FOR IMMEDIATE RELEASE:

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Reuben H. Fleet Science Center's Heikoff Dome Theater To Premiere Digital GSX™ System from Global Immersion With New Daily Public Planetarium Show *BLACK HOLES: The Other Side of Infinity;* And new exhibition "Black Holes: Space Warps & Time Twists" Both Opening Saturday, February 4!

Cross the Event Horizon and Plunge into the Center of a Black Hole. It's the Closest You'll Ever Get to Experiencing the Real Thing!

San Diego CA – January 25, 2012 — There's a place from which nothing escapes, not even light, where time and space literally come to end. Cross the cosmic threshold into the bizarre realm of a black hole when the Reuben H. Fleet Science Center's Heikoff Dome Theater debuts its state-of-the-art, giant dome screen digital GSX™ system from Global Immersion with a new daily public planetarium show, *BLACK HOLES: The Other Side of Infinity,* running in conjunction with our new exhibition "Black Holes: Space Warps & Time Twists"; both open Saturday, February 4. The GSX system will augment the existing IMAX® projector in the Eugene Heikoff and Marilyn Jacobs Heikoff Dome Theater with one of the most comprehensive and powerful fulldome experiences available today.

Feel the Pull of *BLACK HOLES: The Other Side Of Infinity*, Narrated by Liam Neeson ~ State-of-the-Art GSX™ Giant Screen System Promises to Transport Audiences To Infinity ~ and Beyond!

"Black Holes: The Other Side of Infinity" (narrated by Academy Award-nominated actor, Liam Neeson) guides you through other-worldly wormholes to experience the creation of the Milky Way Galaxy and the violent death of a star and subsequent birth of a black hole. High-resolution visualizations of cosmic phenomena are based on data generated by telescope observations and ultra-high end computer simulations with striking, immersive animations of the Big Bang, the formation of the universe, endless seas of dust and gas drawn together by gravity to form the first

stars, the collision of two galaxies that cross paths in the vastness of space, and a simulated flight to a super-massive black hole lurking at the center of our own Milky Way.

BLACK HOLES: The Other Side of Infinity provides a groundbreaking, scientifically accurate perspective on black holes and presents the latest compelling evidence that black holes are real. It gives an overview of the fundamental concepts and terms essential to the understanding black holes:

- Einstein's concept of general relativity, and how the gravity of massive objects warps the fabric of space
- How black holes form from massive stars that die in violent explosions called supernovae
- That gamma-rays are telltale products of black hole formation, and how a NASA space telescope called Swift is looking for these signs right now
- The difference between regular, stellar mass black holes, and immense, supermassive black holes, and how each type forms
- Strong evidence demonstrating there are supermassive black holes at the center of galaxies
- Research conducted by astronomer Andrea Ghez at the Keck Observatory on Hawaii's Mauna Kea volcano, which points toward a supermassive black hole at the center of our Milky Way galaxy

Showtimes in February for *BLACK HOLES: The Other Side of Infinity* in the Heikoff Dome Theater are Monday through Thursday at 3PM, Friday, Saturday and Sunday at 3PM & 6PM. Tickets, which include admission to the digital Planetarium show and access to all exhibit galleries, are $15.75 for adults and $12.75 for children and seniors. *BLACK HOLES: The Other Side of Infinity* will run through the end of March, 2012. For more information, please call (619) 238-1233 or visit our website at www.rhfleet.org .

Go On a Mission with "Black Holes: Space Warps & Time Twists" ~ Out of This World Exhibition Touches Down at the Fleet February 4!

"Black Holes: Space Warps & Time Twists" is an out of this world exhibition exploring what we know, don't know, and think we know about one of the world's greatest space mysteries—black holes . These regions in space, sometimes only a few kilometers across, have gravity so powerful that light cannot escape and matter drawn into them is lost forever. Einstein imagined black holes but doubted they could exist in nature. Today evidence suggests they are quite common. Discover how not to be sucked into a black hole as it opens at the Reuben H. Fleet Science Center on Saturday February 4 for a limited engagement, through April 29, 2012 only!

