Stellar discovery
Silicon carbide found in meteorite predates solar system

Scientists at the McDonnell Center for Space Sciences at Washington University have found the first evidence of silicon carbide in a primitive meteorite—microscopic grains that were formed before the solar system existed.

According to Thomas Bernatowicz, Ph.D., senior research scientist at Washington University and one of the authors of the cover story in the December 24 issue of the science journal Nature describing the find, the silicon carbide may provide scientists a link between the early stages of our solar system and stellar systems that predate it.

"The more materials we can peg as pre-solar system, the more accurately we can determine the kinds of materials that were present when the solar system was formed, as well as the stellar sources that contributed to the mix," Bernatowicz says.

Washington University, Monsanto researchers who have found the first evidence of silicon carbide in a primitive meteorite are, clockwise from left: Thomas Bernatowicz, Ph.D., senior research scientist at the McDonnell Center for the Space Sciences at Washington University; Phil Fraundorf, Ph.D., of Monsanto Co. Research Center; Ernst Zinner, Ph.D., and Brigitte Wopenka, Ph.D., both senior research scientists at the McDonnell Center; and Gail Fraundorf (seated), of Monsanto.

The Chicago scientists chemically processed 15 grams of the Murray meteorite that fell in western Kentucky 38 years ago. They distilled a small fraction of residues enriched in the noble gases, carbon and silicon.

The Washington University and Monsanto researchers subjected these residues to an array of sophisticated microanalytical instruments. Zinner measured the isotopes of silicon, carbon and nitrogen in mineral grains with an ion microprobe and found that their abundances were unlike those typical of solar system materials. Wopenka observed a spectrum corresponding to silicon carbide in an optical device called a laser Raman microscope. Then Bernatowicz and the Fraundorfs, using transmission electron microscopes, conclusively showed that the crystal structure, or arrangement of atoms, of the grains with the odd isotopic composition was identical to that of silicon carbide.

The key to identifying the silicon carbide as interstellar material older than the solar system is in the isotopic composition of the meteorite material, a sort of atomic fingerprint. (An isotope is a form of an element with a characteristic nuclear composition determined by the number of neutrons in the nucleus of an atom of the given element.)

In the Murray meteorite, Zinner determined that the isotopic compositions of carbon, nitrogen and silicon of the material were anomalous compared to that typically found in the solar system, proof of the silicon carbide's pre-solar origin. The silicon carbide in the meteorite, the physicists say, probably originated in the atmosphere of red giants, enormous stars larger than the sun that already have burned their hydrogen core and are burning helium.

"For years, astronomers have been observing what they thought was silicon carbide in stars with the use of infrared spectrometers," Zinner says. "Because the isotopes of carbon, silicon and nitrogen are present in abundances so different from the usual, and also because there was too much oxygen in the early solar system for silicon carbide to form, the indications are clear that the source for these grains is extra-solar system.

"The Washington University scientists believe the silicon carbide they found in the meteorite was formed in or around stars before the formation of our 4.6 billion-year-old solar system. The silicon carbide was expelled from these ancient stars and incorporated into the mixture of gas and dust that eventually collapsed to form the sun, planets, comets and meteorites.

Silicon carbide is very scarce in meteorites. In the Murray meteorite, it is present at the level of only a few parts per million.
The Eastman Brass, the brass quintet comprising resident faculty at the Eastman School of Music in Rochester, N.Y., will perform at 8 p.m. Saturday, Feb. 20, at Edison Theatre.

**Eastman Brass quintet to perform in Edison**

The Eastman Brass, the brass quintet comprising resident faculty at the Eastman School of Music in Rochester, N.Y., will take the stage at Washington University’s Edison Theatre at 8 p.m. Saturday, Feb. 20.

The Edison program includes "Music for Brass Quintet," by composer Gunther Schuller; "Gershwin Variations," by Rayburn Wright; and "Canzonets, Madrigals, Catches and Glees," arranged by the quintet’s horn player, Verne Reynolds.

