



# NSF Tipsheet

National Science Foundation • Office of Legislative and Public Affairs

## News Media Tip - August 14, 1998

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### **"PACKAGING RNA" REALLY DELIVERS**

Although it doesn't get the same kind of attention as its relative (DNA), RNA is the real workhorse of the gene world. Known for its duties as messenger, transcriber, translator and enzyme, RNA has recently been found performing escort duty to DNA molecules.

National Science Foundation (NSF)-funded researcher Peixuan Guo of Purdue University has observed packaging RNA, or "pRNA," in this new role during his study of the virus known as bacteriophage Phi 29. The findings are published in a recent issue of the journal *Molecular Cell*.

Bacteriophages are viruses that infect bacteria, and they may use DNA or RNA as genetic material. After they enter a bacterial cell, bacteriophages take over the cell's machinery to make new copies of their own genetic material and protective protein shell, or "capsid". What has puzzled scientists is that bacteriophages make new capsids first, then somehow insert the replicated copies of their genes into the capsid.

Guo found that, in the case of Phi 29 (a DNA virus), six pRNA molecules could form hexagon shaped rings that drive viral DNA into the capsid. The RNA hexagon attaches itself to the viral capsid and then turns like a wrench on a bolt, which forces the DNA through the pRNA molecule and into the capsid. Although pRNA has been found in other kinds of bacteriophages, Guo's study is the first to show pRNA performing this particular feat. [Greg Lester]



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### **NSF PROGRAM RECEIVES TECHNOLOGY TRANSFER AWARD**

NSF's Industry/University Cooperative Research Centers (IUCRC) received an award from the Technology Transfer Society at its annual conference July 28 in Chicago.

The Justin Morrill Award is given to organizations that establish high standards for

technology transfer activities, make significant contributions to society and promote positive practices that influence public policy.

NSF's \$4-million annual IUCRC program in the Directorate of Engineering has resulted in a return of \$75 million in research investments by member firms and other sponsors, according to one of the Morrill Award nomination summaries.

More than 75 percent of industry's support to university R&D comes through industry-university centers, such as IUCRCs. The IUCRC program was developed in the early 1970s. [Bill Noxon]



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## **COMPUTER SIMULATION DEMONSTRATES "BREATHING" ENZYME ACTION**

Using powerful supercomputers, NSF-supported researchers have unlocked the mystery surrounding one of the fastest, most efficient enzymes in the human body.

Acetylcholinesterase (AChE) works to instantly stop transmissions from one nerve cell to the next nerve or muscle cell.

AChE catalyzes the chemical reaction that breaks up acetylcholine (ACh), a neurotransmitter, thereby serving as the off-switch for the transmission. The speed of this process has puzzled researchers since the structure of AChE was first modeled in 1991. The active site, where the reaction takes place, was found deep inside a groove on AChE -- a groove too narrow to admit ACh quickly.

Using large-scale computer simulations run at the San Diego Supercomputer Center, Andrew McCammon of the University of California, San Diego has shown how AChE does its job: by "breathing". The simulations show that this flexing motion causes AChE to inhale and exhale ACh molecules almost as fast as if the groove was always open. Why, then, is the channel blocked at all?

McCammon's research has demonstrated that this motion keeps larger molecules out of the space intended for ACh. This finding shows that enzymes can use movements to select particular substrates in crowded environments like the inside of a living organism. This work, first published in the August 4 issue of the *Proceedings of the National Academy of Sciences*, also demonstrates the power of using computer simulations to gain insight on major biological problems. [Greg Lester]

For more information on AChE, see: [http://chemcca10.ucsd.edu/ache\\_animated.html](http://chemcca10.ucsd.edu/ache_animated.html)

