Perfomances plus!

Presents

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**MASS Ensemble in Critical Mass**

**Wednesday, May 3rd, 2006**

10am, Concert Hall

Study Guides are also available on our website at [www.fineartscenter.com](http://www.fineartscenter.com) - select Performances Plus! from Educational Programs, then select Resource room.

The Fine Arts Center wishes to acknowledge MassMutual Financial Group for its important role in making these educational materials and programs available to the youth in our region.
MASS ENSEMBLE
Presents
CRITICAL MASS

Company Overview

MASS Ensemble has been fusing music with technology, sculpture, dance and aerial performance for over a decade to create futuristic performing arts concerts. Thrilling audiences all over the world, they have built a loyal audience that is constantly awaiting the next big idea from MASS (MASS is an acronym for Music, Architecture, Sonic, Sculpture).

Now, Mass Ensemble has taken a quantum leap forward with an exciting new production entitled CRITICAL MASS. CRITICAL MASS is high concept, high impact entertainment that fuses the concepts of science with Mass Ensemble’s power to create emotion through performances that stir the soul. With CRITICAL MASS, Mass Ensemble has invented a highly interesting and educational show that is equally cutting edge as it is informative.

MASS Ensemble is a collaborative project that combines the creative forces of artists, musicians, composers and choreographers. The project is guided by Artistic Director, Bill Close whose focus is to bring forth a balance of cutting edge artistic and musical excellence. Through the exciting blend of sculpture, music, dance and the visual arts, MASS continues to delight audiences throughout the U.S. and abroad. MASS Ensemble is known for large scale, sculptural instruments and kinetic musical performances. The Earth Harp, “The World’s Longest Stringed Instrument” and other invented instruments are unique to the ensemble, as they were designed and created by Bill Close. The giant sculptural instruments provide an amazing musical and visual landscape in which the artists perform. In an Earth Harp installation, the bridge and chamber of the instrument rest on the stage as the strings travel out over the audience and attach to the back of the hall. The process turns the concert hall itself into an instrument. In outdoor settings the Earth Harp has been strung to the top of buildings, over valleys and to the top of mountains.
Show Overview

Critical MASS takes the audience through a series of scenes. Each scene reveals a new musical instrument /musical experience that is inspired by a scientific concept. The instruments, voiceovers, projections and choreography combine to reveal an understanding and feeling that is related to each scientific principle. The musical compositions also enhance the understanding of the scientific concepts. The principles explored all relate to the understanding of what mass is and how it transforms into energy. The music varies in style from epic symphonic rock to ambient trance, to heavy driving percussive. The musical power of the high-energy spectacle scenes is balanced out by solo musical vignettes, giving the audience a dynamic range of musical experiences. The over all structure of the show is based on the life of a star, which is the largest single source of mass and energy. The show leaves the audience with a powerful ending, generating an excitement and resonance of the sounds, images and concepts of the show.

“In Einstein's universe, mass is converted into energy in the cores of stars, enabling them to shine, while matter curves space, and time flows faster or slower depending on relative motion or gravity. Einstein's General Theory of Relativity has largely stood the test of time; its manifestations are evident in the observable universe. The current models of how the cosmos began and evolved are largely founded upon Einstein's theory.”

Instruments and their **Scientific Explanations**

**The Earth Harp**

3 Earth Harp pods will rest at various locations on the theater stage and will be strung to rigging points throughout the venue. The audience sits inside of the strings as the venue becomes transformed into an actual musical instrument! The Earth Harp resonates the concepts of wave theory and helps to explain the nature of light and sound in music.

**Long Bow Harp**

The Long Bow Harp is a 25ft long stringed instrument. It is constructed of brushed aluminum and is inspired by sailing vessels. The Long Bow expresses the interaction between two performers creating oneness through sonic exploration.
**Drum Clouds**

These floating clusters of drums come to life through the expertise of master percussionists. *The Drum Cloud serves as a unique projection surface to tell the story of Einstein and CRITICAL MASS.*

**The Drum Orb**

![The Drum Orb image]

The Drum Orb is a sphere of electro / acoustic drums that together create a wide range of percussive voices. Performers work inside of and around the instrument creating amazing patterns of synchronized drumming, choreography, and percussive explosions. *The Drum Orb creates a thermonuclear reaction of percussive energy that emanates from the stage and electrifies the audience.*

**Wing Harp**

![Wing Harp image]

