CHANDRA X-RAY OBSERVATORY

The Chandra X-ray Observatory is the third in NASA's family of Great Observatories that includes the Hubble Space Telescope and the Compton Gamma Ray Observatory. NASA's Marshall Space Flight Center manages the Chandra program. TRW is the prime contractor for the spacecraft. Key subcontractors include Ball Aerospace & Technologies, Inc., Eastman Kodak Company, and Raytheon Optical Systems, Inc. The scientific instruments were built by teams from MIT, Pennsylvania State University, the Smithsonian Astrophysical Observatory, the Laboratory for Space Research in the Netherlands, and the Max Planck Institute in Germany. The Smithsonian's Chandra X-ray Center controls science and flight operations from Cambridge, MA.

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THE CHANDRA X-RAY OBSERVATORY

The Chandra X-Ray Observatory, launched on July 23, 1999, has taken its place with the Hubble Space Telescope and Compton Gamma Ray Observatory in NASA's fleet of Great Observatories. As the world's premier X-ray observatory, Chandra gives astronomers a powerful new tool to investigate the hot regions of the universe where black holes, exploding stars, and colliding galaxies hold sway.

With its combination of four pairs of ultra smooth, high-resolution mirrors and efficient X-ray detectors, Chandra makes images at least thirty times sharper than any previous X-ray telescope. The High Resolution Camera, and the Advanced CCD Imaging Spectrometer record images electronically, and two transmission gratings enable scientists to make precise measurements of the energies of incoming X rays.

The Chandra X-Ray Observatory Center
The Chandra program, managed by NASA's Marshall Space Flight Center in Huntsville, Alabama, is an example of NASA's initiative to streamline the operations of its space science missions. The Smithsonian Astrophysical Observatory's Chandra X-Ray Center (CXC), under the direction of Dr.Harvey Tananbaum, is located at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts. The CXC is responsible for planning the science observations based on proposals from the scientific community, processing data received from the observatory, and providing technical and scientific support to the scientists who use Chandra. The Center operates the observatory from its Operations & Control facility located at One Hampshire Street in Cambridge, Massachusetts.

The CXC is a collaboration of personnel from the Smithsonian Astrophysical Observatory, the Massachusetts Institute of Technology (MIT), and the Chandra prime contractor, TRW.

The Operations & Control Center (OCC) is staffed by the CXC, with the Flight Operations Team provided by TRW. The OCC has a glass-walled area outside the main control room where visitors and press can watch the Flight Operations Team and mission specialists as they communicate with the observatory and carry out the space flight operations.

Commands for executing the observation plan are transmitted from the OCC to one of three ground stations (in Spain, Australia, or California) that make up NASA's Deep Space Network (DSN). The DSN relays the commands to the orbiting spacecraft. The spacecraft carries out the commands and points the telescope to the specified targets, and moves the science instruments to their appropriate positions.

During routine operations, science data and monitoring data are sent from the spacecraft to the OCC, via the DSN, approximately every eight hours. Scientists and engineers use monitoring data to assess Chandra's condition. If the health or safety of the observatory appears to be in danger, the operating mode and the observation plans are modified.

Data from Chandra observations are processed at the Chandra Center. Observatory calibration data are made public as soon as possible. The scientific data belonging to guest observers and guaranteed time observers can be held by them for one year to allow time for analysis and publication of scientific results. The data are then placed in the public archive.

Dr. John A. Tomsick
Scientist, University of California at San Diego

John Tomsick is a Scientist at the Center for Astrophysics and Space Sciences at UC San Diego. Tomsick received a Bachelor's degree in Physics from UCSD in 1993 and a Ph.D. in Physics from Columbia University in 1999. He has been conducting research at UCSD since receiving his Ph.D. Tomsick specializes in X-ray and optical observations of black holes and neutron stars and is interested in using these objects to test physical theories in extreme environments.

