



Stephen Hawking Amazes at Fermilab

by Christine Grusak

Few questions are broader or more all-encompassing than "Where did the universe come from?" On May 10, 1989, Stephen Hawking, Lucasian Professor of Mathematics at Cambridge University, arrived at Fermilab to join other scientists in seeking answers to this question. Hawking participated in the Wormhole Workshop organized by the Fermilab Astrophysics Group and gave a public lecture entitled "Black Holes and Their Children, Baby Universes." Hawking also authored a best-selling book, *A Brief History of Time - From the Big Bang to Black Holes*.

Hawking's third visit to Fermilab began with a press conference on May 10 in 1 West. The press conference was well attended by the media, including WBBM-TV, WMAQ-TV, the *Sun Times*, the Associated Press, and local news outlets.

Rocky Kolb, who co-heads the Fermilab Astrophysics Group, introduced Professor Hawking: "There have been two great developments in 20th-century physics - Einstein's Theory of Gravity, and Quantum Mechanics. By the end of the 1920s, the broad outline of the modern form of these theories had been developed. For the last 60 years the two theories have existed as separate edifices, and perhaps the most fundamental challenge of modern physics is to develop a single theory of quantum gravity to encompass these two revolutionary ideas. . . No one has been more successful in exploiting physical effects of quantum gravity than Stephen Hawking."

Hawking covered topics ranging from his concept of God to the possibility of time travel. When asked about his belief in God, Hawking replied, "I don't believe in a personal God. I wouldn't claim that my view of God is new. It is rather similar to that held by Einstein."

Hawking also believes that time travel as described in science fiction will not be possible. Such time travel might allow us to alter our own pasts, and Hawking said, "If it were [possible], we would have seen people from the future." Hawking explained that while particles could travel back in time, they do not alter the past.

When asked if he would achieve a single theory of quantum gravity, Hawking responded, "If we find a complete unified theory, it will be as a result of the work of many people. I hope to play a part, but any individual contribution will be small. It is possible that it could come within my lifetime."

Hawking also addressed several of the major questions facing cosmology. Asked about the possibility of looking beyond, or before, the creation of the universe, Hawking said, "You can't go back beyond the Big Bang. Time is defined only within the universe. To ask what happened before the Big Bang is like asking what happens north of the North Pole."

The two most important cosmological problems, Hawking said, are to discover why the cosmological constant is zero and why space-time has three dimensions of space and one of time. "Wormholes can probably answer the first question and possibly the second," he concluded.

Does Hawking ever find his work so far-fetched that his life no longer seems real? "I have enough practical problems to keep me in touch with reality," he quipped.

The press conference was marked by periods of quiet anticipation as Hawking formed his replies to questions on a special computer attached to his wheelchair. Diagnosed more than 20 years ago as suffering from ALS, or Lou Gehrig's disease, Hawking now communicates through a computer program called Living Center and a speech synthesizer. He often apologizes for the American accent of the synthesizer.

Though physically limited, Hawking has said his disability has given him more freedom to think. In 1974, Hawking showed that Black Holes, so-called because nothing, not even light, can escape their immense gravity, should actually emit radiation. In 1988, Hawking and Roger Penrose received the prestigious Wolf Prize in physics for their work on singularities - dimensionless points in space-time with infinite densities and irresistible gravitational pull.

The Wormhole Workshop addressed another important concept in cosmology. Wormholes signal the

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Fermilab Arts Series

When **Dorothy Donegan** nuzzles up to the piano, count on a demonstration of the "antic charm and thunderously strong piano work" that left the audience clamoring for more at last summer's Chicago Jazz Festival. Nonstop blues, ballads, boogie-woogie, and jazz classics await jazz buffs when bassist Larry Gray and drummer Joel Spencer join Dorothy Donegan in performance at Fermilab's Ramsey Auditorium at 8:00 p.m. June 17, 1989.

Raised on the South Side of Chicago in the 1930's, Dorothy Donegan received classical piano training at the Chicago Conservatory but drew attention to herself performing jazz. Her electrifying performances at Orchestra Hall as a teenager caught the ear of Art Tatum, whose friendship and encouragement set her on the track to an international performing career. Today, many critics rank her right at the top of the heap along with the likes of Oscar Peterson, Oliver Jones, Art Tatum, Mary Lou Williams, and Marian McPartland.

Dorothy Donegan is particularly known for her fast-paced, kaleidoscopic performances. She may perform such familiar tunes as "Round Midnight"

"Hawking" continued from page 1

creation of baby universes. They may also answer fundamental questions about the nature of time and space. The workshop began May 10 with a colloquium presented by Hawking and ended on May 13. Approximately 50 scientists from around the world attended the workshop.

On May 13, Professor Hawking gave a public lecture through the Fermilab Lecture Series. His talk provided a non-technical view of the development and significance of Black Hole theory. Tickets for the lecture were sold out well in advance of the Saturday evening event.

