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"Tinkering Studio": Where *You* Can Discover Your Inner Inventor

Opening December 27, 2011 at The Reuben H. Fleet Science Center

"Tinkering Studio" WINTER CAMPS Will Run December 26-30; 9AM – 4PM!

San Diego, CA, December 14, 2011 – Back by popular demand, the "Tinkering Studio" returns to the Reuben H. Fleet Science Center! Guests of all ages can follow in the inventive footsteps of Thomas Edison, Alexander Graham Bell and Leonardo da Vinci in the hands-on workshop area set to open December 27, 2011. Originally part of a highly successful 2009 exhibit used to test and refine activities, we discovered that the "Tinkering Studio" provided a flexible environment capable of supporting a vast array of enriching educational programming.

In the new and improved "Tinkering Studio," visitors work together experimenting and collaborating on immersive, creative activities designed to spark curiosity and foster exploration. A few examples: they can make origami and Spirograph® artwork; design and construct simple mechanical toys like tops, catapults and musical instruments from recycled materials; build marble "roller coasters" using tubes and ramps, or create "digital bling" using colorful LED lights, batteries and accessories. The more adventurous can construct chain reaction structures, automata or solar vehicles. Fun hands-on

challenges for all ages include investigations of balancing and stacking structures, logic puzzles, geometry, electricity, magnetism, and gravity – simple concepts taught through problem-solving.

Visitors to the “Tinkering Studio” typically spend an extended period working on projects individually, in family groups, or in spontaneous teams of strangers. The benefits of this kind of in-depth involvement are manifold: in addition to exploring science concepts, visitors develop skills in brainstorming, planning, follow-through, problem-solving, responsibility, teamwork, and motor skills. They develop increased self-confidence and enjoyment of their ability to do hands-on building and experimenting. Often, they can take home a tangible product that they have created or proudly leave it on display as inspiration to future visitors.

Along with Thomas Edison, Alexander Graham Bell and Leonardo da Vinci; Steve Jobs was a tinkerer/inventor, as were George Méliès and Rube Goldberg. The creations they developed have clearly taken on a life of their own and changed our world. Like Hugo Cabret recreating a secret automaton (see: current blockbuster film *Hugo*) and the current fascination with all things created with gear-and-lever technology in ‘steampunk,’ tinkering is no longer your grandpa’s hobby!

The schedule of specific times and activities in the “Tinkering Studio” changes daily ~ it will be posted at the entrance of the exhibit. For more information, please visit our website at http://www.rhfleet.org/site/exhibition/tinkering_studio.cfm. **Read to bottom of release for influences!**

The Tinkering Studio was made possible by a major gift in honor of Grace and Jeffrey, and generous grants from the Kenneth T. and Eileen L. Norris Foundation and the Mandell Weiss Charitable Trust.

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Explorations include: Engineering and Structures, Simple Machines,

Tinkering Tessellations, Crazy Contraptions and Inventions

Kids can grab their tool belt and join us for an eventful series of classes devoted to the science of tinkering, at the Tinkering Studio Winter Camps, taking place the week after Christmas, with

individual supervision for all! Use design aspects from our new “Tinkering Studio” and “Geometry Playground” exhibitions to engineer mighty structures, experiment with unique geometry gadgets, and conjure up crazy contraptions out of recycled materials. Let the tinkering begin!

Tinkering Studio Winter Camps run December 26/27/28/29 and 30; from 9AM to 4PM daily. For grades 1-2 and 3-4; participants may sign up for a single day or enroll for the whole week. Registration fees are \$40.00 per day (members), \$45.00 per day (non-members).

Day 1/December 26: Engineering and Structures ~ Discover the engineering design process as you build teetering towers, broad bridges, phenomenal pyramids, and other colossal structures in this engineering extravaganza.

Day 2/December 27: Simple Machines ~ Discover the fascinating forces that allow simple machines to make doing work easier! Investigate inclined planes, pulleys, levers and wheels and axles to investigate how things move in this riveting day of devices.

Day 3/December 28: Tinkering Tessellations ~ Explore the world of geometry and construct crazy creations using shapes and patterns. Investigate how to use tanagrams, kaleidoscopes and Spirographs© to formulate all kinds of fascinating projects!

