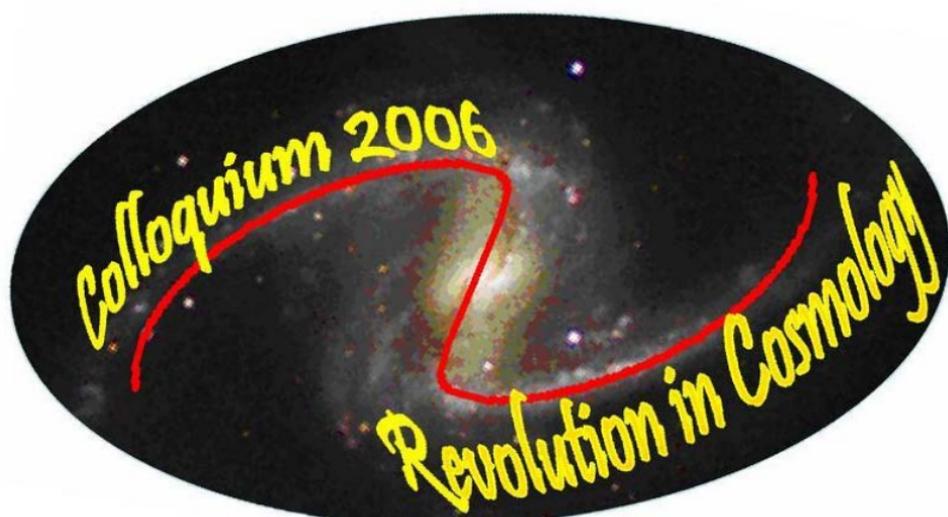


Mensa Colloquium 2006:

Revolution in Cosmology

**Presented by Mensa of
Northeastern New York**



**With the cooperation of American Mensa
&
Mensa Education and Research Foundation**

**Albany, New York
October 6 - 8, 2006**

Gentle Reminders

1. Registrants are required to wear their name badges at all times in a spot where a person of normal height can easily see them. Your badge is your admission to all colloquium sessions and meals. Meal tickets should be displayed on your table at the Saturday lunch and Saturday dinner.
2. If you need help or have questions look for a committee member or volunteer with a blue colored name badge.
3. Our speakers have generously agreed to appear before you. Please be considerate - - questions are fine but please be respectful.
4. Smoking is not allowed in any indoor public areas under New York state law. Please observe these laws.

Welcome from the Co-Chairs



Welcome to
Colloquium
2006:
Revolution in
Cosmology.

Our goal with
this event is to
paint a picture
that illustrates
why many
believe we
are on the
brink of a
scientific
revolution.
Our speakers
include
theorists and
experiment-
alists. They
bring to us
measurement
and pure
thought,

reality and possibility. We hope that by bringing these world renowned experts together we will create a stimulating mix that informs, inspires, and exhilarates you as you experience the revolution in cosmology.

Sit back and enjoy the ride.

Judy Keating and
Harry Ringermacher

The Program

Friday

- 3:00 pm Registration opens
- 5:00 Cocktails, Dinner
- 7:00 Introductions, Keynote Speaker: George Musser, “The Revolution for the Rest of Us” followed by audience questions
- 9:00 Adjourn to Atrium

Saturday

- 8:30 am Introductions
- 8:45 Francis Wilkin, “Cosmology Basics: What Most Cosmologists Can Agree Upon”
- 9:50 Coffee Break
- 10:15 Vera Rubin , “The Universe of Galaxies” followed by audience questions.
- 11:30 Break
- 11:45 Lunch
- 1:00 pm Jeremiah Ostriker, “Heart of Darkness” followed by panel discussion, audience questions.
- 2:40 Break
- 3:05 Lee Smolin, “What is Space? What is Time? Finishing the Revolution that Einstein Started” followed by audience questions.
- 4:20 Questions for the Speakers
- 5:00 Adjourn
- 6:00 Dinner
- 7:30 After-dinner speaker: Brian Greene, “Explaining the Elegant Universe”.
- 8:45 Panel discussion, audience questions.
- 10:00 Adjourn to Atrium