Dr. Philip Kaaret
Astrophysicist, Smithsonian Astrophysical Observatory

Philip Kaaret is an Astrophysicist at the Smithsonian Astrophysical Observatory and a member of the Harvard-Smithsonian Center for Astrophysics. Kaaret received a B.S. in Physics in 1984 from the Massachusetts Institute of Technology, and a Ph.D. in experimental particle physics from Princeton University in 1989. He was subsequently on the faculty of the Physics Department at Columbia University in New York City before coming to SAO in 1998.

Kaaret's main interest is understanding the intense gravitational fields surrounding black holes and neutron stars made luminous by accreting gas from a companion star. He conducts observations at X-ray, optical, and radio wavelengths of objects in our Milky Way galaxy and in nearby galaxies such as the Andromeda galaxy and the starburst galaxy M82. His current work concerns the highly luminous X-ray sources in nearby galaxies which have been interpreted as being intermediate mass black holes, jet ejection from black holes, and the study of black hole populations to probe the star formation history of galaxies.

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Dr. Kimberly Weaver
Astronomer, Laboratory for High Energy Astrophysics, NASA's Goddard Space Flight Center

Dr. Kimberly Weaver is an astronomer with the Laboratory for High Energy Astrophysics at NASA's Goddard Space Flight Center in Greenbelt, MD. She received her Ph.D. in Astronomy from the University of Maryland at College Park, MD, specializing in X-ray studies of active galactic nuclei. She also holds a position as adjunct assistant professor in the Department of Physics and Astronomy at the Johns Hopkins University in Baltimore, MD.

Weaver has authored over 50 papers in scientific journals and has worked with data from almost every X-ray astronomy satellite flown in the last 20 years.

Dr. Neil de Grasse Tyson
Astrophysicist & Director, Hayden Planetarium

Neil de Grasse Tyson is the first occupant of the Frederick P. Rose Directorship of the Hayden Planetarium and he is a Visiting Research Scientist in astrophysics at Princeton University, where he also teaches. Tyson earned his BA in Physics from Harvard and his Ph.D. in Astrophysics from Columbia University. His professional research interests include star formation, exploding stars, dwarf galaxies, and the structure of our Milky Way. Tyson obtains his data from telescopes in California, New Mexico, Arizona, and in the Andes Mountains of Chile.

In addition to dozens of professional publications, Tyson has written, and continues to write, for the public. And since January 1995, has become a monthly essayist for Natural History magazine under the title "Universe." Tyson's recent books include a memoir The Sky is Not the Limit: Adventures of an Urban Astrophysicist; the companion book to the opening of the new Rose Center for Earth and Space One Universe: At Home in the Cosmos (coauthored with Charles Liu and Robert Irion); and a playful Q&A book on the universe for all ages titled Just Visiting This Planet.

