UC SANTA BARBARA
THE Current

April 23, 1999
Gail Brown

WRAPPING UP DNA IN A BIOPHYSICS LAB

They say that the best things come in small packages, and it may be true for DNA as well, at least as it applies to biotechnology.

Helen Hansma, adjunct professor of physics, who runs a biophysics lab at the University of California, Santa Barbara, is checking out new ways to "package" DNA so that healthy genes might be inserted in place of defective ones. Her article in a recent issue of Nucleic Acids Research tells about some of the latest advances in her lab.

"Investigating the mechanism of DNA condensation is important not only for gene delivery, but also for understanding natural biological processes that require DNA condensation, such as viral replication and cell division," she says.

Hansma describes DNA, "which is a really long stringy molecule that's in danger of being cut by enzymes in the body. To get the DNA into the nucleus of a chromosome, you have to make it into a tiny package like a ball of string."

As she states in her article, "Inserting genes into cells has been a goal of medical research for many years. The ways of doing this generally involve compacting the DNA and packaging it with something that will facilitate its uptake into cells."

Hansma is working at the forefront of the new field of atomic force microscopy using microscopes that were invented in the early 80s and then further developed by her

husband Paul Hansma, professor of physics at UCSB, and Digital Instruments over the last decade.

Atomic force microscopy, or AFM, is becoming increasingly useful in medical research, Hansma explains. It uses a tiny atomic-scale tip to tap across

the surface of molecules providing pictures that are like topographic maps, showing the shapes of the surfaces.

According to Hansma, the DNA has negative charges and must be put together with a molecule that has positive charges. "It wraps up when it is neutral," she said.

"Our microscope is a really nice way of finding out which conditions are compacting the DNA," said Hansma. "Some are stretched out and some are compact."

"The final step at the research end is getting the gene to get expressed in the rat liver," she said. "It's easier than putting it into rats. You get a lot of information without killing rats."

Hansma's lab is attracting private industry and doing work for a biotechnology company called the Immune Response Corporation based in Carlsbad, Calif.

"The people in our lab are really good at looking at DNA with this microscope," said Hansma. "The expertise in using the microscopes that we provide is something that they can't get commercially from a company that does microscopy for hire."

Although Helen Hansma is on the faculty of UCSB's Department of Physics, her degrees are a B.A. in Chemistry, an M.A. in biochemistry and a Ph.D. in biological sciences. Her work is an example of the interdisciplinary research for which UCSB is known.

About UC Santa Barbara

The University of California, Santa Barbara is a leading research institution that also provides a comprehensive liberal arts learning experience. Our academic community of faculty, students, and staff is characterized by a culture of interdisciplinary collaboration that is responsive to the needs of our multicultural and global society. All of this takes place within a living and learning environment like no other, as we draw inspiration from the beauty and resources of our extraordinary location at the

edge of the Pacific Ocean.