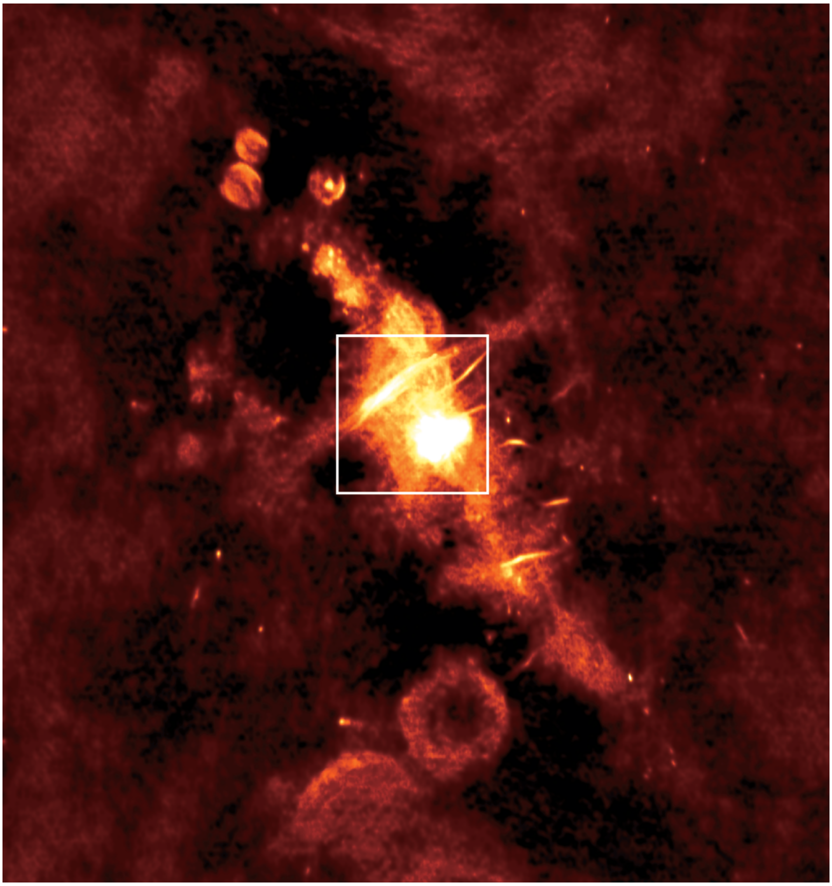

Plate 1. Radiation with a wavelength significantly larger than the size ($\sim 10^{-4}$ cm) of dust particles can pass through the interstellar medium without any noticeable attenuation. Thus, at 90 cm, the galactic center reveals itself as one of the brightest and most intricate regions of the sky. This VLA radio image, spanning an area of about 1,000 light-years on each side, shows a rich morphology produced by supernova remnants (the circular features), wispy, snakelike synchrotron filaments, and highly ionized hydrogen gas. The galactic plane in this image runs from the lower right to the upper left. A schematic diagram of the extended sources seen here is shown in figure 1.1. The central box indicates the bright region magnified in color plate 2. (Produced at the U.S. Naval Research Laboratory by Dr. N. E. Kassim and collaborators from data obtained with the National Radio Astronomy's Very Large Array Telescope, a facility of the National Science Foundation operated under cooperative agreement with Associated Universities, Inc. This image originally appeared in LaRosa, Kassim, and Lazio 2000.)