Since its formation in 1964, the Eastman Brass has provided audiences with a varied and imaginative repertoire; ranging from Baroque to German and English music of the late Renaissance.

The ensemble has toured extensively throughout the United States and Canada and has performed in Israel and Central and South America.

Bob Marsh of the Chicago Sun Times writes, "When I get to heaven, I don't want harps. Give me a brass band like this one.

"Tickets to the performance are $15 to the general public; $10 for senior citizens and Washington University faculty and staff; and $7 for students. To reserve tickets, call the Edison Theatre box office at 889-6543."

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**1988-89 undergraduate tuition, room and board to increase**

Fees for the 1988-89 academic year at Washington University were announced Feb. 9 by Chancellor William H. Danforth.

Tuition will be $12,450 in 1988-89, while room and board will be $4,427 for a student living in a double room and using the regular meal plan. For the current academic year, tuition is $11,400, and room and board are $4,168. The 1988-89 increases are 8.4 percent over the fees charged for the current year.

"Washington University’s costs continue to rise faster than those in the general economy," Danforth said. "Our ‘product’ is education, which relies heavily on interaction between students and outstanding professors. We could save money by teaching larger classes with fewer faculty, but that is an outcome few would welcome and would not be consistent with what we are trying to achieve. In that sense, we are not like a factory producing goods that can save costs with productivity efficiencies.

"Beyond the cost of attracting and retaining talented faculty, we must also deal with other costs that are linked directly to quality. Examples are scientific materials and equipment, and books and periodicals for our libraries," Danforth added.

In Washington University’s undergraduate programs, income from tuition is more than 60 percent of all the income required. Other sources, notably gifts and income from the University’s endowment, are critical elements but provide less than one-quarter of the University’s basic academic and administrative functions," according to James Buchholz, vice chancellor for finance and administration.

"To help students and families meet its costs, Washington University has developed a Cost Stabilization Plan (CSP). The CSP program freezes tuition and room and board costs not covered by financial aid at the charges in effect during the first year of the agreement. The plan allows monthly installment payments over as many as 10 years at fixed interest rates, generally near the prime.

"As in past years, financial aid will increase to help our students cover increased costs. This should minimize the impact of these increases," said Dennis J. Martin, director of financial aid.

More than 50 percent of Washington University students receive need-based support.

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**Jacquelyn Rodgers, business school registrar, dies at age 60**

Jacquelyn L. Rodgers, 60, registrar at the John M. Olin School of Business, died Jan. 15, 1988. She had been hospitalized since Nov. 30, when she suffered a cerebral hemorrhage.

"Mrs. Rodgers first joined the University in 1966 as secretary-receptionist in the dean’s office of the College of Arts and Sciences. In addition, from 1971-78 she served concurrently as secretary to the field study committee of the college. She left the University in 1978 to become an administrative assistant in an insurance brokerage firm.

"She was featured in a 1972 issue of a campus newsletter. Her uncanny ability to remember the names of students in the college had earned her fame across the campus. In the article she remarked that she wanted ‘to convey the feeling that this (the college) is not some lofty tower but a warm place.’"

"Mrs. Rodgers came back to the University in 1981 as assistant to the business school registrar. After several promotions, she was named registrar in July 1987. She is survived by two sons, Michael P. of London, England, and Todd C. of St. Louis; a daughter, Gwen Toll of St. Louis; a sister and two brothers; and two grandchildren."

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**Provost search committee named**

A committee to search for a provost has been appointed by Chancellor William H. Danforth. The Provost Search Committee will be chaired by Ronald G. Evans, M.D., Elizabeth E. Mallinckrodt Professor of Radiology and head of the Department of Radiology.

W. Maxwell Cowan resigned from the position of provost and executive vice chancellor, effective Jan. 1, 1988, to become vice president and chief scientific officer of the Howard Hughes Medical Institute in Bethesda, Md.

Ralph E. Morrow, Ph.D., former provost, is serving as acting provost.