Sunday

- 9:00 am Introductions, summary
- 9:35 Marc Millis, “Cosmology through Breakthrough Spaceflight”.
Panel discussion, audience questions
- 10:45 Break
- 11:00 Open Q&A to panel
- 12:00 Colloquium ends

Location of Events:

**All speaker events are in Grand Ballroom
Salons D, E, F, G, and H.**

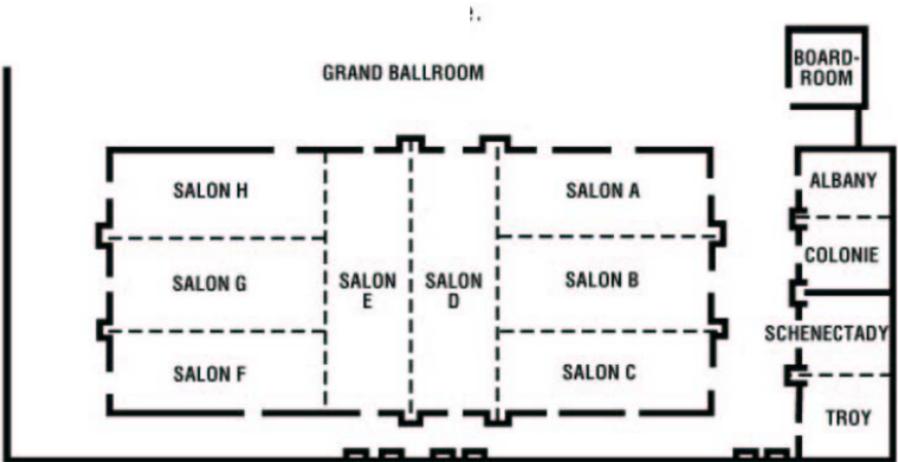
**Friday dinner and Saturday lunch and Sunday
breakfast are in the “City Rooms”
(Albany, Colonie, Schenectady,
and/or Troy) and Salons A, B, and C
and the Atrium.**

**Saturday lunch and Sunday breakfast are in the
“City Rooms” (Albany, Colonie,
Schenectady, and/or Troy) and
Salons A, B, and C.**

Saturday Dinner is in Salons D, E, F, G, and H.

“The Atrium” is the areas between the Grand
Ballroom and the “City Rooms” and the south exits.
It will host buffets, bars, book sales, and book
signings.

Colloquium
Registration



About the Co-Sponsors

American Mensa is an organization for anyone who scores in the top two percent on an accepted, standardized intelligence test. Mensa provides social interaction and mental stimulation to its 50,000 members through local, regional, national, and international gatherings. For more information about the organization call 1-800-66MENSA or visit www.us.mensa.org.

The Mensa Educational and Research Foundation (MERF) is a philanthropic, non-profit organization funded primarily by gifts from Mensa members. MERF works to identify and foster human intelligence for the benefit of humanity and to encourage research into the nature, characteristics and uses of intelligence. MERF publishes a research journal, awards scholarships, and gives several awards for articles or papers on intelligence or giftedness.

Colloquium 2006 Co-Chairs:

Judy Keating & Harry Ringermacher (Speaker Chair)

Committee:

Steven Gapp	Ann McCarthy
Ken Gacioch	Joseph O'Malley
Willard Hoyt	Lisa Repko
Leo Kellogg	Glenn Wendt

Panel Moderators:

Ken Schick, Union College, Bailey Professor of Physics, Emeritus

Larry Mead, University of Southern Mississippi, Professor of Physics

John Blinke, Mensa Bulletin "Supplementally" columnist

Special Thanks to:

Chris Edwards, Chicago Mensa and Colloquium 2007 Co-Chair

Friday

October 6, 2006

“Somewhere, something incredible is waiting to be known. “

Carl Sagan

George Musser



George Musser is a staff editor, writer, and troublemaker for *Scientific American* magazine in New York. He did his undergraduate studies in electrical engineering and mathematics at Brown University and his graduate studies in planetary science at Cornell University, where he was a National Science Foundation Graduate Fellow. His thesis work modeled mantle convection on Venus in order to explain broad plateaus, known as coronae, mapped by the *Magellan* orbiter. Musser served as editor of *Mercury* magazine and of *The Universe in the Classroom* tutorial series at the Astronomical Society of the Pacific, a science and science-education nonprofit based in San Francisco. The *San Francisco Examiner* called *Mercury* “the most exciting and thought-provoking astronomy magazine for several light-years around.” As a firm believer in empirical science, he awaits conformation of this assessment by the Voyager space probes over the next 10,000 years.

At *Scientific American*, his primary focus remains space science, meaning everything outside the ionosphere. He continually finds himself drawn to a subject far more challenging than astrophysics: human society. A number of articles he solicited and edited have appeared in *The Best American Science Writing* and *The Best American Science & Nature Writing* anthologies. Musser was the originator and one of the lead editors for the single-topic issue “A Matter of Time” (Sept. 2002), which won a National Magazine Award for editorial excellence, and he coordinated the single-topic issue “Crossroads for Planet Earth” (Sept. 2005), which won a Global Media Award from the Population Institute and was a National Magazine Award finalist.

The Revolution for the Rest of Us Presented by George Musser:

In the time-honored tradition of essayists and paper-givers everywhere, I'd like to question the premise of my own title. Is the revolution in cosmology really a revolution? There are good reasons for thinking it isn't. By "revolution," people generally refer to two broad developments since the late 1990s: (1) a new level of precision in measurements of cosmic expansion, the cosmic microwave background radiation, and large-scale structures, and (2) a "concordance" model that accounts for all these observations. It is a strange revolution that endorses the status quo, but this one did: the model was already cosmologists' favorite, and even its strangest aspect, dark energy, had been mulled for decades. So it isn't a paradigm shift like the discovery of the expanding universe in the 1920s. Moreover, the supposed revolution hasn't had the broad cultural ramifications of, say, the Copernican revolution. Cosmology these days is likelier to be ignored than put on trial.

I think these developments have the potential to be revolutionary in scientific and cultural senses. Cosmology has become part and parcel of efforts by fundamental physicists to unify quantum mechanics and Einstein's general theory of relativity into a single theory. The universe is both a testing ground for theoretical ideas & a source of new research questions. The unified theory, in turn, could reveal whole new principles on which the natural world is based. We might glean some hints of these principles from the remarkable properties of the universe revealed by modern cosmology: the way order has emerged from randomness, the hierarchy of scales, the possibility of multiple universes, the special role played by information. In short, the revolution in cosmology may not strictly be one, but could herald the start of one.

Saturday

October 7, 2006

*“First of all, we must note that the
universe is spherical.”*

Nicolaus Copernicus

Francis Wilkin



Francis Wilkin is an astrophysicist with primary interests in the physics of star formation. He had his undergraduate training in physics and astronomy at the University of Massachusetts,

Amherst, receiving his BS in 1989. He went on to graduate studies at University of California at Berkeley where he received his Ph.D. in Astronomy in 1997. He did Postdoctoral research work at NASA Ames Research Center in 1998, California Institute of Technology 1999-2000 and Observatoire de la Cote d'Azur, France in 2001. He worked at the Universidad Nacional Autonoma de Mexico / Centro de Astronomia y Astrofisica, 2002-2004. He has been a faculty member of the Department of Physics and Astronomy at Union College in Albany, NY, since 2004.

He has worked on subjects relating to star formation, protostars, stellar winds, and astrophysical shocks.

**“Cosmology basics:
What most cosmologists can agree upon”
presented by Francis Wilkin**

Dr. Wilkin will discuss some of the basic observations and theoretical concepts upon which our understanding of the Universe rests. These include the age, size, and density of the observable universe, universal expansion, the cosmic microwave background, chemical abundances, and the formation of structures such as galaxies and superclusters. He will review the observations that point to the existence of dark matter and dark energy, whose nature remains one of the greatest unsolved problems of science.