The exhibit is designed like a space mission; visitors are sent out to search for evidence of real black holes in our universe. Through a number of stations, a visitor will observe the peculiar properties of black holes, their amazing journey from theory to fact, and some common - and entertaining -

misconceptions. A variety of interactive components will give visitors an in-depth experience of how black holes behave, shape our universe and influence our lives.

At the start of their journey, visitors will pick up a Black Holes Explorer's ID Card, which they can use throughout the exhibit to collect discoveries and generate a personalized website that only they can access. The website serves as part personal diary, part observer's log and will include data recorded by the visitor, including their observations, conclusions, questions, notes and photos they've captured of their group and their activities. Helping to guide the visitor through their explorations in the exhibit will be photos and videos of the Youth Team exhibit collaborators and a diverse team of scientists and engineers.

The final portion of the exhibit is truly an adventure for space travelers of all ages. Step into your immersive excursion pod and set your course for an extreme fantasy vacation to the supermassive black hole at the center of our galaxy. The challenge: pilot your pod to an alien spacecraft wreck at the edge of the black hole and dive down to discover its hidden treasure—then live to tell about it.

Prepare to be disoriented as the black hole distorts the once-familiar surrounding universe. Adventurous excursion activities will allow you to experience the black hole's spectacular effect on its environment, space and time. But keep an eye on the clock – you don't want to be left behind when your galactic cruise ship, the Singularity, departs. Unexpected emergencies could arise, prompting a fall into the black hole itself!

"Black Holes: Space Warps & Time Twists" is a production of the Harvard-Smithsonian Center for Astrophysics. The Black Holes exhibition was originally funded by a grant from the National Science Foundation with additional major support from the National Aeronautics and Space Administration.

About the Reuben H. Fleet Science Center

The Reuben H. Fleet Science Center ("the Fleet") is home to Southern California's only IMAX® Dome Theater and 100+ hands-on science exhibits for all ages. Watch immersive giant-screen films in the Heikoff Dome Theater, featuring the world's first NanoSeam™ Dome screen in an IMAX Theater. The Fleet is the first Giant Dome Theater in the country to share a digital planetarium with an IMAX Dome theater, following the recent installation of a new, state-of-the-art, giant dome screen digital GSX™ system from Global Immersion, which will augment the existing IMAX® projector in the Heikoff Dome Theater with one of the most comprehensive and powerful fulldome experiences available today. The digital system will not only enhance our planetarium capabilities but expands the possibilities for sustainable institutional programming that could include evening programming with cultural content of various kinds. Experience seven galleries of fun, interactive exhibits, including major traveling exhibitions. A hurricane simulator thrills visitors with gusts of wind up to 80 miles per hour. Enjoy sandwiches, salads and healthy treats in Galileo's Café. Find unique educational toys and games, books, IMAX DVDs and more in the North Star Science Store.

Located at 1875 El Prado, two blocks south of the San Diego Zoo on Park Blvd, the Fleet Science Center is a non-profit organization dedicated to furthering the public understanding and enjoyment of science and technology. For information regarding current admission prices, please call (619) 238-1233 or visit our website at www.rhfleet.org.

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FOR MEDIA: high-resolution photographs from the film are available for download at:
http://www.rhfleet.org/media/images/index.cfm

BLACK HOLES: The Other Side of Infinity

CONTENT OVERVIEW

They're one of the most intriguing and mysterious phenomena in the universe, places where time and space are warped to the extreme, and nothing—not even light—can escape the pull of their ferocious gravity. Black holes once defied the imagination. But now, the more scientists look for evidence of them, the more they find, and the more they learn about the role of black holes in the universe. *BLACK HOLES: The Other Side of Infinity* is a stunning presentation of the latest science about black holes visualized using supercomputing technology. The show whisks audiences to a place humans can never venture—to the center of a black hole.