Hawking discussed some of the implications that the existence of Black Holes might have on our lives. In particular, he addressed the possibility of using Black Holes to travel through space and time. Hawking said, "If there are objects called Black Holes, which things can fall into, but not get out, there ought to be other objects, that things can come out of but not fall into. One could call these White Holes. One might speculate that one could jump into a Black Hole in one place, and come out of a White Hole in another. This would be the ideal method of

and "Tea for Two" in ragtime, gospel, or boogie-woogie styles. She may burst into stretches of stride piano at impossibly fast tempos, quote classical and pop tunes, or break into a singalong. And all this is done with a theatricality and bravura that leaves the audiences of this self-proclaimed "last of the red hot mammas" cheering for more.

Tickets for this performance of the Dorothy Donegan Trio are \$12. Reserve tickets by calling ext. ARTS weekdays between 10:00 a.m. and 12:00 noon, or 1:00 and 4:00 p.m. Phone reservations are held for five days, but due to ticket demand those not paid for within five working days will be released for sale.

Coming Soon

Stories - "Fridiculousness: Jonathan Frid in a Lighter Vein" - July 22

Showcase - "Straight from the Harp" - August 26, JazzHarp of Deborah Henson-Conant, Celtic Harp of Sileas, Paraguayan Harp of Alfredo Ortiz

Comedy - The Reduced Shakespeare Company - September 23

long-distance space travel . . . all you would need would be to find a nearby Black Hole."

Unfortunately, this method of space travel would be extremely unstable. Hawking explained, ". . . the slightest disturbance, such as the presence of the spaceship, would destroy the wormhole, or passage, leading from the Black Hole to the White Hole. The spaceship would be torn apart by infinitely strong forces. Anyone care to buy a ticket for the Titanic?"

Hawking also explained how baby universes form from Black Holes which have evaporated, or lost their mass through emitting particles and radiation. "What will happen then to objects, including possible spaceships, that fell into the Black Hole? A small, self-contained universe branches off from our region of the universe. This baby universe may join on again to our region of spacetime," said Hawking.

Hawking has been particularly interested in Black Holes and related objects because they may duplicate conditions at the instant the universe was created, answering the question "Where did the universe come from?"

In Memoriam

Muhammed Afdal
1933 - 1989

Muhammed Afdal, a member of the Research Division/Computing Department User Support Group during his four years at Fermilab, passed away on April 24. He is survived by his wife.

Changes in Procedure for Admittance to Railhead Yard

As of May 1, 1989, it was necessary to eliminate the guard at the Railhead Storage Yard entrance. As a result of this, new procedures have also been established for admittance into the Railhead area. These new changes are as follows and will be in effect until further notice: For entrance regarding storage items, contact Support Services on exts. 3577 or 2071

For matters involving radioactive items, contact Radiation Physics on ext. 3741. For scrap deliveries, arrangements need to be made through the Property Office on ext. 3585. We apologize for any inconvenience and ask your cooperation in this matter.

- Ron Haynes

Facilities Request Forms for Functions

This is a reminder that Facilities Request Forms must be delivered to the Accommodations Office, MS 332, at least two weeks prior to scheduled events. The time is necessary to avoid conflicts and evaluate cost implications.

When requesting food and beverage arrangements through the Cafeteria, please obtain a written estimate of the cost for these arrangements from Peggy McAuliff (ext. 3646) prior to submitting the form for approval.

Please note that the Laboratory has established a policy that no alcoholic beverages will be served at Barn parties prior to 4:00 p.m. and there will be no exceptions.

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Benefits Notes

Alert - Parents of 1989 Graduates

College graduation is around the corner for some employees' dependents. If they are enrolled in the Lab's medical and dental plans, their coverages terminate on graduation day, unless they will continue as full-time graduate students and are under 23 years old. If they do not have group medical and dental coverage elsewhere, they can elect to continue on the Lab's plans. Please call the Benefits Office at exts. 4362 or 4361 for additional information and an election form. - Paula Cashin

The Activities Office.

Swimming Pool Memberships



Season Pool Membership applications have been mailed. If you did not receive one, stop by 1 East/Activities Office or call ext. 2548. It's just that simple.

Swimming Lessons... First Come, First Served

Parents opting to have their children participate in swim classes are urged to apply *now*. An application can be found in the 1989 Swim Pamphlet. Mail this form to Jean Guyer, MS 125, before classes are filled.

Canoe Rentals

Planning to do a little canoeing? If so, reservations are being accepted. For more information or to reserve your canoe, call Jean Guyer, ext. 3126. Rental fee for canoes is \$5 per day/per canoe. Registration and payment must be made in advance.

Recreation Complex Memberships

Fermilab gym membership may now be purchased in the Activities Office from 8:30 a.m. to 4:30 p.m., Monday through Friday. The cost of a membership is \$30 or \$15 for students. You can't beat the price! Stop by and see Claudia Foster.

- Jean Guyer

Congratulations to:

Judy and James (*Accel. Div.*) Rosenzweig on the birth of Maxfield Aaron. Maxfield was born at 10:06 p.m. on May 5, 1989, at St. Joseph's Hospital in Chicago. He weighed 7 lbs, 4-1/2 ozs., and was 20-1/2 in. long.