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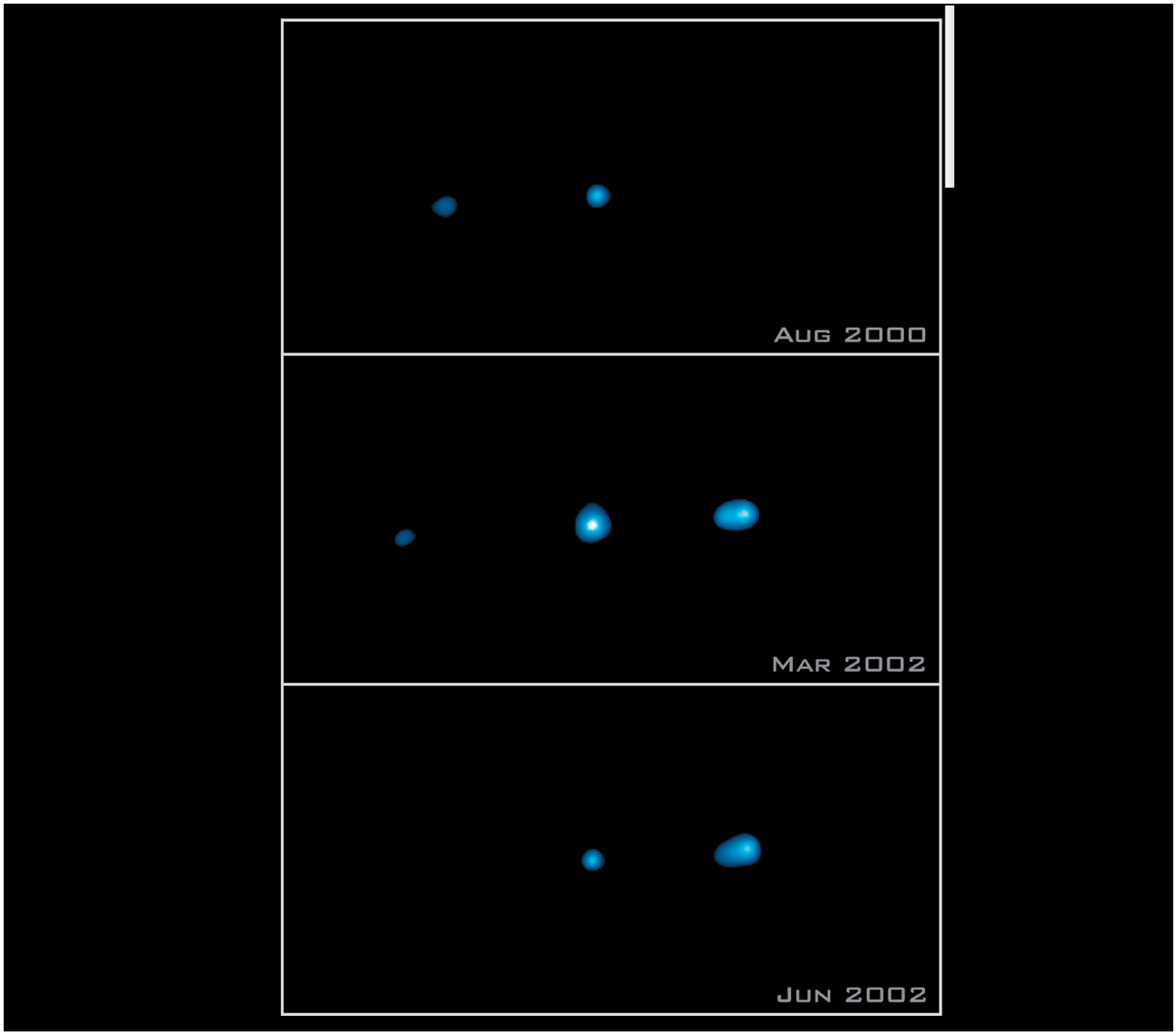

COLLAGE OF CHANDRA'S OBSERVATIONS OF XTE J1550-564

Image Caption
This series of images of XTE J1550-564 shows the black hole (center), the approaching eastern jet, and the receding western jet (right). In four years, the jets have moved about two light years from the black hole, and the eastern jet has faded dramatically.