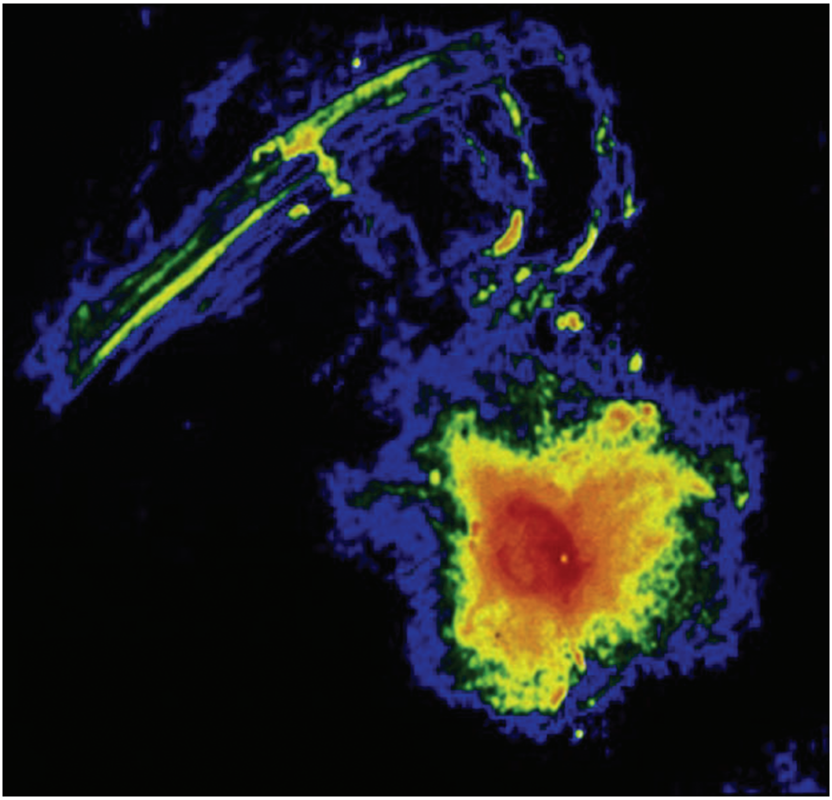

Plate 2. This is the magnified view of the central bright region of color plate 1. This VLA radio image shows the intensity of radiation at 20 cm, produced mostly by magnetized, hot gas between the stars. The size of this magnified region is about one-fifth of that shown in color plate 1, spanning a couple of hundred light-years in either direction. The galactic plane runs from the top left in this image to the bottom right, as in color plate 1. One of the most interesting features appearing here is the system of narrow filaments (some wrapped around each other) with a width of about 3 light-years. These radio filaments are oriented perpendicular to the galactic plane. The bright rosettelike region surrounds the center of our Galaxy, which is magnified further in color plate 3. The spot in the middle of the red spiral identifies the radio source known as Sagittarius A*, believed to be the supermassive black hole at the center of our Galaxy. (Image courtesy of F. Yusef-Zadeh, and the National Radio Astronomy Observatory/Associated Universities, Inc.)