Saturday

October 7, 2006

*“Science progresses best when
observations force us to alter our
preconceptions.”*

Vera Rubin

Vera Rubin



Vera C. Rubin is an observational astronomer who has studied the motions of gas and stars in galaxies and motions of galaxies in the universe for 75% of her life. Her work was influential in discovering that most of the matter in the universe is dark.

She is a graduate of Vassar College, Cornell University, and Georgetown University; George Gamow was her thesis professor. A staff member at the Department of Terrestrial Magnetism, Carnegie Institution of Washington since 1965, she is now a Senior Fellow. She is a member of the National Academy of Sciences, and the Pontifical Academy of Sciences. President Clinton awarded her the National Medal of Science in 1993. Among other honors, she received the Gold Medal of the Royal Astronomical Society (London) in 1996. The previous woman to receive this medal was Caroline Herschel in 1828. She has honorary degrees from Harvard, Yale, and Princeton, among other colleges. Vera is active in encouraging and supporting women in science. Her husband and their four children are Ph.D. scientists in physical chemistry, geophysics, astronomy, and mathematics.

“THE UNIVERSE OF GALAXIES”

Presented by Vera Rubin

Every civilization, from the time of the earliest humans to the present day, tells stories about the universe. What is known in each epoch reflects mostly the available technology. Today astronomers know that bright galaxies and clusters of galaxies populate the universe, but make up less than 10% of its matter. The remaining matter is dark, and is inferred by its gravitational effect on the bright matter that we study. As early as 1784, discussions of dark matter were in the literature, although attempts to evaluate the importance of these non-luminous bodies were rare before the early part of the 20th Century. Following a brief discussion of the early history, I will tell the story of the bright universe that we know, and the dark universe that is obscure.

Saturday

October 7, 2006

*“In order to make an apple pie from
scratch, you must first create the
universe. “*

Carl Sagan

Jeremiah Ostriker



Jeremiah Paul Ostriker is a distinguished astrophysicist at Princeton University. He received his B.A. from Harvard, his Ph.D at the University of Chicago in 1964, and carried out post-doctoral work at Cambridge, England. From '71 to '95, Ostriker was a professor at Princeton, and served as Provost from '95 to '01. From '01 to '04, he

was appointed as “Plumian Professorship of Astronomy & Experimental Philosophy” at Cambridge. He has since returned to Princeton as Distinguished Visitor, Institute for Advanced Study. He is a Fellow of the American Association for the Advancement of Science. He serves on the board of trustees, American Museum of Natural History, and is a member of the American Academy of Arts and Sciences, American Astronomical Society and associate member of the Royal Astronomical Society.

President Clinton awarded him the National Medal of Science in '00. Among many other honors, he received the Karl Schwarzschild Medal from the Astronomische Gesellschaft in '99 and the Gold Medal of the Royal Astronomical Society in '04.

He's very influential in advancing the theory that most of the mass in the universe is not visible at all, but consists of dark matter. He worked in the development of sophisticated numerical simulations of the evolution of the universe & formation of structure in cosmology, including galaxies, clusters of galaxies, & intergalactic medium. The Ostriker & Steinhardt concordance model (a flat universe with a cosmological constant) has received strong support from observations of distant supernovae & fluctuations in the cosmic background radiation. He married noted poet & essayist Alicia Ostriker in '59.

“Heart of Darkness”
presented by Jeremiah Ostriker

In the last 100 years, an extraordinary amount has been discovered about the universe. It wasn't until the 20th century that astronomers discovered that ours was not the only galaxy, but one of many. Later still we were able to use increasingly sophisticated telescopes that allowed us to see so far out into space that we can actually look back in time. Some of the finding in our own neighbourhood is especially troubling.