Credit: NASA/CXC

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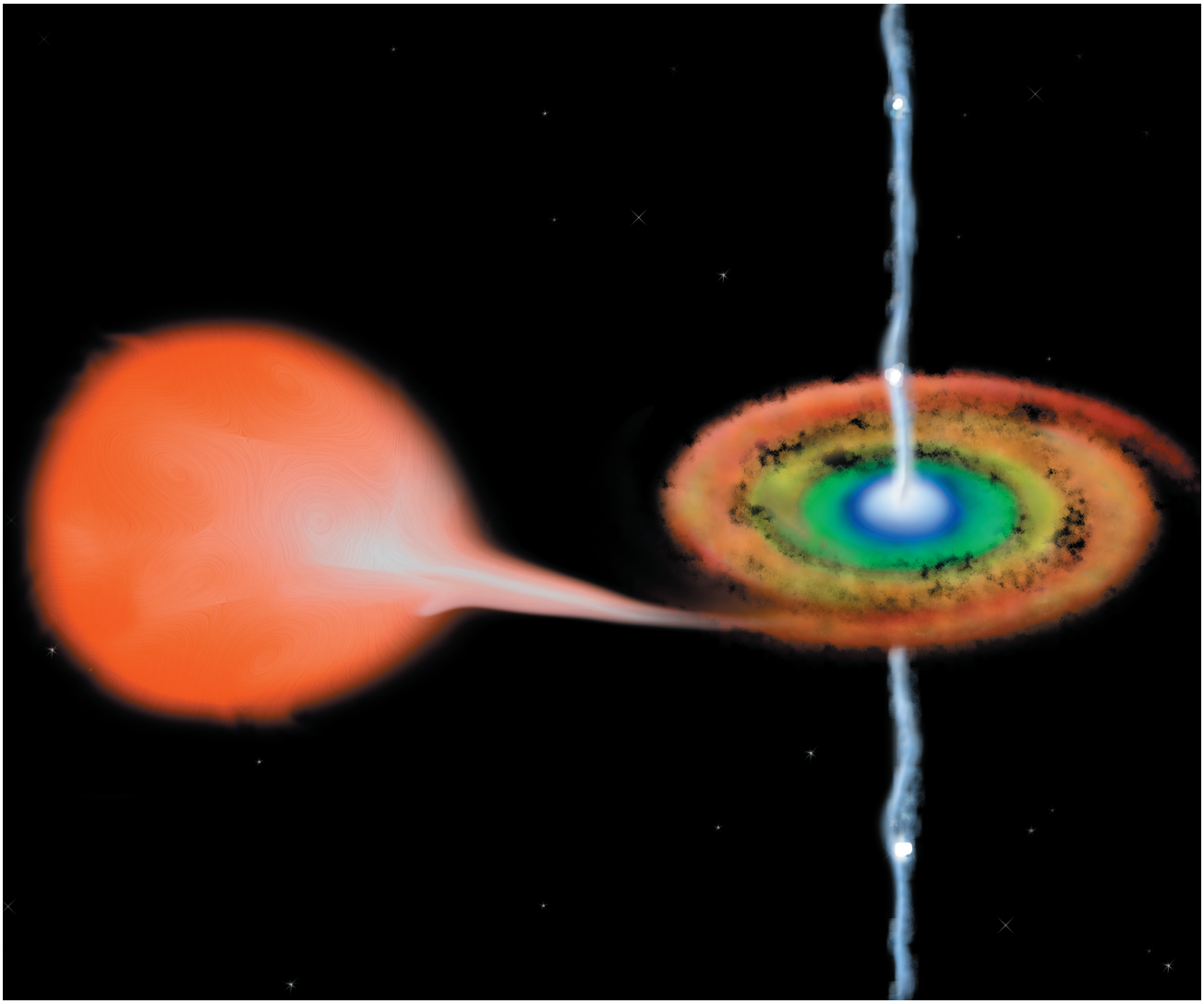

ILLUSTRATION OF X-RAY BINARY SYSTEM

Image Caption
An artist's conception shows a double star system with a normal Sun-like star in orbit around a black hole. As gaseous matter is pulled from the normal star, it forms a disk around the black hole and is heated to temperatures of millions of degrees. Intense electromagnetic forces in the disk can expel jets of high-energy particles.