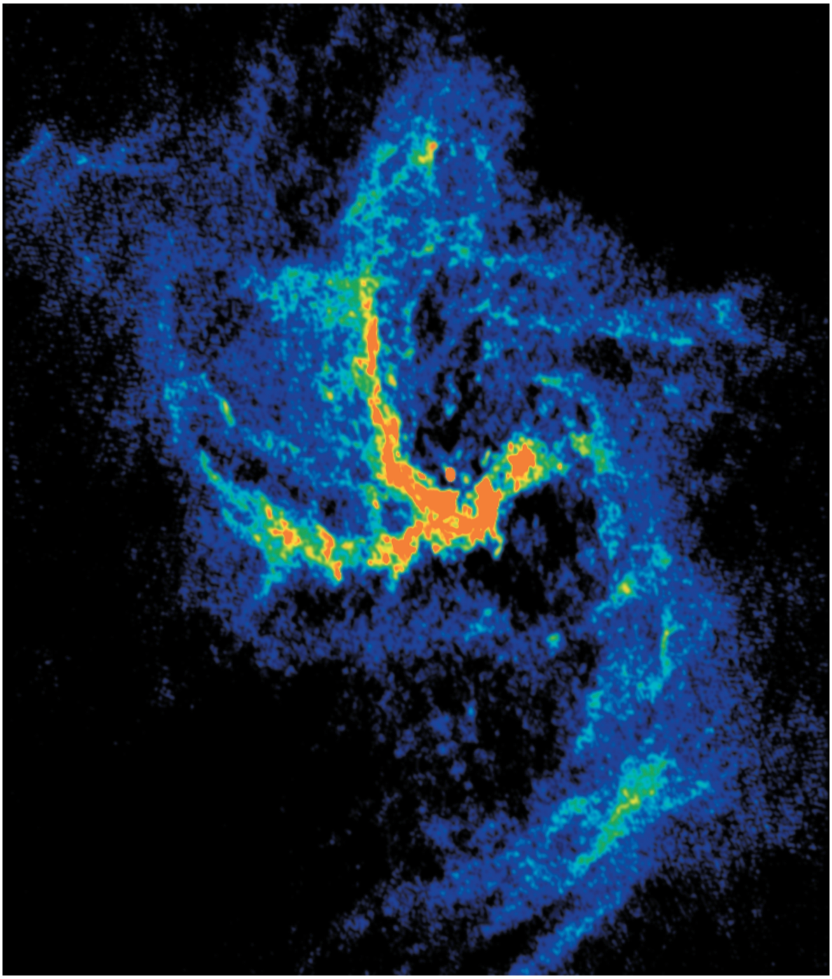

Plate 3. This image shows a magnified view, though now at 6 cm, of the (red) spiral structure in color plate 2. Each of the “arms” is about 3 light-years in length, but it is not clear whether we are witnessing a real spiral pattern or merely a superposition of independent gas flows into the center. It is now known that this gas is moving about the nucleus with a velocity as high as 1,000 km s^{-1}. The central region is magnified further in color plate 4. (Image courtesy of F. Yusef-Zadeh at Northwestern University, and the National Radio Astronomy Observatory)

