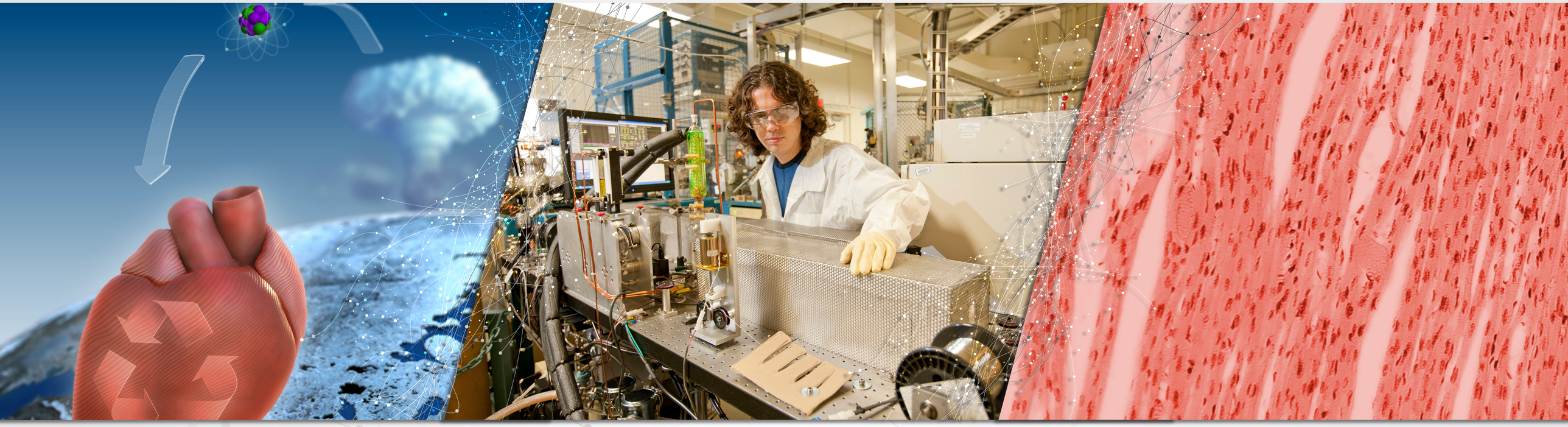
HEART **Cells**

Advancing therapeutic possibilities



The human heart is made up of hundreds of millions of muscle cells called cardiomyocytes. Cardiac events such as heart attacks can injure heart tissue, as can chronic diseases, infections, and other cardiopathic anomalies. Therapies aimed at repairing damaged cardiomyocytes can benefit from the knowledge of whether these cells are finite or generate later in life.

Carbon-14 produced by mid–20th century aboveground nuclear bomb tests resides in genomic DNA of human cardiomyocytes, which allows retrospective birth dating. Carbon-14 concentrations in the atmosphere sharply increased during the tests, then dropped exponentially after the Limited Nuclear Test Ban Treaty in 1963. Our consumption of photosynthetic plants means that the carbon-14 concentration in the food supply mirrors that in the atmosphere at any given time. Therefore, the concentration of carbon-14 in DNA serves as a benchmark for when a cell was born.

CAMS scientists and colleagues have used accelerator mass spectrometry for radiocarbon dating of cardiomyocytes over the normal human life span. They found that cardiomyocytes do renew, with a gradual decrease from 1% turning over annually at the age of 25 to 0.45% at the age of 75. Fewer than 50% of cardiomyocytes are exchanged during a normal life span. The capacity to generate cardiomyocytes in the adult human heart provides motivation for development of therapeutic strategies that stimulate the regeneration process.

PLS Physical & Life Sciences

CAMS Center for Accelerator Mass Spectrometry