Day 4/December 29: Crazy Contraptions ~ Let your imagination run wild in designing and building a crazy contraption to amaze your family and friends using recyclable materials. Investigate how you can incorporate physics to move, spin, roll or shake your amazing gizmo.

Day 5/December 30: Inventions ~ Calling all inventors! Discover the science behind some of your favorite inventions based on the Fleet’s “Tinkering Studio” exhibit. Create mock-silly putty, discover how springs work and think outside the box to plan, design and build an ingenious invention. Tools included –just bring your imagination!

The “Tinkering Studio” and Winter Camps enable students and families to explore new materials, investigate new technologies, and build new creations. They are encouraged to engage in inquiry, the scientific process of asking and answering questions. Inquiry is part of both national and state educational standards for science, yet there is very little opportunity in most schools to actually practice it. The Reuben H. Fleet Science Center is proud to offer these experiences to provide important enrichment to augment school curricula and foster a deeper understanding and enjoyment of both the process of scientific inquiry and its hands-on applications.

For more information, please visit our website at

<http://www.rhfleet.org/site/education/camps.cfm?EduCamp=WinterCamps>

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 IMAX Heikoff Dome Theater, featuring the world’s first NanoSeam™ Dome screen in an IMAX Theater. Watch for our new state-of-the-art Digital Dome projection system in February 2012! 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 exhibit are available for download at:

<http://www.rhfleet.org/media/images/index.cfm>



“TINKERING STUDIO” INFLUENCES

THOMAS ALVA EDISON (February 11, 1847 – October 18, 1931) was an American inventor and businessman who developed devices that greatly influenced life around the world, including the phonograph, the motion picture camera, and a long-lasting, practical electric light bulb. Dubbed "The Wizard of Menlo Park" by a newspaper reporter, he was one of the first inventors to apply the principles of mass production and large teamwork to the process of invention, and is often credited with the creation of the first industrial research laboratory. Edison is the fourth most prolific inventor in history, holding 1,093 US patents in his name, as well as many patents in the UK, France, and Germany. Numerous inventions that contributed to mass communication and, in particular, telecommunications include a stock ticker, a mechanical vote recorder, a battery for an electric car, electrical power, recorded music and motion pictures. His advanced work in these fields was an outgrowth of his early career as a

telegraph operator. He originated the concept and implementation of electric-power generation and distribution to homes, businesses, and factories – a crucial development in the modern industrialized world. His first power station was in Manhattan, NY. {Wikipedia}

LEONARDO di ser Piero DA VINCI (April 15, 1452 – May 2, 1519) was an Italian Renaissance polymath: painter, sculptor, architect, musician, scientist, mathematician, engineer, inventor, anatomist, geologist, cartographer, botanist and writer whose genius epitomized the Renaissance humanist ideal, the archetype of the Renaissance Man, a man of "unquenchable curiosity" and "feverishly inventive imagination". One of the greatest painters of all time, he was educated in the studio of renowned Florentine painter, Verrocchio. His earlier working life was spent in the service of Ludovico il Moro in Milan. He later worked in Rome, Bologna and Venice and spent his last years in France, at the home awarded him by Francis I. Renowned primarily as a painter - the Mona Lisa, The Last Supper, his drawing of the Vitruvian Man; his paintings together with his notebooks, which contain drawings, scientific diagrams, and thoughts on the nature of painting; compose a contribution to later generations of artists only rivalled by Michelangelo. Revered for his technological ingenuity, he conceptualised a helicopter, a tank, concentrated solar power, a calculator, the double hull and outlined a rudimentary theory of plate tectonics; but few of his designs were constructed or even feasible during his lifetime. Some smaller inventions, such as an automated bobbin winder and a machine for testing the tensile strength of wire, entered the world of manufacturing unheralded. He made important discoveries in anatomy, civil engineering, optics, and hydrodynamics, but he did not publish his findings and they had no direct influence on later science. {Wikipedia}