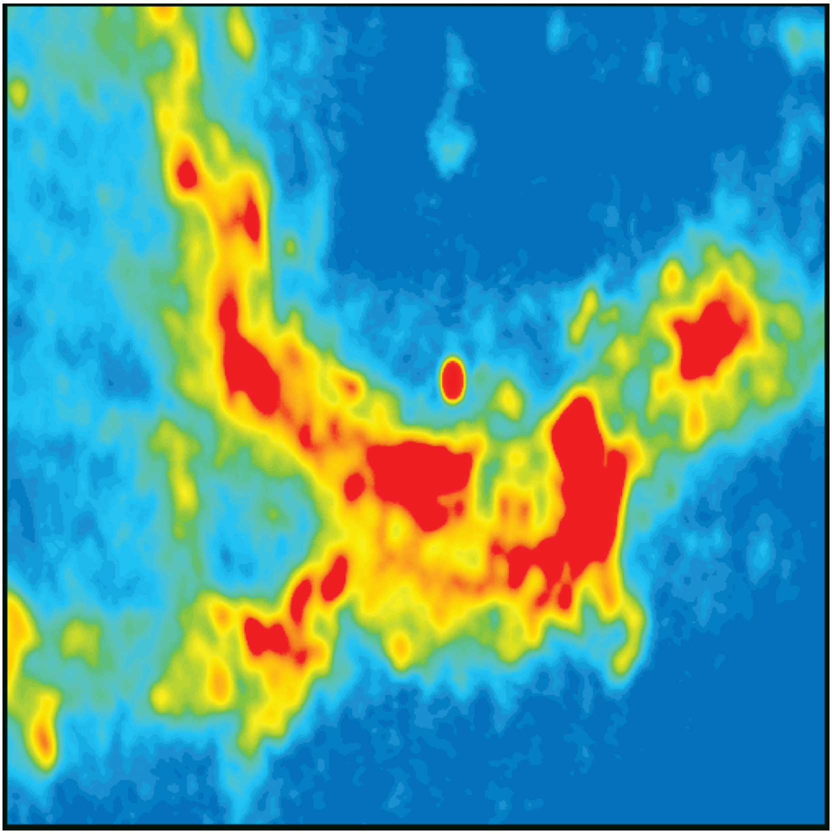

Plate 4. At 2 cm, the innermost 2 light-year × 2 light-year region of color plate 3 is dominated by the central portion of the spiral pattern of Sagittarius A West and a bright pointlike source known as Sagittarius A*, near the middle of the image. This object, which appeared as a spot of emission near the middle of the rosette in color plate 2, is associated with a mass of $\approx 2.6–3.6 \times 10^6\ M_{\odot}$. To the north of Sagittarius A*, the cometary-like feature (in light blue against the dark blue background) is associated with the luminous red giant star IRS 7. The gas blown upward from its envelope provides evidence of a strong wind emanating from the region near the supermassive black hole. The distance between Sagittarius A* and the red giant is ~3/4 light-year. (Image courtesy of F. Yusef-Zadeh at Northwestern University, and the National Radio Astronomy Observatory)

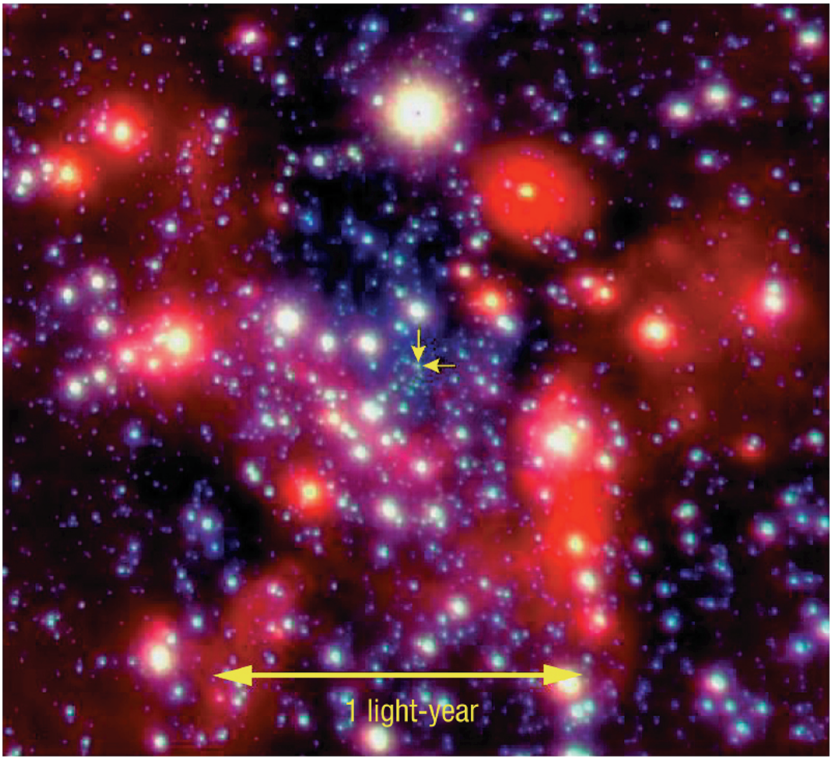

Plate 5. This very sharp 2 light-year × 2 light-year view of the stars surrounding the supermassive black hole at the heart of the Milky Way was created with the European Southern Observatory's 8.2-meter telescope atop Paranal, Chile. The colorization was produced by blending three images between 1.6 and 3.5 microns, using a color scheme in which blue is hot and red is cool. The diffuse emission is produced by interstellar dust. The location of the black hole itself, which coincides with the center of the Galaxy, is indicated by the two yellow arrows in the middle of the image. Sagittarius A* does not radiate perceptibly at infrared wavelengths, so it is not visible in this image. (Photograph courtesy of R. Genzel et al. at the Max-Planck-Institut für Extraterrestrische Physik, and the European Southern Observatory)