Credit: CXC/M.Weiss

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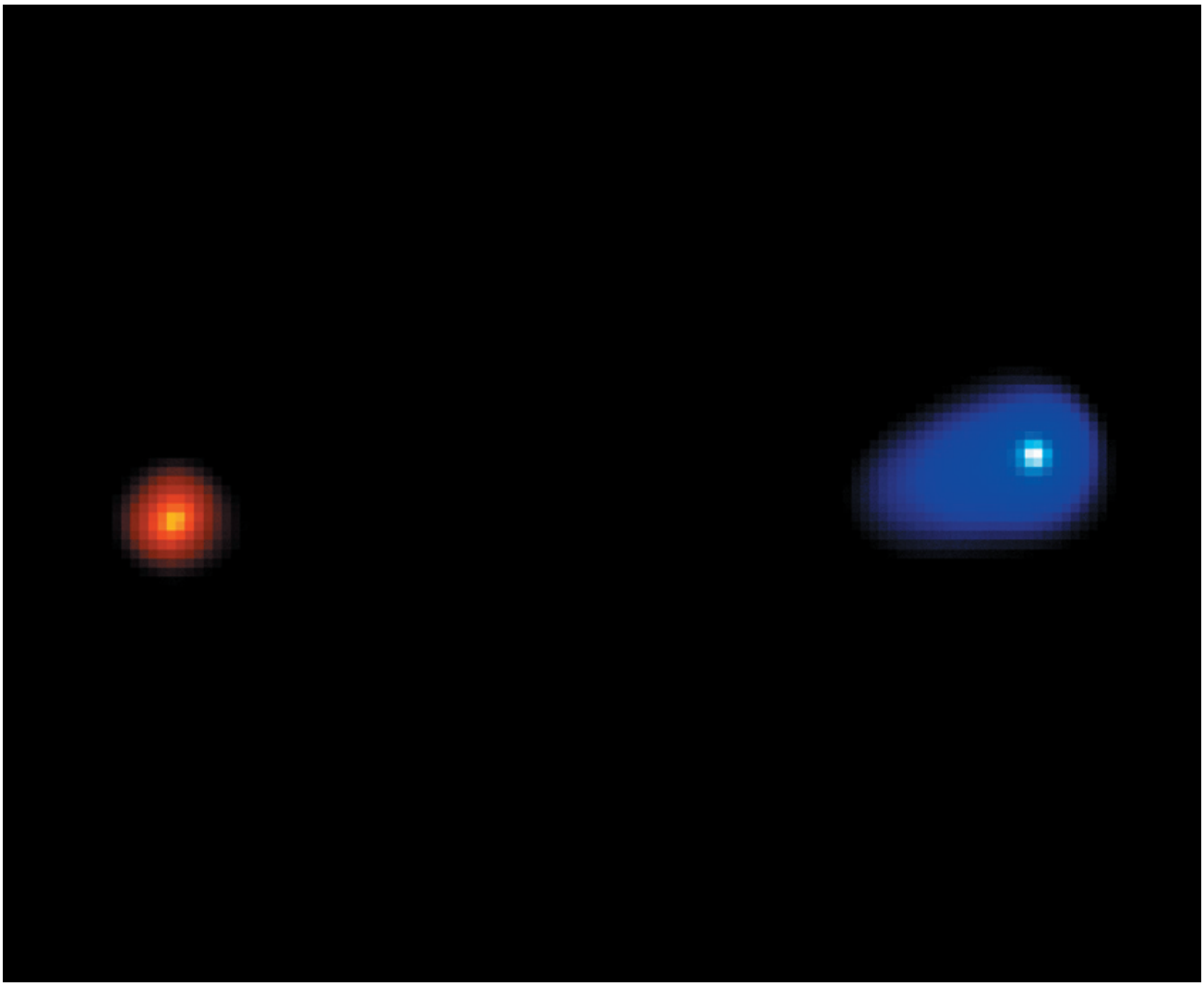

CLOSE-UP IMAGE OF WESTERN JET IN XTE J1550-564

Image Caption
In this Chandra image of XTE J1550-564, taken in June 2002, red represents the central black hole and blue shows the western jet emanating from it. The cometary shape of the western jet indicates that it is being slowed down by interstellar gas.