In addition to Evans, other members of the search committee are: Gary I. Boren, LL.B., professor of law; Harvey R. Colten, M.D., Harriet B. Speer Professor of Pediatrics and head of the Department of Pediatrics; Richard M. Diemer, D.D.S., Ph.D., associate dean for educational development, School of Dental Medicine; Nicholas Dopuch, Ph.D., Hubert C. and Dorothy R. Moore Professor of Accounting, Joshua A. Gordon, president of Student Union; Larry A. Haskin, Ph.D., Ralph E. Morrow, Distinguished University Professor and chairman of the Department of Earth and Planetary Sciences; Lucan W. Krukowski, Ph.D., professor and chairman of the Department of Philosophy; James E. McLeod, director of African and Afro-American Studies; Hyfrique M. McMahon, professor of art and director of graduate studies in the School of Fine Arts; Philip Needleman, M.D., Alumni Professor of Pharmacology and chairman of the Department of Pharmacology; Martha N. Ozawa, Ph.D., Bette Bofinger Brown Professor of Social Biology; Carl B. Safar, associate professor of architecture; Robert H. Salisbury, Ph.D., Sidney W. Souers Professor of American Government and chairman of the Department of Political Science; Barry E. Spielman, Ph.D., professor and chairman of the Department of Electrical Engineering; and Gloria W. White, associate vice chancellor, personnel and affirmative action.

**Editor:** Susan Killeen, 889-5254, Campus Box 1070.

**Assistant Editor:** Bridget McDonald, 889-5262, Campus Box 1184.

**Editor, Medical Record:** Joni Westerhouse, 809-6257, Medical School Campus Box 8065.

**Contributing Writers:** Debra Bernardo, Joyce Bono, Tony DiMartino, Regina Engellau, Tony Fitzpatrick, King McLoy and Carolyn Sanford.

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Harold Blumenfeld, professor of music, will have his first major orchestral work, "Diluvial," Evocations of A.R., premiered on Feb. 20, 1987, by the Cincinnati Philharmonic Orchestra performed it under the direction of its conductor, Gerhard Samuel. On Feb. 19, Blumenfeld's 1981 Rimbaud cantata, "La Face Cendrée," will receive its 16th performance, 20 years after the first performances of the Cincinnati College Conservatory. Blumenfeld's "Un Carnet de Danse," an extended setting of the final section of Rimbaud's "Sermont in Hell," was composed in early 1987 and premiered by the Voices of Change of Dallas with Blumenfeld serving as guest conductor.

Irving Engel, professor of architecture, has had a book published by Prentice-Hall Inc. The book, titled Structural Steel in Architecture and Building Technology, addresses the needs of architecture students and others in the building professions. The book is intended to serve as a college-level textbook as well as a professional reference.

Holllis Huston, Ph.D., assistant professor of political science, presented a paper, titled "Telling Lies and Selling Truth" at the Themes in Drama Conference Feb. 12-14 in Riverside, Calif.

Angela Miller, Ph.D., professor of psychology, presented a paper, forthcoming in the Journal of the American Counseling Association, which includes a cash award of $20,000.

Gerald R. Popelka, Ph.D., clinical research scientist at the Central Institute for the Deaf and professor of audiology, has been elected a Fellow of the American Speech-Language-Hearing Association (ASHA) at its 1987 annual convention in New Orleans. He also presented a tutorial session on "Digital Signal Processing for the Hearing Impaired" and participated in a panel on "Hearing Aid Selection Strategies and Proberub Microphone Measure" at the convention. Popelka served as an assistant member of a National Institutes of Health study section that reviewed project proposals in Washington, D.C.


Eugene Rubin, M.D., Ph.D., assistant professor of psychiatry, and John C. Morris, M.D., assistant professor of neurology, lectured at a conference on "Geriatric Mental Health: An Overview for the Primary Care Physician," held Nov. 13 at the University of Nebraska Medical Center in Omaha. Rubin presented psychiatry grand rounds, titled "Behavioral Manifestations of Alzheimer's Disease," and Morris presented medicine grand rounds, titled "Parkinson's Disease and Dementia.