THE SEARCH FOR BLACK HOLES

Though we can't see black holes in the traditional sense, we know they exist because of the telltale signs they emit. The Swift space telescope detects gamma-ray bursts that erupt when a black hole is formed after a large star dies in a massive explosion called a supernova. In *Black Holes: The Other Side of Infinity*, we learn what triggers this chain of events is gravity, a force so powerful at its most extreme that it can actually warp the fabric of the cosmos.

THE FORMATION OF STELLAR MASS BLACK HOLES

BLACK HOLES: The Other Side of Infinity leads us through the process of black hole formation by focusing on a particular class of stars called red supergiants. Much more massive than our sun, these stars lead short violent lives, truncated by the crush of gravity. The star's core becomes so dense and massive, it collapses in on itself. The star rocks the cosmos in a powerful supernova explosion. Left in its wake is a black hole, an object a fraction the mass of the original star, only concentrated into a volume millions of times smaller. It is literally a puncture in the fabric of the cosmos. The gravity of the black hole is so intense, resisting it would be like trying to paddle against the current of a river plunging toward a waterfall. Anything that crosses the black hole's point of no return, or event horizon, cannot escape.

SUPERMASSIVE BLACK HOLES

Though these regular black holes seem fearsome enough, there are others that are even more immense and mind-boggling. These supermassive black holes are millions to billions of times more massive than our sun. Scientists now believe these supermassive black holes exist in the centers of galaxies. Black Holes: The Other Side of Infinity shows us how these supermassive black holes form, and how astronomers have detected the presence of one at the center of our own Milky Way galaxy by studying the behavior of the stars around it.

TRAVEL INSIDE THE BLACK HOLE AT THE CENTER OF THE MILKY WAY

What if we could take a trip into the supermassive black hole at the center of the Milky Way? It's a physical impossibility for humans, but for the first time *BLACK HOLES: The Other Side of Infinity* creates this journey with scientific accuracy, using a course plotted by the observations of astronomers, and the equations of Einstein to take us there. What we find is a bizarre realm, a maelstrom of light, matter and energy unlike anything we've ever seen or experienced before.

THE SCIENCE OF BLACK HOLES

WHAT IS A BLACK HOLE?

Most people think of a black hole as a voracious whirlpool in space, sucking down everything around it. But that's not really true! A black hole is a place where gravity has gotten so strong that the escape velocity is faster than light. But what does that mean, exactly? Gravity is what keeps us on the Earth, but it can be overcome. If you toss a rock up in the air, it will only go up a little way before the Earth's gravity slows it and pulls it back down. If you could throw the rock hard enough, it would have enough velocity that the Earth's gravity could not slow it down enough to stop it. The rock would have enough escape velocity to escape the Earth. For the Earth, that velocity is about 11 kilometers per second (7 miles/second). But the escape velocity of an object depends on its gravity: an object with more gravity will have a higher escape velocity because the gravity will "hold onto" things more strongly. The Sun has far more gravity than the Earth, so its escape velocity is much higher—more than 600 kilometers/second (380 miles/second). That's 3,000 times faster than a jet plane! If you take an object and squeeze it down in size, or take an object and pile mass onto it, its gravity (and escape velocity) will go up. At some point, if you keep doing that, you'll have an object with so much gravity that the escape velocity is faster than light. Since that's the ultimate speed limit of the universe, anything too close would get trapped forever. No light can escape, and it's like a bottomless pit: a black hole.

HOW DO BLACK HOLES FORM?

Astronomers think there are many ways to make a black hole. The most common is probably in a supernova, an exploding star. When a star with about 20 times the mass of the sun ends its life, it explodes. The outer part of the star screams outward at high speed, but the inner part of the star, its core, collapses down. If there is enough mass, the gravity of the collapsing core will compress it so much it can become a black hole. When it's all over, the black hole will have a few times the mass of the sun. This is called a "stellar-mass black hole," what many astronomers think of as "regular" black hole. But there are also monsters, called supermassive black holes. These lurk in the centers of galaxies and are huge; they can be millions or even billions of times the mass of the Sun! Their origin is a mystery, but they probably formed at the same time as their parent galaxies. Perhaps each one started as a single huge star that exploded to create a black hole and then accumulated more material (including other black holes), or they may have condensed directly from matter streaming into the center of the newly shaped galaxy. Astronomers think there is a supermassive black hole in the center of every large galaxy, including our own Milky Way.