The Wing Harp is a brushed aluminum soprano stringed instrument. It hangs on stage and can spin and soar through the air. *Audiences sail on solar waves across the universe as MASS Ensemble’s ethereal Wing Harp sends sound across time and space.*

**Sun Sitar**

![Sun Sitar image]

The Sun Sitar is a giant sitar like instrument that creates deep resonant tones that resemble the qualities of North Indian classical music. *CRITICAL MASS tunes people of all ages into the infinite vibrations of the big bang as the Sun Sitar drones the raga of creation.*

**Spinning Drumbrellas**

![Spinning Drumbrellas image]

These spinning drum sculptures come to life through the hands of performers and dancers. The kinetic instrument spins and twirls with awesome percussive power. *Experience the infinite density of mass and the bending of space, time and the imagination as MASS Ensemble performs on their giant Spinning Drumbrellas.*
Albert Einstein Biography

By the time Albert Einstein died at the age of 76, he had totally transformed the way that we see the universe, including our very notions of space and time. Not bad for someone who struggled at school.

Einstein was born in Ulm, Germany in 1879. As a schoolboy, his work didn't scream "genius" and even his teachers found it hard to reconcile the student they had known with the great scientist he later became. After finally graduating from the Polytechnic School in Zurich, he couldn't find a job in a university so he worked for the Swiss Patent Office and spent his spare time working on theoretical physics problems.

The time that Einstein spent thinking about physics rather than patent applications was well spent and in 1905, whilst still at the patent office, he published three papers in the leading German physics journal, Annalen der Physik. These papers on Brownian motion, the photoelectric effect and special relativity contained explanations and ideas that changed the way we all view the world. At the age of just 26, Einstein had produced not one, but three groundbreaking pieces of work.

By the time he finally found an academic job in 1909, Einstein's reputation as one of the greatest scientists of all time was spreading rapidly. And in 1915, at the age of 36, Einstein produced his theory of general relativity which delved even further into the workings of the universe.

But Einstein's private life was not as successful as his academic life. In 1903 he married his first wife, Mileva Marie, but not before they had a daughter, Lieserl, who they put up for adoption in 1902. Einstein and Mileva also had two sons, Hans Albert in 1904 and Eduard in 1910, but by 1914 divorce proceedings had started. And in 1919, Einstein married his cousin, Elsa, who had nursed him through serious illness.

After being awarded the 1921 Nobel Prize for physics for his work on the photoelectric effect, Einstein became closely involved with the development of quantum theory before moving on to pursue the search for a grand unified theory that would tie all of physics together.

In 1933, Einstein escaped the persecution of Jews by Nazi Germany by accepting a position at the Institute for Advanced Study at Princeton, USA where he spent the rest of his life. Einstein was a pacifist and although he initially supported the use of atomic weapons as a deterrent in the Second World War he later campaigned for nuclear disarmament and world peace.

Einstein died in 1955 of heart failure and became an icon of genius.

excerpted from: http://www.einsteinyear.org/facts/biography
Critical MASS explores some important scientific concepts

**Expanding Universe:** In 1929 Edwin Hubble measured the redshifts (light seen from distance galaxies) of a number of distant galaxies. He also measured their relative distances by measuring the apparent brightness of a class of variable stars in each galaxy. When he plotted redshift against relative distance, he found that the redshift of distant galaxies increased as a linear function of their distance. The only explanation for this observation is that the universe was expanding.

**E=MC**\(^2\): The most famous part of special relativity is the equation \(E=mc^2\), where \(E\) is energy, \(m\) is mass and \(c\) is the speed of light. The equation stems, in part, from the relationship between energy and momentum that Einstein developed to ensure that the speed of light was the same for everyone no matter what they were doing. The equation tells us that energy and mass can be changed from one to the other - that they are equivalent.

**Gravity:** The natural force of attraction exerted by a celestial body, such as Earth, upon objects at or near its surface, tending to draw them toward the center of the body.

**Mass:** The mass of an object refers to the amount of matter that is contained by the object; the weight of an object is the force of gravity acting upon that object. Mass is related to "how much stuff is there" and weight is related to the pull of the Earth (or any other planet) upon that stuff.

**Mass Transfer:** When objects orbit each other, matter may be transferred from the less dense to the denser object. The more massive, compact object "accretes" matter from its neighbor due to its greater gravitational pull. This is referred to as Mass Transfer.

**Mass Collapse:** When the inward gravitational pull of an object is no longer resisted by outward pressure, it collapses catastrophically, converting some of its mass into gravitational energy and radiating gravitational waves.

