 percent less when alcohol was part of the meal—and it remained lower for at least 8 hours. Suter now wants to see if the same trend holds for other meals and smaller quantities of alcohol. —J.R.