WHAT HAPPENS WHEN YOU FALL INTO A BLACK HOLE?

If you fall into a black hole, you're doomed. Sure, once you fall in you can never get back out, but it turns out you'll probably be dead before you get there. The gravity you feel from an object gets stronger the closer you get. As you approach a black hole feet-first, the force of gravity on your feet can be thousands of times stronger than the force on your head! This has the effect of stretching you, pulling you apart like taffy. Tongue-in-cheek, scientists call this "spaghettification." By the time you reach the black hole, you'll be a thin stream of matter many miles long. It probably won't hurt, though: even falling from thousands of kilometers away, the entire gory episode will be over in a few milliseconds. You may not even make it that far. Some black holes greedily gobble down matter, stealing it from an orbiting companion star or, in the case of supermassive black holes, from surrounding gas clouds. As the matter falls in, it piles up into a disk just outside the hole. Orbiting at huge speeds, the matter in this accretion disk gets extremely hot—even reaching millions of degrees. It will spew out radiation, in particularly high-energy X-rays. Long before the black hole could rip you apart you'd be fried by the light. But suppose you somehow manage to survive the trip in. What strange things await you on your way down into forever? Once you pass the point where escape velocity is faster than light, you can't get out. This region is called the event horizon. That's because no information from inside can escape, so any event inside is forever beyond our horizon. As mind-boggling as it may seem, when a black hole forms, the matter that created it actually collapses all the way down to a point. When that happens, our math (and intuition) fail us. It's as if the matter has disappeared from the universe, but its mass is still there. The black hole itself, inside the event horizon, has zero size, but it still has all the mass of everything that ever fell into it. That's why its gravity is so ferocious.

WHERE ARE BLACK HOLES LOCATED?

Black holes are everywhere! As far as astronomers can tell, there may be millions of black holes in our Milky Way galaxy alone. That may sound like a lot, but the nearest one discovered is still 1,600 light-years away—a pretty far distance, about 16 quadrillion kilometers! This is certainly too far away to affect us. The giant black hole in the center of the galaxy is even farther away; at a distance of 30,000 light years, we're in no danger of being sucked into the vortex. For a black hole to be dangerous, it would have to be very close, probably less than a light year away. Not only are there no black holes that close, there aren't any known that will ever get that close. So don't fret too much over getting spaghettified anytime soon.

IF BLACK HOLES ARE BLACK, HOW CAN WE FIND THEM?

The black hole itself might be invisible, but the ghostly fingers of its gravity leave behind fingerprints. Some stars form in pairs, called binary systems, where the stars orbit each other. Even if one of them becomes a black hole, they may remain in orbit around each other. By carefully observing such a system, astronomers can measure the orbit of the normal star and determine the mass of the black hole. Only a few binary systems have black holes though, so you have to know which binaries to observe. Fortunately, astronomers have discovered a signpost that points the way to black holes: X-rays. If a black hole is "eating" matter from a companion star, that matters gets very hot and emits X-rays. This is like a signature identifying the source as a black hole. That's why astronomers want to build a spacecraft equipped with special detectors that can "see" in X-rays. In fact, black holes are so good at emitting X-rays that many thousands can be spotted this way.

HOW DO BLACK HOLES AFFECT THINGS NEAR THEM?

