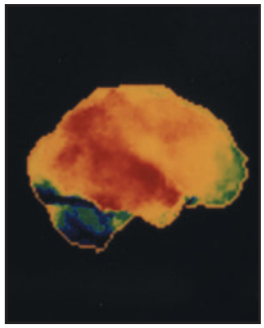
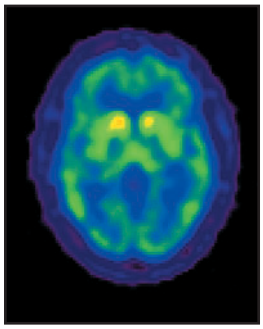
University of Michigan, Ann Arbor

The **BER** research program at the University of Michigan covers a spectrum of research in radiopharmaceuticals, from their chemical design and synthesis to their implementation in PET and SPECT brain chemistry studies. Scientists here also have renowned expertise in the development of computer science for nuclear medicine imaging systems. This coordinated effort has contributed valuable insight to several **neurologic disorders** that affect movement, memory, **aging**, and **dementia**.

Alzheimer's Disease



Parkinson's Disease



Radiochemists here have developed several techniques that now make it practical and economical for drug companies to commercially manufacture certain radiopharmaceuticals. In the area of imaging systems, scientists here were among the first to develop a pixel-by-pixel method for analyzing PET data to study pharmacokinetics (i.e., the activity and fate of drugs in the body, such as absorption, distribution, and excretion).

These brain scans illustrate the functional specificity of two radiopharmaceuticals for different biochemical processes. The patient with **Alzheimer's disease** shows a diffuse pattern of decreased activity of acetylcholine esterase, an enzyme involved in memory. In the patient with **Parkinson's disease**, the image shows reduced activity of a specific monoamine transporter, a brain function crucial to the dopamine system that controls body movements.

BER scientists in Ann Arbor anticipate that their nuclear medicine research will lead to improved medical management of neurologic diseases, a better match of patients to effective drug therapies, a more rational pathway to the development of new drug treatments, and new insights about biochemical mechanisms that naturally protect the brain from neurologic diseases.

Future Promise of Nuclear Medicine Depends on BER

The human body operates on millions of chemical reactions. All the characteristics of a living human being—our hair color, the activity of the heart, how we think and remember, the way we laugh—depend on a galaxy of biochemical reactions that occur many millions of times per minute within the cells and tissues of our body. A deranged chemical process can cause disease. And a disease results in other abnormal biochemical changes. Nuclear medicine, with its unique ability to reveal biochemical processes, provides crucial information about numerous diseases. More than any other federal agency, the Department of Energy (DOE), through the **BER Medical Sciences** program, has fostered the development of nuclear medicine. The future promise of nuclear medicine, the radiopharmaceuticals and imaging systems of tomorrow, depends on the progress and creativity of today's BER researchers *(see page 21)*.

Converting ENERGY to Medical Progress
BER