**Mass Explosion:** Cosmic explosions such as supernovae, which may follow the collapse of a massive star, trigger shock waves in the surrounding space. As long as the explosion and resulting shockwave are non-spherical, they will trigger gravitational waves.

**Sonic Boom (The Speed of Sound):** When an airplane moves at supersonic speeds, the air pressure waves begin to pile up ahead of the airplane and compress, forming shock waves.
The Speed of Light: The speed at which light travels in a vacuum; the constancy and universality of the speed of light is recognized by defining it to be exactly 299,792,458 meters per second or 186,282.397 miles per hour.

The Sun: A star that is the basis of the solar system and that sustains life on Earth, being the source of heat and light.

Vibration: A limited reciprocating motion of a particle of an elastic body or medium in alternately opposite directions from its position of equilibrium, when that equilibrium has been disturbed, as when a stretched cord or other body produces musical notes, or particles of air transmit sounds to the ear. Quick motion to and fro; oscillation, as of a pendulum or musical string. Light, sound, mass are all working with the principles of vibration. It is believed that mass at its tiniest form is made of vibrating strings.

For the Classroom

Critical Mass can be tied into the *Earth and Space Science* curriculum of the Massachusetts Science and Technology/Engineering Curriculum Framework.

Here are some questions to think about and work on before coming to see MASS.

1) If there were no limits to creating a musical instrument, what sort of instrument would you create? How do you play it? Can you draw what it might look like?

2) The Architect Frank Lloyd Wright said, “Architecture is frozen music”. Can you see music when you look at architecture? Find rhythmic patterns in the architecture of your classroom. Find an architectural space / room that changes the sound of your voice, perhaps a big hall or stair well.

3) The Science of sound. The science of strings. What is Sound? – Vibration. Sound is waves of vibration that take many different shapes and sizes. What is Pitch? How high or low a sound is, which is determined by the frequency of a sound wave, the size.

4) Name some stringed instruments. What happens to the pitch when a string gets shorter? (The pitch goes up, or higher) What happens to the pitch when a string gets longer? (The pitch goes down, or lower)

As the majority of the MASS instruments are based around long string technology, it is important to know how long strings are played. First a player puts on a cotton glove that has rosin powder on the fingers. The glove helps to hold the rosin and keep natural oils
off the strings. Two fingers lightly pinch the string and run along. This action creates a compression wave within the material of the string. The fingers push the vibration along in a similar manner that one might create tone by running their finger around the edge of a glass. The action produces tones akin to cello or viola, however they are more resonant with upper harmonics. The tones are pure and beautiful.

**Try this!**
Using a thin glass (fine crystal wine glasses work well) with a bit of water, wet your finger and run finger around edge of glass to produce a tone. This is creating a compression wave. This is the same type of vibration used by the players of the Earth Harp to create tone on the long strings.

**Draw Music.**
Listen to a piece of music and draw what that music sounds like. Draw the waves of the music, the colors of the music, the rhythmic patterns of the music; whatever you think the music sounds like!
E=FAC²: Other Events During the Week!
UMass Fine Arts Center 30th Anniversary Celebration
In Collaboration with the UMass Department of Physics

Art and science come together in a celebration that includes technology, sculpture, music, dance, yoga, physics demos, juggling and everything else touched by the laws of physics. In residence for five days, Mass Ensemble will bring their world premier performance of Critical Mass and will install a giant playable Earth Harp. Come help us celebrate our 30th birthday and the joy of physics. Bring the family, bring your desire for something new, and bring your best Einstein impersonation.

Community Day
Sunday, April 30
11am – 3pm
UMass Fine Arts Center Lobby, Plaza and Student Union Gallery

Happenings on the Plaza

Installation of Giant Earth Harp
Watch as members of Mass Ensemble install a giant earth harp from the roof line of the FAC building to the plaza. When completed, come and pluck a few strings.

Also
UMass Jugglers
Grillin’ and Chillin’ with UMass Catering Barbeque and Herrell’s Magic Ice Cream Bus
Travel the cosmos pathway and learn about our solar system.
Einstein look-alike contest for children and adults
Music
Physics-based Dance
Live radio with WRSI The River 93.9FM
Hands-on science activities from Mad Science
And more!

Happenings in the Lobby
Amazing demonstrations of the laws of physics
Presented by the UMass Physics Department, come and enjoy exhibits using optical illusion and light. You won’t believe your eyes! The exhibits will be available for viewing all day on community day and during box office hours (10am to 6pm), April 30 – May 4.