Are we in danger of being gobbled up by a black hole? Actually, no. We're pretty safe. The gravity from a black hole is only dangerous when you are very close to it. Surprisingly, from a large distance, black hole gravity is no different than the gravity from a star with the same mass. The strength of gravity depends on the mass of the object and your distance from it. If the sun were to become a black hole (don't worry, it's way too lightweight to ever do that), it would have to collapse down so much that its event horizon would be only 6 kilometers (4 miles) across. From Earth's distance of 150 million kilometers (93 million miles), we'd feel exactly the same gravity as we did when the sun was a normal star. That's because the mass didn't change, and neither did its distance. But as we got up close to the black hole, only a few kilometers away, we'd definitely feel the difference! So stellar-mass black holes don't go around tearing up stars and eating everything in sight. Stars, gas, planets and anything else would have to get up close and personal to a black hole to get trapped. But space is big. The odds of that happening are pretty small. Things are different near a supermassive black hole in the center of a galaxy. Every few hundred thousand years, a star wanders too close to the black hole and gets torn apart. This produces a blast of X-rays that can be visible for decades! Astronomers found another amazing thing when studying galaxies: the stars in the inner parts of galaxies seem to orbit the galactic center faster when the supermassive black holes there are more massive. This might sound obvious, but in fact the mass of even a monster black hole is only a fraction of a percent of the mass of the innermost part of a galaxy—yet the stars still seem to "know" how massive it is. Astronomers are not sure why this is, but they suspect that the supermassive black hole and the inner regions of the galaxy in which it sits formed at the same time, and somehow affected each other during that time. It's a mystery that scientists are still trying to figure out.

CAN BLACK HOLES BE USED TO TRAVEL THROUGH SPACETIME?

It's a science fiction cliché to use black holes to travel through space. Dive into one, the story goes, and you can pop out somewhere else in the universe, having traveled thousands of light years in the blink of an eye. But that's fiction. In reality, this probably won't work. Black holes twist space and time, in a sense punching a hole in the fabric of the universe. There is a theory that if this happens, a black hole can "connect" with another black hole, forming a tunnel in space called a wormhole (because it's like a tunnel formed by a worm as it eats its way through an apple). If you enter a wormhole, you'll pop out someplace else far away, not needing to travel through the actual intervening distance. Unfortunately, scientists also think that the

gravity at the mouth of a wormhole would tear anyone to shreds who was foolish enough to try to go in. Also, the energies needed to keep the mouth of the wormhole open are forbiddingly huge. In reality, wormholes probably don't exist. When we invent interstellar travel, we'll have to go the long way around.

WHAT CAN WE LEARN FROM BLACK HOLES?

Black holes represent the ultimate endpoints of matter. They twist and rip space and time, pushing our imagination beyond its breaking point. But they also teach us a lot about the way the universe works. What happens at the very edge of a black hole, where light cannot escape, where space and time swap places, where even Einstein's General Relativity is stretched to the breaking point? Black holes are a natural laboratory where we can investigate such questions. Einstein predicted that when a black hole forms, it can create ripples in the fabric of space, like the waves made when you throw a rock in a pond. No one has ever detected these gravity waves, but scientists are building experiments right now to look for them. If they are detected, these waves can teach us much about how gravity works. Some scientists even think gravity waves were made in the Big Bang. If we can detect these waves, it will be like looking back all the way to time zero, the start of everything there is.

AMAZING FACTS ABOUT BLACK HOLES

- Astronomers think that a black hole is born every day.
- Inside a black hole, time can run backward or forward.
- Surprisingly, black holes may not be totally black.
- Infalling material can get hot enough to glow.
- Sometimes black holes are so bright they can outshine an entire galaxy.
- Supermassive black holes can be so luminous we can see them from distances of billions of light years.
- There may be millions of stellar-mass black holes in our own Milky Way galaxy.
- There is a supermassive black hole right in the middle of the Milky Way galaxy that tips the cosmic scales at 4 million times the mass of the Sun. But don't worry—at nearly 30,000 light years away, it's too far away for us to fall into it.