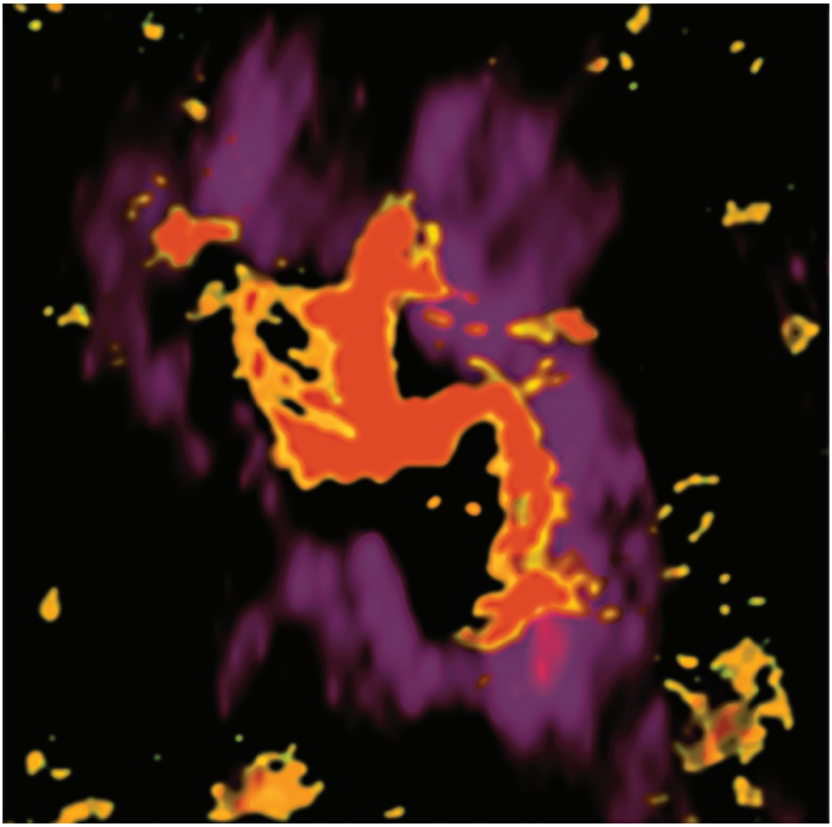

Plate 6. The obscuration toward the galactic center is much less severe in the infrared than at optical wavelengths. This is a radio image of ionized gas (Sgr A West) at $\lambda = 1.2$ cm, with its three-arm appearance (orange) superimposed on the distribution of HCN emission (violet), providing evidence for the presence of a torus of dusty gas in orbit about the central source of gravity, Sagittarius A*. The dust in this ring shines by converting ultraviolet light into an infrared glow. Most of the ionized gas is distributed within the molecular cavity. At the distance to the galactic center, this image corresponds to a size of approximately 4 pc on each side. (Image courtesy of F. Yusef-Zadeh at Northwestern University, M. Wright at the Radio Astronomy Laboratory, University of California at Berkeley, and the National Radio Astronomy Observatory)