ALEXANDER GRAHAM BELL Alexander Graham Bell (March 3, 1847 –August 2, 1922) was an eminent scientist, inventor, engineer and innovator credited with inventing the first practical telephone. Bell's father, grandfather, and brother had all been associated with work on elocution and speech, both his mother and wife were deaf, profoundly influencing Bell's life's work. His research on hearing and speech further led him to experiment with hearing devices which culminated in Bell being awarded the first US patent for the telephone in 1876. In retrospect, Bell considered his famous invention an intrusion on his real work as a scientist and refused to have a telephone in his study. Many inventions marked Bell's later life, including groundbreaking work in optical telecommunications, hydrofoils and aeronautics. In 1888, Alexander Graham Bell became one of the founding members of the National Geographic Society. Bell has been described as one of the most influential figures in human history. {Wikipedia}

HEDY LAMARR Although better known for her Silver Screen exploits, Austrian actress Hedy Lamarr became a pioneer in the field of wireless communications following her emigration to the US. The international beauty icon, along with co-inventor George Anthiel, developed a "Secret Communications System" to help combat the Nazis in World War II. By manipulating radio frequencies at irregular intervals between transmission and reception, the invention formed an unbreakable code to prevent classified messages from being intercepted by enemy personnel. Lamarr and Anthiel received a patent in 1941, but the enormous significance of their invention was not realized until decades later. It was first implemented on naval ships during the Cuban Missile Crisis and subsequently emerged in numerous military applications. But most importantly, the "spread spectrum" technology that Lamarr helped to invent would galvanize the digital communications boom, forming the technical backbone that makes cellular phones, fax machines and other wireless operations possible. {WomenInventors.com}

GEORGE WASHINGTON CARVER Born into slavery, freed as a child, curious throughout life, Carver profoundly affected the lives of people throughout the nation. He successfully shifted Southern farming away from risky cotton, which depletes soil of its nutrients, to nitrate-producing crops such as peanuts, peas, sweet potatoes, pecans, and soybeans. Farmers began rotating crops of cotton one year with peanuts the next. Carver spent his early childhood with a German couple who encouraged his education and early interest in plants; went to Simpson College in Iowa, in 1877 then transferred to Iowa Agricultural College in 1891 (now Iowa State University); earning a B.S. and an M.S. In 1897 Booker T. Washington, founder of the Tuskegee Institute, convinced Carver to serve as director of agriculture. From his laboratory at Tuskegee, Carver developed 325 different uses for peanuts--until then considered lowly food fit for hogs--and 118 products from the sweet potato. Other Carver innovations include synthetic marble from sawdust, plastics from woodshavings, and writing paper from wisteria vines. Carver only patented three of his many discoveries. "God gave them to me," he said, "How can I sell them to someone else?" Upon his death, Carver contributed his life savings to establish a research institute at Tuskegee. His birthplace was declared a national monument in 1953, and he was inducted into the National Inventors Hall of Fame in 1990. {about.com}

STEVEN PAUL JOBS (February 24, 1955 – October 5, 2011) was an American businessman and inventor widely recognized as a charismatic pioneer of the personal computer revolution. He was co-founder, chairman, and chief executive officer of Apple Inc.; co-founder and chief executive of Pixar Animation Studios; and a member of the board of directors of The Walt Disney Company. In the late 1970s, Jobs directed the aesthetic design and marketing of the Apple II series of personal computers. In the early 1980s, Jobs saw the commercial potential of Xerox PARC's mouse-driven graphical user interface, which led to the creation of the Apple Lisa and, one year later, of Macintosh. In 1985, Jobs left Apple and founded NeXT; acquired the computer graphics division of Lucasfilm Ltd, spun off as Pixar Animation Studios, and was credited in Toy Story (1995) as an executive producer. He remained CEO and majority shareholder at 50.1 percent until its acquisition by The Walt Disney Company in 2006. Apple's 1996 buyout of NeXT brought Jobs back to the company he co-founded, becoming permanent CEO in 2000, spearheading the advent of the iMac, iTunes, iPod, iPhone, and iPad. Jobs fought an eight-year battle with cancer, resigned as CEO in August 2011, then elected chairman of Apple's board of directors. On October 5, 2011, around 3:00 p.m., Jobs died at his home in Palo Alto. {Wikipedia}