Svetozar Stojevac, Ph.D., visiting scholar from the University of Belgrade who shares an appointment in sociology and philosophy, spoke on "East European Reflections on Glasnost" at the annual meetings of Christians Associated for Relationships with Eastern Europe in New York City.

Robert B. Thompson, J.D., professor of law, has published an article titled "What Federal Role Is Appropriate in the Regulation of Tender Offers?" in a recent edition of The National Law Journal. He also wrote an article on "Defining the Federal and State Realms of Tender Offer Regulation," which was published in Vol. 64, No. 4 of the Washington University Law Quarterly.

Carl P. Wellman, Ph.D., professor in the Humanities, has a selection of his poems included in the Anthology of 20th Century Native American Poetry.

Gene M. Zaffi, L.L.M., adjunct professor of law in the graduate tax program, spoke on "Tax and Financial Aspects of Buy-Sell Agreements" in the 34th annual tax conference of Missouri Tax Practitioners, held in Jefferson City.

Have you done something noteworthy?

Have you: Presented a paper? Won an award? Been named to a committee or elected an officer of a professional organization? The Washington University Record will help keep its readers informed of academic activities and professional honors. Faculty and staff, including Washington University's Faculty, staff and alumni professional activities are gladly accepted and encouraged. Send details along with your full name, highest earned degree, current title and department to: The Washington University Record, Box 136, 6510 Wallace Circle, Alumnae House, 6510 Wallace Circle.

Attorney General Richard J. Daley will be honored at this year's National Alumni Board of Governors dinner. Allen Martin Jr. has been named Board President for the upcoming year. Allen Martin Jr., the president of the National Alumni Board of Governors, will be honored at this year's National Alumni Board of Governors dinner. Allen Martin Jr., the president of the National Alumni Board of Governors, will be honored at this year's National Alumni Board of Governors dinner. Allen Martin Jr., the president of the National Alumni Board of Governors, will be honored at this year's National Alumni Board of Governors dinner. Allen Martin Jr., the president of the National Alumni Board of Governors, will be honored at this year's National Alumni Board of Governors dinner. Allen Martin Jr., the president of the National Alumni Board of Governors, will be honored at this year's National Alumni Board of Governors dinner.

Stellar discovery

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Newsmakers

Washington University faculty and staff make news around the globe. Following is a digest of media coverage that have received during recent weeks for their scholarly activities, research and general expertise.

How's 'Clean' Is Clean? asks an article about air quality. Jan. 4, issue of Newsweek. The Reagan years haven't been easy for environmentalists, who have had to fight for a majority or none at all. Congress will be reauthorizing the Clean Air Act of 1977, and in the next eight months intends to take a close look at what 'clean air' means. 'The Clean Air Act is badly out of date,' says Ken Bogdanski, a senior policy rector for the Center for the Study of American Business. 'However anyone has enough guts to cast it in the question.'
**CALENDAR**

**LECTURES**

Thursdays, Feb. 11
2:45 p.m. Dept. of Mechanical Engineering Lecture, "Special Element Methods for Incorporable Navier-Stokes Equations," Anthony Patera, assoc. prof. of mechanical engineering, MIT, 100 Cupples II.

**Lectures**

Friday, Feb. 12
4 p.m. Dept. of Chemical Engineering Seminar, "The Behavior of Immobilized Living Cells: Characterization Using Isotope Tracers," Roberton, Roberton, prof. of chemical engineering, MIT, 100 Cupples II.

Saturday, Feb. 13
11 a.m.-12:30 p.m. University College Seminar, "The Ideological Novel," Barbara Sarfaty, WU assoc. prof. of political science, mammals Lounge.
Sunday, Feb. 14
Monday, Feb. 15

**TUESDAYS**

**MUSIC**

Sunday, Feb. 14
7:30 p.m. Dept. of Music Piano Recital with Marilyn, graduate student in music, Graham Chapel.

