

Nobel in Chemistry Recognizes GFP Innovations

On October 8, Professor Gunnar Öquist, Secretary General of the Royal Swedish Academy of Sciences, announced the award of the Nobel Prize in Chemistry for 2008 to 3 scientists working in the United States for the discovery and development of green fluorescent protein (GFP). The recipients included Osamu Shimomura, PhD, from the Marine Biological Laboratory (Woods Hole, MA) and Boston University Medical School; Martin Chalfie, PhD, from Columbia University (New York, NY); and Roger Y. Tsien, PhD, from the University of California, San Diego (La Jolla). These 3 individuals contributed to different stages of GFP development, including initial discovery, innovations that have led to its use as a tagging tool in medicine and the biosciences, and the identification of other bioluminescent and fluorescent proteins.

The academy cited the use of glowing proteins as “a guiding star for biochemistry.” GFP was first observed in jellyfish in 1962. Since then, this protein has become one of the most important tools in contemporary bioscience. With the aid of GFP, researchers have developed methods to map the role of different proteins in the body. When combined with DNA technology, researchers now routinely use GFP to track gene expression, assess nerve cell damage in Alzheimer’s disease, and monitor insulin-producing beta cells in the pancreas of a growing embryo.

Shimomura was born in 1928 in Kyoto, Japan, and received his doctorate in organic chemistry in 1960 from Nagoya University (Japan). He was responsible for the original isolation of GFP from the jellyfish *Aequorea victoria*, which drifts with the currents off the west coast of North America. He discovered that this protein glowed bright green under ultraviolet light. He has continued his active interest in GFP (www.conncoll.edu/ccacad/zimmer/GFP-ww/shimomura.html).

Chalfie was born in 1947 and grew up in Chicago, IL. He received his doctorate in neurobiology in 1977 from Harvard University (Boston, MA). He demonstrated the value of GFP as a luminous genetic tag for various biological phenomena. In one of his first experiments, he colored 6 individual cells in the transparent roundworm *Caenorhabditis elegans* with the aid of GFP. He continues

to investigate aspects of nerve cell development and function using GFP and other techniques (www.columbia.edu/cu/biology/faculty/chalfie/Chalfie_home/).

Tsien was born in 1952 in New York, NY, and received his doctorate in physiology in 1977 from Cambridge University (UK). He has contributed to the general understanding of how GFP fluoresces and extended the color palette beyond green, allowing researchers to tag proteins and cells with different colors so that various biological processes can be followed simultaneously. His active laboratory continues to build on the GFP work by developing novel ways to image and potentially deliver targeted drugs to tumor cells (www.tsienlab.ucsd.edu).

GFP is being used increasingly in molecular imaging. It has been an essential element in research reported in more than a dozen articles in *The Journal of Nuclear Medicine* over the past year, and the variety of these investigations shows its wide utility and potential. Among the many topics explored have been molecular-genetic imaging based on reporter gene expression (*J Nucl Med.* 2008;49[suppl 2]:164S–179S); the use of PET and GFP imaging to monitor the efficacy of adoptively transferred prostate cancer-targeted human T lymphocytes (*J Nucl Med.* 2008; 49:1162–1170); the use of immunofluorescence in inflammation/infection imaging (*J Nucl Med.* 2008;49:995–999); in vivo imaging of polymer nonparticles targeted to the lung endothelium (*J Nucl Med.* 2008;49:103–111); the use of PET and bioluminescence to image mesenchymal stem cell transplant (*J Nucl Med.* 2007;48:2011–2020); and monitoring of tumor targeting with antibody-functionalized radiolabeled carbon nanotubes (*J Nucl Med.* 2007;48:1180–1189).

GFP is now “an essential piece of the scientific toolbox,” said Jeremy M. Berg, PhD, director of the National Institute of General Medical Sciences, which has funded work by all 3 scientists. “It is impossible to overstate the impact of these investigators’ work on scientific progress.” The 3 2008 Nobel laureates in chemistry will share the \$1.4 million award, which will be officially presented by King Carl XVI Gustaf of Sweden on December 10 in Stockholm. ✧