It is all around us; it fills the universe and yet we cannot see it, touch it or even determine what it is. Astronomers the world over are still trying to explain this elusive presence in the Universe - a presence with nothing except its weight to prove its existence. So far all it has is a name: dark matter.

But this increased knowledge brings with it even deeper mysteries.

Once we realized we could calculate the weights of planets and stars by measuring their gravitational pull, we started to realize that there was much more matter in the Universe than can be accounted for by the visible objects alone.

There are elements - particles of some kind perhaps - that don't shine, don't react with anything and yet they exist in the Universe. It seems to be their gravity that is the "glue" that holds galaxies together, and is responsible for the growth of cosmic structures from tiny early seeds.

More recently still, we have discovered strong evidence to suggest that alongside this dark matter is an even stranger component of “dark energy”, which dominates gravity and is causing the Universe to expand at an ever accelerating rate. What this means for the future of this Universe is something we can still only guess at.

Saturday

October 7, 2006

“There are many hypotheses in science which are wrong. That's perfectly all right; they're the aperture to finding out what's right. Science is a self-correcting process. To be accepted, new ideas must survive the most rigorous standards of evidence and scrutiny. “

Carl Sagan

Lee Smolin



Lee was born in New York City in 1955 and raised there and in Cincinnati. After leaving high school early, he attended Hampshire College and the Univ. of Cincinnati, graduating from Hampshire in 1975 with a degree in Physics

and Philosophy. He attended Harvard University receiving a Ph.D. in theoretical physics. He held postdoctoral positions at the Institute for Advanced Study in Princeton, The Institute for Theoretical Physics (now KITP) in Santa Barbara and the Enrico Fermi Institute at the Univ. of Chicago. This was followed by faculty positions at Yale, Syracuse and Penn State Universities, where he helped to found the Center for Gravitational Physics and Geometry. He held visiting positions at various times at Cambridge and Oxford Universities and at SISSA and the Universities of Rome and Trento in Italy. He was a Visiting Professor at Imperial College. In September of 2001 he moved to Canada to be a founding member of the Perimeter Institute for Theoretical Physics, where he has been ever since.

Lee's main contributions to research are in the field of quantum gravity. He was, with Abhay Ashtekar and Carlo Rovelli, a founder of loop quantum gravity, but has also contributed to string theory, the foundations of quantum mechanics, elementary particle physics and theoretical biology. He has a strong interest in philosophy and his three books, *Life of the Cosmos*, *Three Roads to Quantum Gravity* and *The Trouble with Physics* are in part philosophical explorations of issues raised by contemporary physics.

Lee's hobbies include jazz guitar and dingy sailing.

**“What is space? What is time? Finishing the
revolution that Einstein started.”
presented by Lee Smolin**

A bit more than a century ago Albert Einstein initiated a revolution in physics with his simultaneous inventions of the relativity and quantum theories. A great many key discoveries have been made since then, but the revolution began then has yet to be completed. Among the things left to do are to find the correct unification of Einstein's theory of space and time- general relativity-with quantum theory.

In this talk I will explain what are the five key problems that must be solved before the revolution Einstein started is completed and highlight some of the progress that has been made towards them. I will describe one point of view about what our view of nature will be once the revolution is completed. I will also explain the key obstacles that must be overcome before we finally obtain a complete and comprehensive theory of the new universe Einstein discovered.

Saturday

October 7, 2006

“We had the sky up there, all speckled with stars, and we used to lay on our backs and look up at them, and discuss about whether they was made or only just happened. “

Mark Twain

Brian Greene



Brian Greene received his undergraduate training at Harvard University where he graduated Summa Cum Laude in '84. He went on to graduate school at Oxford University as a Rhodes Scholar and received his doctorate in '86. From '87-90, he was a postdoctoral

fellow at Harvard. In '90 he joined the faculty of Cornell University as assistant professor. By '95 he had been promoted to tenured associate then full professor, along the way winning an Alfred P. Sloan Foundation Fellowship & National Science Foundation Young Investigator Award. In '96, Professor Greene left Cornell to join Columbia University, where he holds a full professorship in the Physics and the Mathematics Departments. He is co-director of Columbia's Institute for Strings, Cosmology, & Astroparticle Physics

His research interests focus on quantum mechanical properties of space & time and hold many fundamental discoveries in String Theory. Dr. Greene and his colleagues showed that in string theory – by including quantum mechanics – the fabric of space can tear, establishing that the universe can evolve in far more dramatic ways than Einstein had envisioned.