DR. TEMPLE GRANDIN Prolific woman inventor Dr. Temple Grandin amazes people not for the great strides she has made to improve animal-handling devices, nor that she earned a Ph.D in animal science and became a world-renowned teacher and speaker; but that she accomplished all this while living with autism. With guidance and mentoring, Grandin, who didn't speak until she was nearly four years old, learned to use aspects of her autism to fuel her work as an inventor. The social stigmas may have helped inform her belief that animals should not be mistreated or subjected to a lower quality of life. To put her beliefs into practice, Grandin designed a number of inventions that use behavioral principles rather than excess force to control animals. Her restraint systems keep animals calm and prevent them from getting hurt, and her center-track restraint system is currently used to handle nearly half of all the cattle in North America. She has designed livestock handling facilities around the world, and developed an objective scoring system for assessing the handling of cattle and pigs at meat plants. A prominent author and expert on autism; she strongly believes the characteristics of the condition can be controlled and modified. Featured on "Today," "48 Hours" and "20/20;" written about in People, Forbes and The NY Times; and profiled in a recent feature film. {WomenInventors.com}

JUAN LOZANO, a Mexican inventor with a lifelong obsession with jet packs, invented the Rocket Belt. Juan Lozano's company Tecnologia Aeroespacial Mexicana sells the Rocket Belt for a hefty price. According to their website, "founder Juan Manuel Lozano has been working with hydrogen peroxide propulsion systems since 1975, inventor of the penta-metallic catalyst pack to be used with organic hydrogen peroxide and inventor of the most popular machine in the world to produce you own hydrogen peroxide to be used as a rocket fuel." {about.com}

RUBE GOLDBERG (1883-1970) was a Pulitzer Prize winning cartoonist, sculptor and author. Born in San Francisco; graduated from UC Berkeley with a degree in engineering, worked for the City of SF Water and Sewers Dept.; then worked in the sports dept of a SF newspaper, submitting drawings and cartoons to the editor until published. Rube soon moved to NY to work for the Evening Mail drawing daily cartoons, which led to syndication and a national presence. A founding member of the National Cartoonist Society, a political cartoonist and a Pulitzer Prize winner, Rube was a beloved national figure and oft-quoted radio and TV personality. Best known for his "inventions", Rube's early years as an engineer informed his most acclaimed work. A Rube Goldberg contraption – an elaborate set of arms, wheels, gears, handles, cups and rods, put in motion by balls, canary cages, pails, boots, bathtubs, paddles and live animals – takes a simple task and makes it extraordinarily complicated. He had solutions for How To Get The Cotton Out Of An Aspirin Bottle, imagined a Self-Operating Napkin, and created a Simple Alarm Clock. The promise and pitfalls of modern technology make Rube Goldberg's inventions even more relevant now. From think-tanks in Silicon Valley, to the NY Times, to "Meet the Press," hardly a day goes by without the name "Rube Goldberg" being invoked. In fact Rube Goldberg is an adjective in Webster's Dictionary. {rube Goldberg.com}

MISTER GEPPETTO is a fictional character in the novel The Adventures of Pinocchio by Carlo Collodi. Geppetto is an elderly, impoverished woodcarver and the creator (and thus father) of Pinocchio. He carves a talking block of pinewood into a marionette and names him "Pinocchio". Before he is even built Pinocchio already has a mischievous attitude; no sooner than Geppetto is finished carving Pinocchio's feet does the puppet proceed to kick him. Once the puppet has been finished and Geppetto teaches him to walk, Pinocchio runs out the door and away into the town and into further adventures in becoming a 'real boy.' {Wikipedia}

Dr. EMMETT BROWN (*Back To The Future*) "Doc" Brown is a scientist whose research and experimentation lies primarily in the field of physics, but spans from nuclear physics to astronomy. Doc's main invention is a time machine; a DMC DeLorean automobile with a flux capacitor that channels physical energy into 4-dimensional travel through space-time continuum. {imdb.com}

"To invent, you need a good imagination and a pile of junk." - Thomas Edison

"You can discover more about a person in an hour of play than in a year of conversation." - Plato

"Discovery is the ability to be puzzled by simple things." - Noam Chomsky

"The art and science of asking questions is the source of all knowledge." - Adolf Berle

“To understand is to invent.” - Jean Piaget

“When you can do the common things in life in an uncommon way, you will command the attention of the world. -
George Washington Carver.