Credit: NASA/CXC

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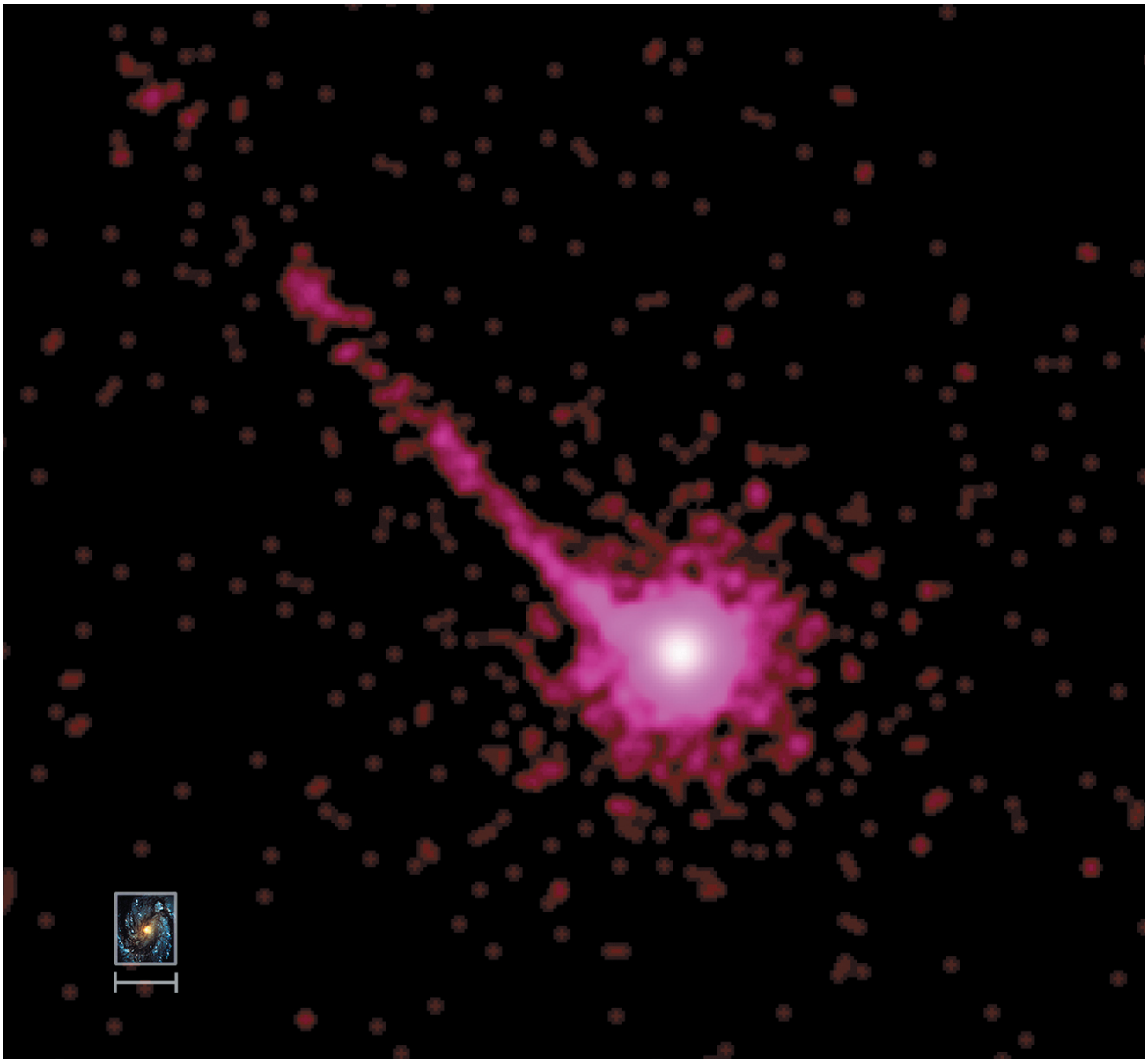

CHANDRA IMAGE OF X-RAY JET PKS 1127-145

Image Caption
The Chandra X-ray image of the quasar PKS 1127-145, a highly luminous source of X-rays and visible light about 10 billion light years from Earth, shows an enormous X-ray jet that extends at least a million light years from the quasar. The inset box compares the relative size of the Milky Way with the jet. Furthermore, the system XTE J1550-564 is just a fraction of the size and is found in one of the spiral arms of the Milky Way galaxy.

Credit: NASA/CXC/A. Siemiginowska (CfA)/J. Bechtold (U. Arizona)