BLACK HOLES GLOSSARY OF TERMS

• Accretion disk: A disk of matter that forms when a large amount of material falls into a black hole. The disk is outside the event horizon of the black hole. Friction and other forces heat the disk, which then emits light.
• Escape velocity: The velocity needed for an object to become essentially free of the gravitational effect of another object.
• Event horizon: The distance from the center of a black hole where the escape velocity is equal to the speed of light.
• Gamma-ray burst: A mysterious explosion of high-energy light, some of which is thought to be due to the formation of a black hole.
• Gravity: The attractive force of an object that depends on its mass, and your distance from it. The more massive an object, or the closer you are to it, the stronger the force of its gravity will be.
• Mass: The quantity of matter that makes up an object.
• Supernova: An exploded, or exploding, star.
• Wormhole: A tunnel-like "shortcut" through space formed when two black holes separated by a large distance gravitationally warp the fabric of space. The existence of wormholes has not yet been proven.

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This material was developed by the NASA Education and Public Outreach Group at Sonoma State University under the direction of Dr. Lynn Cominsky. Text written by Dr. Phil Plait.

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Applications, Spitz, Inc., and the Swift and GLAST Education and Public Outreach Programs at Sonoma State University. "Black Hole Flight Simulator" by Dr. Andrew J.S. Hamilton, © University of Colorado.

BLACK HOLES: THE OTHER SIDE OF INFINITY

Collaborator Biographies

NARRATOR: LIAM NEESON continues to take on challenging roles and has become one of the leading international motion-picture actors today. The Irish-born Neeson originally sought a career as a teacher, attending Queens College, Belfast, and majoring in physics, computer science, math and drama. His interest quickly shifted to theater, and in 1976 Neeson began his acting career with the prestigious Lyric Players Theatre in Belfast. Neeson is recognized for his many memorable roles. He starred in the box-office phenomenon *Star Wars: Episode I—The Phantom Menace* (1999), playing the role of Qui-Gon Jinn, the Master Jedi Knight who bestows his Force-ful wisdom upon Obi-Wan Kenobi and the young Anakin Skywalker. In addition, Neeson was nominated for an Academy Award for his portrayal of Oskar Schindler in Steven Spielberg's highly acclaimed *Schindler's List*, and has appeared in other recent hits such as *Batman Begins, Kinsey* and *Love Actually*.

COMPOSER: RICHARD FIOCCA has a long list of award-winning film and television credits, including scores for PBS, HBO, the BBC, and all the major US networks. Recent work includes theme and scoring for the CBS newsmagazine "48 Hours, the Discovery Channel/Animal Planet's Into the Lion's Den, the IMAX feature *Wildfire*, and music and sound design for the Oscar winning HBO documentary Liberation: A Survivor Remembers. He also composed the score for CBS TV's groundbreaking special on the World Trade Center attack "9/11." Recent collaborations with Thomas Lucas include "Mysteries of Deep Space" and "Voyage to the Milky Way," both for PBS. Fiocca has also created an extensive oeuvre of concert works: his String Quartet No. 1 in D was performed at the Kennedy Center in Washington, DC, and his Serenade for Clarinet was recently featured at the Contemporary Composer's Concert at Carnegie Hall. He is currently working on The Fourth Way, an orchestral tone poem based on the life and teachings of the Russian mystic and spiritualist G.I. Gurjieff. A frequent visitor to Prague as both a conductor and composer, Fiocca recorded the score for *BLACK HOLES: The Other Side of Infinity* with the Czech Screen Orchestra.

DIRECTOR: THOMAS LUCAS has completed more than 20 major documentary films for NOVA, PBS, the Discovery Channel and other networks. He specializes in productions that make use of special effects and high-end computer animations. Lucas got his start in 1985 with the production of a documentary for NOVA called "Tornado!" The film became one of the most popular productions in NOVA's history, reaching an audience of tens of millions. It was also cited by Michael Crichton as the inspiration for the 1996 motion picture *Twister.* Lucas' other productions have explored such diverse subject matter as the mysteries of deep space, cannibalism, cyborgs, the 1988 Yellowstone wildfires and hammerhead sharks, among other topics. *BLACK HOLES: The Other Side of Infinity* is Lucas' first planetarium show. Using adaptations of the scientific visualizations from *Black Holes*, Lucas is directing a NOVA program called "Monster of the Milky Way" that will be broadcast on PBS in 2006.