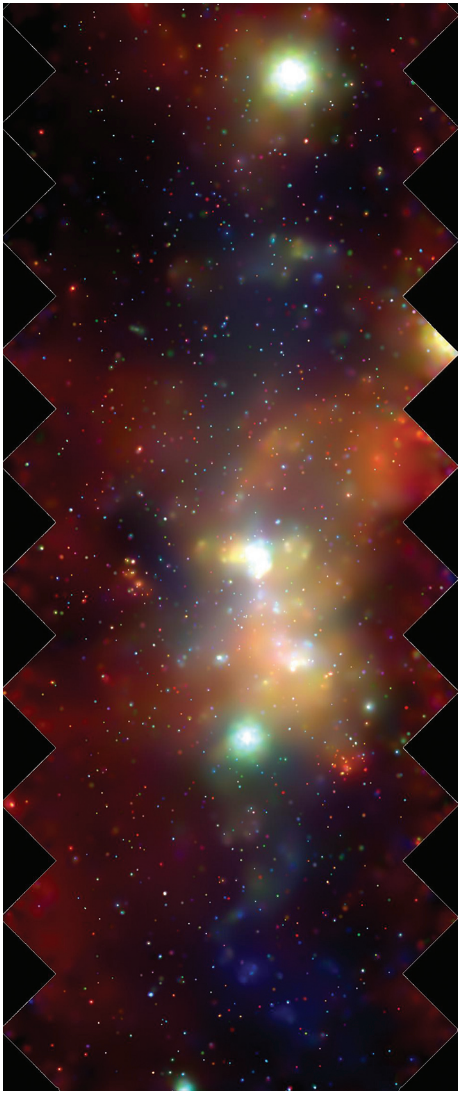

Plate 7. This image is a mosaic covering an $\sim 2^\circ \times 0.8^\circ$ band in galactic coordinates centered at $(l^{II}, b^{II}) = (-0.1^\circ, 0^\circ)$. Based on thirty separate observations made in July 2001, this image is color coded to show intensity in three different energy bands: 1–3 keV (red), 3–5 keV (green), and 5–8 keV (blue). The galactic plane runs vertically down the center of this map. (Image courtesy of Q. Daniel Wang at the University of Massachusetts, Amherst, and NASA)

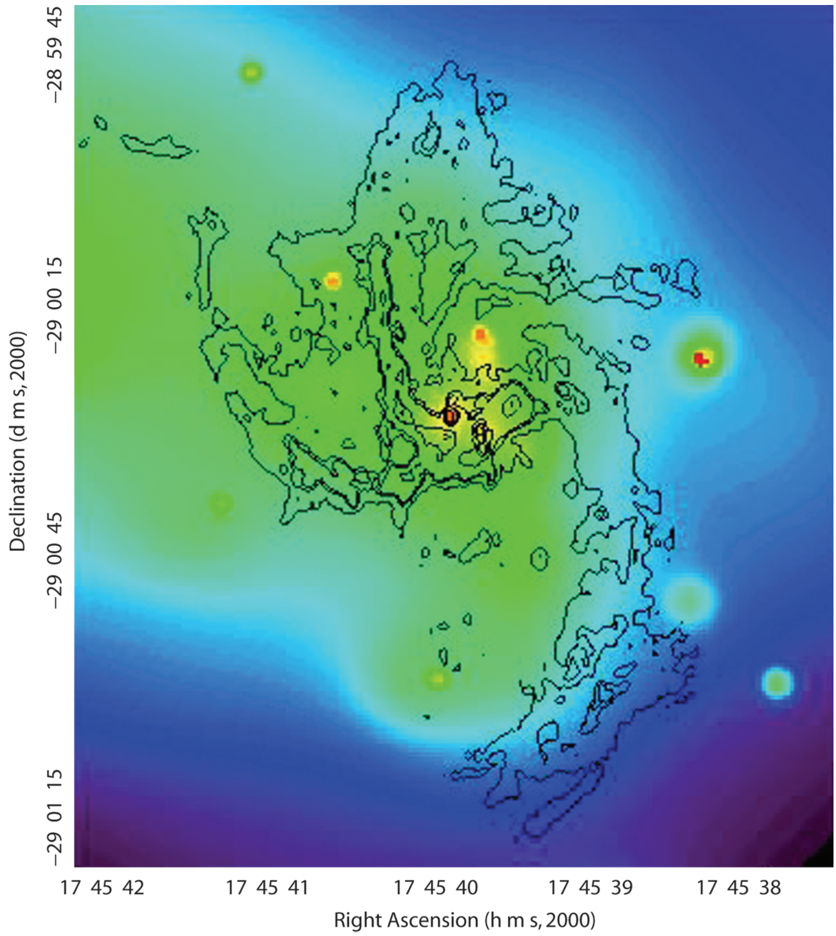

Plate 8. This is a smoothed, colorized version of the *Chandra* 0.5–7 keV image shown in figure 3.4, though with a slightly larger field of view (showing the central $1.'3 \times 1.'5$ of the Galaxy). Overlaid on the X-ray image are VLA 6 cm contours corresponding to the intensity map shown in color plate 3. The X-ray emission from Sagittarius A* itself appears as a red dot at $17^h45^m40.0^s$, $-29^\circ 00' 28''$. Bright diffuse emission from hot gas is visible throughout the region and appears to be produced primarily via wind-wind collisions (see chapter 7). (From Baganoff et al. 2003)