In the '03, Dr. Greene hosted the 3-part NOVA “The Elegant Universe” which won an Emmy Award & a '04 Peabody Award for broadcast excellence.

He authored the national bestsellers, *The Elegant Universe*, winner of the Aventis Prize, Britain's top science book award, & the basis of the Nova Series, and *The Fabric of the Cosmos: Space, Time & the Texture of Reality*. The Washington Post describes him as “the single best explainer of abstruse concepts in the world today.”

“Explaining the Elegant Universe” presented by Brian Greene

Superstring theory is a framework that seeks to complete the revolution in our understanding of spacetime initiated by Einstein with his special and general theories of relativity. While very much a work in progress—and thus still a highly tentative framework—string theory has already suggested compelling modifications to our understanding of matter, gravity, black holes, field theory, geometrization, topological evolution, as well as offering substantial insights into various mathematical disciplines. Nevertheless, there are key areas in which the theory must make significant progress in order to realize its potential and enter the arena experimentally confirmed theories of nature. In this talk I will review the basic ideas and motivations for string theory, and then give a state-of-the-art assessment of the field.

Sunday

October 8, 2006

“We live in ancient times.”

Harry Ringermacher

Marc Millis



Marc Millis is NASA's leading expert on Breakthrough Propulsion Physics - covering such visionary goals as gravity control, space drives, and faster-than-light travel. When funded the Breakthrough Propulsion Physics Project assessed 8 different research approaches and documented its findings in 16 peer-reviewed

journal reports.

Millis joined Cleveland's Glenn Research Center in 1982 after earning a degree in Physics from Georgia Tech. His assignments evolved from engineering support into research and eventually into project management in a variety of areas of rocket science. All the while Millis spent his discretionary time pondering how to make rocketry obsolete, which eventually led to the creation of the Breakthrough Propulsion Physics Project. This gained wide attention, being cited in Newsweek, Wired, Popular Science and the New York Times.

Millis recently completed a Masters of Science in Physics Entrepreneurship from Case Western Reserve University and is an alumnus of the International Space University Summer Session.

Millis pursues futuristic visions outside of NASA. He founded the nonprofit Tau Zero Foundation in 2006, to accelerate progress and education toward practical interstellar flight. In 2005, Millis authored: "Making the jump to light-speed" a chapter in the National Geographic book: Star Wars - Where Science Meets Imagination. Millis enjoys craftsmanship such as building award-winning science fiction scale models and publishing "how-to" articles on the projects. Amidst all of this, Millis enjoys time as a husband and father.

“Cosmology Through Breakthrough Spaceflight” presented by Marc Millis

"Space drives," "Warp drives," and "Wormholes:" these concepts may sound like science fiction, but they are being written about in reputable journals and have reawakened consideration that human voyages to other star systems might someday become possible. While such utilitarian ambitions might seem irrelevant to the lingering mysteries of cosmology, this perspective changes the way we look at the same phenomena. Curiosity-driven physics aims to find the simplest underlying laws that govern *everything*. Interstellar flight, on the other hand, seeks *only* a propulsion breakthrough - a means of moving spacecraft more efficiently and quickly across vast interstellar distances. In the first step of the scientific method where one defines the problem, the initial problem statement affects how subsequent data and hypotheses are formed. The Cosmic Background Microwave Radiation, Dark Matter, Dark Energy, and the very meaning of inertial frames and spacetime take on a different meanings. With this change of perspective, additional paths toward solutions are opened. By pursuing new ways to move through the cosmos, we might very well improve our understanding of the cosmos.