Across the Pond
The Art of Science
Student Union Gallery Exhibit
Travel the cosmos pathway from the plaza to the Student Union Gallery where you view some truly astonishing images from science. From fantastic outer reaches of space to the tiniest particles here on earth, these images are awe-inspiring. Courtesy of the
UMass Physics Department and the Student Union Gallery. For more details on the exhibit visit: [http://courses.umass.edu/critmass/](http://courses.umass.edu/critmass/)
Gallery Hours: 11am to 5 pm M-Th (see Opening Reception, below)

**In the Concert Hall**
**Minuteman Band in Concert**
George N. Parks, conductor
Rick Cook, graduate assistant conductor
A fun afternoon of Concert Band music for the whole family with music from John Philip Sousa & Fisher Tull; and premiering an arrangement by Keith Murray of *Lord of the Rings* from the Academy Award-winning movie.
Fine Arts Center Concert Hall at 3pm, $10 general public, $5 for students youth 18 and under and senior citizens.

**Monday, May 1**
**Sound and Yoga Workshop**
Experience the healing practice of yoga with the giant Earth Harp providing the music.
Led by Mass Ensemble artist and Los Angeles yoga teacher Andrea Brook.
Outside on the plaza (Lobby if rain) at 4pm
Call 413-545-3671 for info.
Open to the Public, Free

**Einstein’s Big Idea**
PBS NOVA Presentation
A dramatization of the remarkable story behind the equation E=mc².
Flavin Hall, Isenberg School of Management Rm 137 at 7pm
Open to the Public, Free

**Tuesday, May 2**
**Arts in Business Lecture**
Join the Artistic Director of Mass Ensemble, Bill Close, for a multi-media lecture on how major corporations integrate the arts into their business practice.
Campus Center Rm 168 at 4pm
Open to the Public, Free

**The Art of Science Exhibit Opening Reception**
Come see the mergence of art and science and meet the physics folks behind the exhibit and the artists of Mass Ensemble. Presented by the UMass Physics Department.
Student Union Gallery 5pm – 7pm
Open to the Public, Free

**Wednesday, May 3**
**Einstein made (Relatively) Simple**
Lecture by UMass Physics Professor Guy Blaylock
Flavin Hall, Isenberg School of Management Room 137, 4pm
Open to the Public, Free
E=FAC² is presented in collaboration with the UMass Physics Department and Office of Student Affairs and Campus Life.

For a complete list of events visit: www.fineartscenter.com/criticalmass

UMass Physics Department involvement, including gallery images and explanations, physics demonstrations in FAC lobby, and more information about Professor Blaylock’s lecture on Albert Einstein: http://courses.umass.edu/critmass/index.html

Mass Ensemble’s homepage: http://massensemble.com
Evacuation Procedures

In the event of an emergency requiring evacuation of the building, procedures are in place to ensure that the audience can exit safely.

Sections 4, 5, 6
Exit through the lobby.

Sections 1, 2, 3 & Pit
Exit toward stage.

Note: Interior house conditions may necessitate alternate exit routes.

Mezzanine 1, 2, 3
Exit rear through lobby.

Balconies 1, 2 exit toward stage, up two flights and down interior fire escape.
NOTICE TO ALL TEACHERS AND CHAPERONES

- **PERFORMANCES BEGIN PROMPTLY AT 10AM OR NOON.**
  Many of our performances sell out. This means we can have up to 1,600 students to seat. Please help us by arriving **30 minutes** prior to the start of the performance. This will allow our ushers to get everyone seated and for you and your students to visit the rest rooms and get settled. It is important that we begin our performances on time so that all schools can meet their lunch and/or dismissal times.

- **PLEASE CHECK LOCATION OF PERFORMANCE WHEN MAKING YOUR BUS RESERVATION.**

- The staff of the Fine Arts Center needs your help! An increasing number of students are coming into the performance space with gum, food, beverages and portable music players. **None of these items is allowed in the halls for performances.** Many of these items are stowed in backpacks and are not easily noticed. Our goal is to offer high quality performances for young people. In order to enhance the experience, we ask for your cooperation in preventing these items from entering the hall.

- For the comfort of all concerned, we ask that backpacks, lunches and other gear be left on the bus. Our long-standing policy of no cameras or tape recorders still is in effect.

- At the conclusion of the performance please remain in your seats until your school group is dismissed.