**EXHIBITIONS**

"Oil Sketches from the Ecole des Beaux-Arts," drawings and paintings from the collection that won prizes in the French Academy between 1816 and 1865, Gallery of Art, upper and lower level galleries. Feb. 20-Apr. 17, 2:30-8:30 p.m. weekdays, 1:30-5 p.m. weekends. For more info., call 889-4523.
"Six Centuries of Notable Books: Highlights From Special Collections of Washington University," through April 8, Olin Library, Special collections, level 5, 9:30 a.m.-5 p.m. weekdays.
"Drawings by Sculptors," featuring the work of several contemporary artists. Through March 10, Sponsored by School of Fine Arts and WU Bill Bril Hidell Foundation, Hildell House, 6500 Forsyth Blvd. 9:30 a.m.-4:30 p.m. weekdays. For more info., call 889-4523.

**Wednesday, Feb. 17**
3:30 p.m. "The Importance of Community," Olin Library, level 5.

**Friday, Feb. 19**
10 a.m. Dept. of Political Science Seminar, "Our Interests and Our Interactions with Government," Barbara Sarfaty, WU assoc. prof. of political science, free, Simon Aud.
5 p.m. Bookmark Society Film/Discussion, "Hey, Mr. Tambourine Man," led by attorney Patricia Russell-McCloud for conversion of military-oriented property to civilian activity in both the St. Louis area and around the country. Registration fees, due by Feb. 1, arc $10 with lunch included or $5 if you bring your own lunch. To register or for more info., call 727-1096 (mornings) or 993-2464.

**CALENDAR**

The deadline to submit items for the Feb. 25-March 3 calendar is the Washington University Record is Feb. 11. Items must be typed and state time, date, place, nature of event, sponsor and admission cost. Incomplete items will not be printed. If available, include speaker's name and identification and the title of the event, also include your name and telephone number. Address items to King McElroy, calendar editor, Box 1070.

**Celebration**

Center. The featured menu items are Italian, Chinese, Mexican and Cajun food. The cost for the event is $7.65 for seniors, $5.50 for students and $5.50 for students with meal plan. Tickets may be purchased at the door.

The popular Mardi Gras party will be held from 7 to 9 p.m. on Friday, Feb. 19, and Sat., Feb. 20, in The Gargoyle. The party, which is free, is open to the Washington University community only.

As part of Cultural Celebration, the Washington University Filmboard will show the films "The Castle of Otranto," "Three Men and a Cradle," and "Witnes," "Black Narcissus" will be shown at 7 and 9 p.m. on Feb. 12 and 19, and "Three Men and a Cradle" will be shown at 7 and 9 p.m. Feb. 17 and 18. "Witness" will be shown at 7:30 p.m. on Feb. 19 and 20. On Feb. 21, it will be shown at 7 p.m. only. The films cost $2 and will be shown in Brown Hall Auditorium.

Cultural Celebration is sponsored by the Washington University Filmboard Activities, Residential Life and Stix International House. It is primarily funded by Student Union and the Congress of the South-40.

For more information on the event, call 889-5704. For more information on Cultural Celebration activities, call 889-5010.

**WEAPONS TOPIC OF ALL-DAY CONFERENCE**

The Department of Engineering and Policy is co-sponsoring an all-day conference on "Jobs and Weapons: Disarming Them — Economic Conversion Planning for the 1990s."

The conference, also sponsored by the St. Louis Economic Conversion Project and the Lentze Peace Research Laboratory, will be held from 9 a.m. to 4 p.m. on Saturday, Feb. 19, in Lopata Hall.

Topics to be discussed include the impact of military spending on the economy, how weapons production impacts the labor force, and strategies for campus efforts aimed at reducing the activity to civilian activity in both the St. Louis area and around the country.

Registration fees, due by Feb. 1, are $10 with lunch included or $5 if you bring your own lunch. To register or for more info., call 727-1096 (mornings) or 993-2464.