Special Guest, Mary Keating,

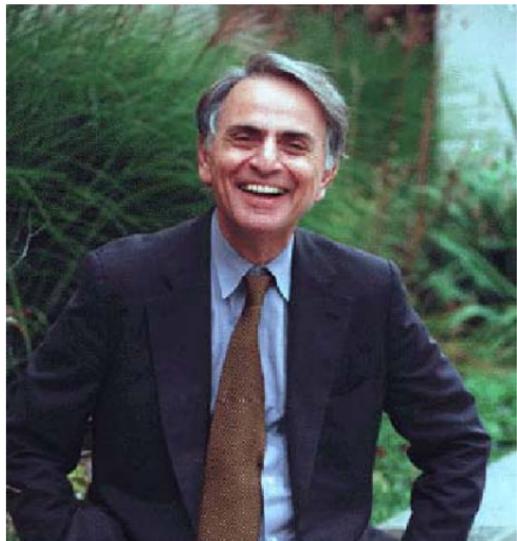


Mary was a secretary to Carl Sagan in 1968 during his professorship at Harvard University. After leaving his position as Mary's superior he went on to earn NASA medals for Exceptional Scientific Achievement and Distinguished Public Service, he received 22 honorary degrees, co-authored or edited more than 20 books, published

more than 600 papers, won a Pulitzer Prize, won an Emmy and a Peabody Award, and was nominated for a Grammy. He also brought cosmology to the hearts and homes of PBS television viewers with his series "Cosmos".

Mary will be circulating throughout our colloquium and is likely to be seated at the autograph table. She will be more than happy to share her experiences of working with the marvelous man and the times when manual typewriters were common place, carbon paper was the backup file, and personal computers were not to be found. Another memorable event in her brief time with Dr. Sagan was her first sighting of a mini skirt.

Thirteen years before her service under Dr. Sagan she gave birth to your colloquium co-chair, Judy.



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The Next Mensa Colloquium:

Colloquium 2007: The Aspects of Humor

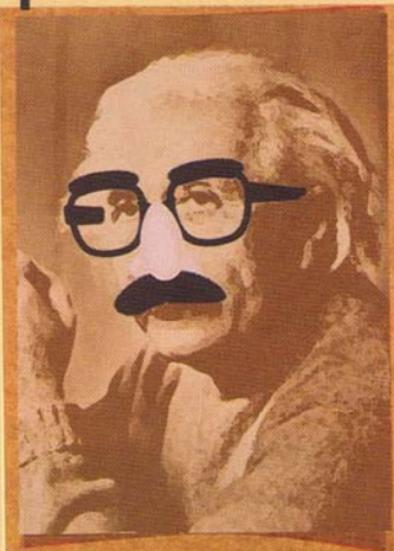
March 23 - 25, 2007 Chicago, Ill.

The program will be a Janus. Facing one direction, an inspection of the nature of humor within us and its role in our self and world views along with its origins and interactions with our physiology. The other face will be directed toward the mechanics, creation, presentation and daily utility of comedy along with hands-on workshops on exercising these insights.

Featuring:

Jest for the Health of it: Is Laughter Really the Best Medicine? Dr. Rod Martin

Joking Cultures: How Groups — Even Mensa — Develop a Humor Identity Dr. Gary Alan Fine



Comedy workshops to introduce the practice of improv, writing and physical comedy.

Registration for the entire weekend of activities and three meals is only \$170 for Mensans and \$220 for non-Mensans through Sept. 30.

Enrollment is limited, so don't slip up and leave it to the last minute — register online now at www.colloquium2007.us.mensa.org. If you prefer, you can send your registration form to Colloquium 2007, American Mensa, Ltd., 1229 Corporate Dr. West, Arlington TX 76006-6103. E-mail your registration questions to registration@colloquium.us.mensa.org.

Looking Forward:

If this weekend excites our membership enough to pull together a committee and host a Mensa Colloquium please contact Stuart Friedman, Mensa's intellectual events committee chair at intellectualevents@us.mensa.org.