*We hope that you and your students enjoy your theatre experience!*
PARKING POLICY

FOR GROUPS NOT TRAVELING BY SCHOOL BUS

We are pleased to announce that we have made arrangements with the UMass Parking Services to allow our patrons to park in the Campus Parking Garage for the reduced rate of just $1 during your stay.

This rate is available to home school families and schools that will arrive by private transportation rather than by bus. Please let us know at the time you make your reservations that you will be traveling by car. Parking passes will be mailed with your invoice approximately one month prior to each performance. You will be sent a sheet that includes 10 parking passes that you may cut and give out to drivers in your group. Should you require additional passes, please photocopy the sheet. The passes are valid for the garage only on the date of your reserved performance. You may park in the garage for performances in either the Concert Hall, Rand Theater or Bowker Auditorium. Parking at meters on campus does not apply.

We hope that this policy will better meet your needs. Please do not hesitate to call our office if you have questions.

Programming Office: (413) 545 – 0190.
PARKING AND DIRECTIONS FOR THE FINE ARTS CENTER
CONCERT HALL and RAND THEATER

CONCERT HALL

School Bus Parking: Students should be dropped-off at Haigis Mall off of Massachusetts Avenue. University Security will direct buses to an appropriate parking lot during the performance (typically by the football stadium). PLEASE BE SURE YOUR BUS DRIVER KNOWS THAT ALL PERFORMANCES LAST APPROXIMATELY 1 HOUR AND THEY SHOULD RETURN A FEW MINUTES BEFORE THE ANTICIPATED END TIME. If drivers are not with the buses, they may miss the radio call from security asking them to return for pick-up, resulting in unnecessary delays returning to your school.

Individual cars: If necessary, individuals may drop-off students with a chaperone at Haigis Mall (you will be directed by security to the mid-point turn of Haigis Mall – see map) prior to parking. We recommend parking in the Campus Center Parking Garage to avoid searching for a metered space. It is a five-minute walk to the Concert Hall. All other available parking during weekdays is at meters. Available lots and pricing (current as of 9/1/04) are listed below:

Parking in the Garage is available to our patrons at a discounted rate of $1. To receive this rate you MUST give the Garage attendant a parking pass. To receive your pass, please call our office to let us know that you will be arriving by car. Parking passes are sent with the invoices. (413)545-0190

Parking meters are enforced Monday—Friday, 7AM—5PM. Meter rates are $1.00 per hour.

Parking Garage – near Campus Center, across from the Mullins Center off Commonwealth Avenue
Lot 34 – Behind Visitors Center with 3, 5 & 10 hour meters available
Haigis Mall – 2 hour maximum on meters
Lot 62 - Adjacent to Fernald Hall with 3 hour maximum on meters, limited spaces available.

From the North: (Vermont, Greenfield) I-91 south to Route 116. Follow signs on 116 “To the University of Massachusetts.” Exit ramp leads to Massachusetts Avenue. Turn left (east) on to Massachusetts Avenue toward the campus. Continue through one light and watch for Lot 34 by the Visitors Center on your right and the entrance to Haigis Mall on your left.

From the South: (Springfield, Holyoke) I-91 north to Route 9. East on Route 9 over the Coolidge Bridge and through Hadley. Left at Route 116 (across from Staples) heading north toward campus. Right at first exit at “University of Massachusetts” bear right onto Massachusetts Avenue toward campus. Continue through one light and watch for Lot 34 by the Visitors Center on your right and the entrance to Haigis Mall on your left.

From the West: (Northampton, Pittsfield) Route 9 east through Northampton and over Coolidge Bridge. Follow remaining directions from “From the South” above.

From the East: (Belchertown, Ludlow) North on Routes 21, 181 or 202 to Route 9 into Amherst. Right on to North Pleasant Street (main downtown intersection), north through center of town. Turn left at Triangle StreetBertucci’s Restaurant on your right), rejoining North Pleasant Street. To reach Lot 34 and Haigis Mall continue on main road, which becomes Massachusetts Avenue. Haigis Mall will be on your right, Lot 34 on your left.
For Concert Hall, Rand Theater and Bowker Auditorium – Patrons traveling by car are encouraged to park in the parking garage. Discounted parking is available in the garage for $1. A parking permit is required for discounted parking in the garage. Call the Programming Office if you require permits at (413) 545 – 0190. All other parking on campus is at available meters at the rate of $1 per hour. Parking is enforced Monday – Friday, 7AM – 5 PM.

Buses will drop-off students as indicated on map. Buses will be given parking instructions by Campus Security.