EXECUTIVE PRODUCER: JOSLYN SCHOEMER was bitten by the astronomy bug in 1990 when attending a lecture about wormholes and black holes. After receiving her undergraduate degree in astrophysics and math, she discovered a passion for sharing the excitement of astronomical discoveries and the exploration of space with the general public through films, exhibits and educational programs. She received a M.S. in museum and field studies, with an emphasis on informal science education. Schoemer has worked on a variety of space science education projects for informal learning institutions. These include exhibits and programs at the Smithsonian's National Air and Space Museum in Washington, DC, including Voyage!, a scale-model solar system permanently installed on the National Mall. She coordinated space projects for the Challenger Center for Space Science Education, the University of Colorado Natural History Museum and the University of Colorado's Fiske Planetarium. Schoemer joined the Denver Museum of Nature & Science in

1999 as a project manager and worked on developing the Museum's permanent space science exhibition, Space Odyssey. Black Holes: The Other Side of Infinity is her first all-digital planetarium show.

SCIENCE DIRECTOR: DR. ANDREW J.S. HAMILTON is a fellow of JILA (formerly the Joint Institute for Laboratory Astrophysics), and a professor in the Department of Astrophysical and Planetary Sciences at the University of Colorado at Boulder, where he has worked since 1986. Though Hamilton's background is in mathematics and astrophysics and he has published about 60 papers on subjects ranging from supernovas to cosmology, his students helped pique his interest in black holes. Their strong desire to understand relativity led Hamilton to develop his first scientifically accurate general relativistic visualizations of black holes in 1996. With the help of one of his accelerated introductory astronomy classes, Hamilton used those visualizations to create a highly popular show on black holes that debuted at Fiske Planetarium at CU in 1997. This content was adapted for a Web page called "Falling into a Black Hole," which has received more than a million visitors since it went online in 1997. Hamilton continued to refine his visualization technique with the development of the "Black Hole Flight Simulator" during a yearlong sabbatical with the Denver Museum of Nature & Science in 2001 and 2002. The simulator, an elaborate software program, takes real, computational data about black holes and translates it into the images that are the centerpiece of Black Holes: The Other Side of Infinity.

SCIENCE DIRECTOR: DR. LYNN COMINSKY has been a professor of physics and astronomy at Sonoma State University since 1986, and currently chairs the Departments of Physics and Astronomy, and Chemistry. At SSU, she also directs the education and public outreach (E/PO) group that develops science and mathematics curriculum resources for grades K–12, and is primarily sponsored by NASA. Cominsky is a scientific coinvestigator and leads the education and public outreach team for the Swift Gamma-ray Burst Explorer Mission, launched by NASA on November 20, 2004, and featured in Black Holes: The Other Side of Infinity. Swift is studying gamma-ray bursts, the biggest explosions observed in the universe today. Cominsky serves in a similar capacity on NASA's Gamma-ray Large Area Space Telescope (GLAST) mission (expected to launch in 2007), and on the European Space Agency's XXM-Newton mission, which studies X-rays from black holes, neutron stars, supernova remnants and stellar corona.

NCSA PRODUCER AND ART DIRECTOR: DONNA J. COX is a professor of art and design at the University of Illinois at Urbana-Champaign and director of visualization at the National Center for Supercomputing Applications. Her collaborative scientific visualizations are featured in a variety of large-format venues around the world, including the Academy Award-nominated 1997 IMAX film Cosmic Voyage, and on two American Museum of Natural History planetarium shows, Passport to the Universe and The Search for Life: Are We Alone? She and her team also provided the thrilling visuals used in the NOVA programs "Hunt for the Supertwister" and "Runaway Universe" on PBS. Cox's passion is bringing cultural scientific narratives to a wide range of audiences through innovative and aesthetic presentations of data-driven scientific simulations. In addition to her large-scale productions, Cox has authored many articles on the use of visualization in science, art, and information design.

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