Trudy's NALREC News

So, the **Old Timer's Party** was such a success that we are still trying to catch our breath. I didn't know we had that many Old Timers. However, most of them don't look old to me (everything is relative). The food was great, the band good, and the fellowship was outstanding. It was certainly good to see some of those folks again. I hope we do this again real soon. Thanks go out to Glenn Lee and Jo Baaske for a job well done.

There may still be time to get your tickets for the play **Shear Madness** on Thursday, May 25. Call Jesse Guerra for more information and availability.

Tom Regan and Mike Urso are in charge of the **Hard Times Party** to be held June 30th. They are finalizing their arrangements, which include swimming, a band, and some great summer foods. We hope the weather is agreeable, but if not, we will move inside and have a great time anyway.

Joe Morgan has arranged a bus for the **Cubs** game on one of the following tentative dates: June 8, Thursday, 7:00 p.m.; June 10, Saturday, 3:00 p.m.; June 24, Saturday, 3:00 p.m.; or July 20 or 21 at 1:20 p.m. Please contact him at ext. 4181 for further information.

Joe also has just 20 tickets for the **Bears-Detroit** game in September. The game will be held in Detroit. \$115 covers air fare, game tickets, and round-trip bus transportation to Midway Airport on the 23rd and back on the 24th. I believe it also includes hotel reservations, and rental cars are being considered. Call Joe for details. Tickets will go quickly.

Dominick Carullo also has made arrangements to provide several trips for both teens and adults for fishing, rafting, canoeing, etc. Call him on ext. 3187 for further information.

As of this writing, 67 people have responded positively to our questionnaire regarding the **Annual Family Picnic** - "Taste of Fermi." If you have not responded as yet, please do so immediately. We will be required to present various restaurants with an accurate count as to how many folks will be attending. Let's make the Picnic as fabulous a success as the Old Timer's Party was. Wasn't it good to see each other? - **Trudy Kramer**

FermiNews Classified Ad\$

FOR SALE

Motorized Vehicles:

1975 MG MIDGET CONVERTIBLE. Beautiful - runs great, 1-yr.-old engine. Has two convertible tops and tonue cover. \$3400. Call 859-0653.

1978 FORD FAIRMONT. 4 dr., auto trans., power brakes and steering, new engine, muffler, and exhaust system, 83,518 orig. miles. \$600 or best offer. Call 879-9034 after 5:30 p.m.

1979 FORD GRANADA, 91,700 miles, auto, ps/pb, air, good condition, two new tires, \$750. Call Jim at ext. 3281, or evenings and weekends: 983-9058.

1980 TOYOTA TERCEL. 5-spd. manual trans., new tires, new battery, new brakes, AM/FM cassette, rebuilt trans., body in great condition, needs some engine work. \$800 or best offer. Call Mark at 879-5896.

1986 MUSTANG LX HATCHBACK w/V6 engine, auto trans, factory T-tops, A/C, premium factory ster./cass., all power incl. windows and locks, tilt wheel, cruise control, new brakes, tires and wire wheels, alarm, rust-proofed, transferable warranty, very clean, white. \$6895. Call Jon at ext. 3281, 312-355-7075 evenings and weekends.

Miscellaneous:

POOL FILTER, 1-hp sand filter, \$75 or offer. WOOD OR COAL BURNING STOVE, white enamel finish, \$100 or offer. Call Tom at ext. 2474 or 897-6340.

CHAIN LINK FENCE, green vinyl coated, 42 in. high, 100 ft in various lengths, 11 posts, top rail and gate included. \$225.00. Call Jim Fagan at ext. 2474 or 620-4459.

IBM PS/2 MOD 50, 10-MHz 80286 μ p, 20-MB HD, 1.44 MB 3.5" FD, enhanced keyboard, IBM Proprinter II, PS/2 color display, Hayes 2400 BAUD internal modem/smart com, DOS 4.1/WINDOWS, EXCEL spreadsheet/database software, Retail: \$5544; all for \$4800. Call Bob at ext. 3769 or 879-6355.

JAYCON 2450 TRAVEL TRAILER. Sleeps eight, bath with shower, bunk beds, gas stove, refrigerator, heater, awning, air conditioner. Price: \$5,500. Excellent condition. Call Don Byrd ext. 4881 or 557-2397.

FOR RENT:

HOUSE FOR RENT (Carol Stream), three-bedroom colonial featuring 21' x 12' mbr, 1-1/2 ba., cac, fr, all appl., 2-car att. gar. w/edo, 20' x 18' deck w/gazebo, Cul-de-sac, walk to school and park, 1/2 m. to day care, 5 min. to Stratford Mall. \$1095/mo. 773-2729 or 972-2120.

HOME NEEDED:

FOR POINTER DOG, I found the dog and am unable to give him a permanent home. The dog is friendly, approximately two yrs. old, male. Call Janell at ext. 3377 or at home 815-795-5681.