“There is an art to science, and science to art; the two are not enemies, but different aspects of the whole.” - Isaac Asimov

“We learn more by looking for the answer to a question and not finding it than we do from learning the answer itself.” -
Lloyd Alexander

“Creativity is the type of learning process where the teacher and pupil are located in the same individual.” - Arthur
Koestler

“Things are not difficult to make. What is difficult is putting ourselves in a state of mind to make them.” - Constantin
Brancusi

“The 'silly question' is the first intimation of some totally new development.” - Alfred North Whitehead

“Creativity is the ability to see relationships where none exist.” - Thomas Disch

“The first rule of intelligent tinkering is to save all the parts” - Paul R Ehrlich

“When you're curious, you find lots of interesting things to do.” - Walt Disney

*A “Rube Goldberg Machine” is an extremely complicated device that executes a very simple task in a complex, indirect way. This is now used as an expression to describe any system that's confusing or complicated and came about from Goldberg's illustrations of absurd machines.

The novel: *The Invention of Hugo Cabret*, by Brian Selznick

“It's the most beautiful, complicated machine I've ever seen. [. . .] It's a windup figure, like a music box or a toy, except it's infinitely more complicated.” (Selznick, 114)

“[. . .] the other automata I've seen were all built by magicians for use in their performances [. . .] some magicians started off as clockmakers. They used their knowledge of machines to build these automata to amaze their audiences. The sole purpose of the machines was to fill people with wonder, and they succeeded.” (Selznick, 115)

The Invention of Hugo Cabret, a novel by Brian Selznick, follows the story of an orphaned boy who lives in the walls of a Paris train station, caring for the giant clocks. Hugo learned the trade from his father, who had been a skilled clockmaker before he died in a fire. For months, Hugo blamed himself for his father's death. The horologist had been working late one night on an obsession that he and Hugo shared: an ancient, rusty automaton that had they had found in the attic of a museum. The automaton was intricate, complicated, and broken, but Hugo's father filled several notebooks with drawings of its hundreds of parts in hopes that he would one day be able to restore it to working order. After the night of

the fire, Hugo finds the charred automaton and the remaining notebooks and decides that he will fix the machine. His secret hope is that the automaton, which is mechanically designed to hold a pen and write a message, was altered by his father to hold a new secret message – a last word – for *him*.

In order to gather parts for the automaton, Hugo begins to steal small mechanical toys from Georges, a toymaker in the train station. He breaks them into their parts and fits them into the machine according to his father's drawings. One day, George catches sight of Hugo and the drawings of the automaton in notebook, and becomes very upset. As it turns out, the automaton was originally built by Georges, who is really George Méliès: a famous filmmaker, magician, and an inventor of wonderful machines. The automaton, which Hugo eventually restores, does not write out a secret message from Hugo's father, but instead draws a key scene from one of Méliès' most famous movies, *A Trip to the Moon* (1902). This discovery eventually rescues Méliès from obscurity and he is granted the recognition he deserves by the French Film Academy.

More on the real George Méliès:

George Méliès was a French filmmaker who worked in cinema at its inception at the turn-of-the-century. He was also a magician, and owned and performed at the Théâtre Robert-Houdin, where his shows regularly featured automatons, among other illusions. Méliès loved automata and owned a large collection. In 1895, he witnessed the Lumière brothers' first public screening of a film, and after attempting to purchase a camera from them (they refused to sell), he built a working camera using parts from his automatons. The connection between magicians, cinema inventors, and automatons is not so surprising considering the familiarity with machines and desire to innovate demanded by all three in this period. Méliès became known for leveraging his mechanical genius to design innovative special effects, including substitution, multiple exposures, time-lapse photography, and dissolves. *A Trip to the Moon* (1902), which was featured in *The Invention of Hugo Cabret*, is considered to be an important early science fiction film that creates elements of magic and fantasy through its narration and its clever use of the cinema apparatus.

A Trip to the Moon (1902): <http://www.youtube.com/watch?v=7JDaOOwOMEE>

Steampunk:

Steampunk is a science fiction/fantasy vision that imagines steampower era style (i.e. Victorian Britain or the Wild West) blended with the capabilities of modern technology. It sometimes features complicated gear-and-levers machinery that performs futuristically: mechanical computers, for example. It refers back to the styles of Jules Verne, H.G. Wells, and Mary Shelley. Other popular film reference points include the movie *Wild Wild West* (1999) starring Will Smith and Kevin Kline, Terry Gilliam's *Brazil* (1985), and *League of Extraordinary Gentlemen* (2003).