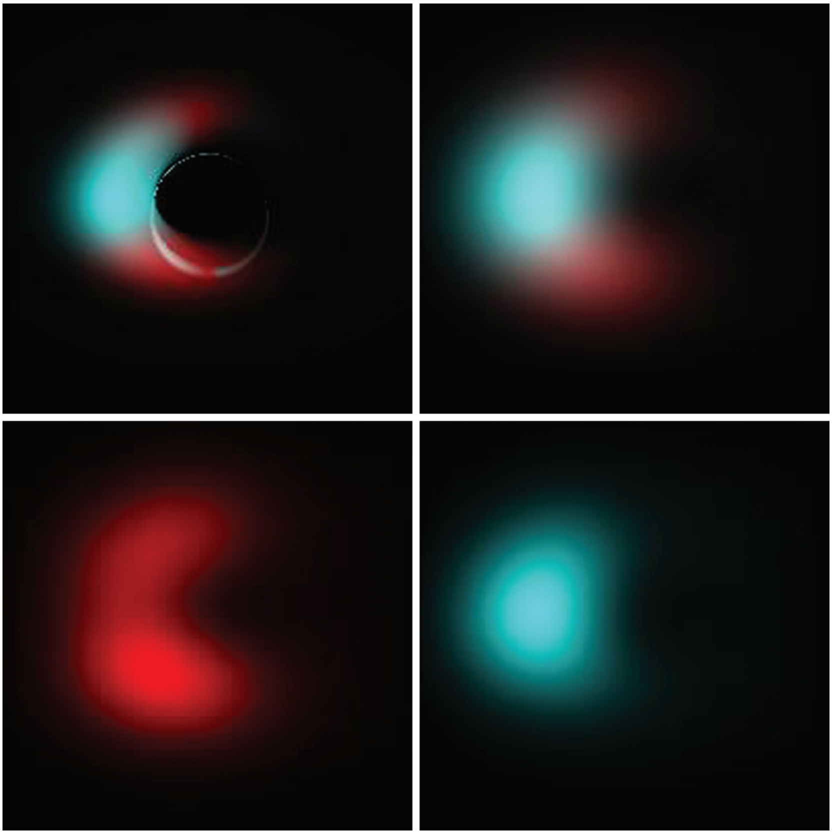

Plate 9. These are simulated images of the 1-mm emission from magnetized gas orbiting about the black hole in a counterclockwise direction. At this wavelength, we are viewing a polarization map near the peak of the mm–to–sub-mm portion of Sagittarius A*'s spectrum. The panel in the top left-hand corner shows the raw ray-tracing output, colorized so that red corresponds to a net vertical polarization, whereas cyan shows the brightness map of radiation polarized in the horizontal direction. The ringlike feature is produced by radiation that orbits once around the black hole before escaping. The corresponding image in the top right-hand corner is blurred to account for the finite VLBI resolution and interstellar scattering. At this wavelength, the obscuring effects of scattering by the interstellar gas and dust are present, though not overwhelming, and we can begin to see the shadow of the black hole cast against the radiant plasma. The clarity continues to improve as the wavelength of the radiation decreases further, though this effect is somewhat mitigated by the fact that the source also gets fainter. The lower two panels show the vertical (red) and horizontal (cyan) components of the polarized emission. The pixel brightness in all images scales linearly with flux. (From Bromley, Melia, and Liu 2001)