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COVER

Artist's conception of Renaissance Center, Detroit, Michigan, site of the AAAS Annual Meeting, 26-31 May 1983. See page 45 for information about the program. [Steve Shepherd, Gaithersburg, Maryland]

American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

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Is digging up that first premium stopping you from providing all the financial protection your family deserves? Then here's really good news. With the introduction of MOD ONE* October 1, 1982, Teachers Insurance has cut up to 50% from initial premiums on term policies of \$100,000 to \$249,000. And we've trimmed off even more for policies of \$250,000 and above. This means you now need only about half as much premium money "up front" to start a large new TIAA policy. Putting it another way, for roughly the same outlay as before you can now begin a new policy that provides twice as much immediate protection for your family!

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Policy Amount ▶	\$50,000	\$100,000	\$150,000	\$200,000	\$250,000
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First-year premium	\$126.75	\$169.00	\$253.50	\$338.00	\$380.25
Premium per \$1,000	\$2.53	\$1.69	\$1.69	\$1.69	\$1.52
Issued to women aged 35					
First-year premium	\$110.25	\$147.00	\$220.50	\$294.00	\$330.75
Premium per \$1,000	\$2.20	\$1.47	\$1.47	\$1.47	\$1.32

As you can see, premium rates for policies of \$100,000 to \$249,000 are ⅓ less than those for smaller policies, and for policies of \$250,000 or more, they're 40% less. Substantially lower first-year premiums for all ages and big discounts for larger policies encourage everyone to consider the higher levels of family protection they may have felt they just couldn't afford until now.

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Note to present TIAA policyowners: MOD ONE premium rates apply only to policies issued on or after October 1, 1982, but cash dividends payable in accordance with the 1982 scale will continue to provide equitable treatment for policies issued prior to that date.

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In our April issue:

A WINDOW ON THE SLEEPING BRAIN

In the really deep sleep that brings most respite from the cares of waking hours, the brain takes off into strenuous dreaming, evidenced by rapid eye movement under the closed eyelids. What is it that keeps the body from following the brain into the strenuous activity of the dream? Adrian Morrison has demonstrated the presence and function of a switch deep in the brain. By ingenious experiment with sleeping laboratory animals he has opened the switch, and the animals have proceeded to act out their dreams. His work illuminates the nature of REM sleep and the circuitry of motor control in both sleeping and waking hours.

Also in April: Hot springs on the ocean floor, early farmers of Northern Europe, chemical signals of social amoebae, silicon micro-mechanical devices, the structure of quarks and leptons, intuitive physics, a nuclear-weapon-free zone in Europe.

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ving Reich, and an exceptionally able recent graduate from F & M who had majored in biology. No enrollee had ever before taken a course called biology.

Each student's success was evaluated partially by his or her score on the College Board's 100-item 60-minute biology achievement test. After only 3 weeks the median score was 727, better than 95 percent of the able senior high school students who choose to take this difficult examination do after at least a school year of biology. Scores ranged from 590 (61st percentile) to two 800's (30 points above the minimum 99th percentile). All 25 students stayed the course, and four of them were among the 13 who enrolled in chemistry for the next 3 weeks.

Results for chemistry were at least as good as for biology. A 14-year-old boy scored 790 and 780 on the biology and chemistry achievement tests; another 14-year-old boy, legally blind, scored 740 and 800, respectively; a 15-year-old girl scored 790 and 740; and a 14-year-old girl scored 720 and 700. Most of the 34 students are working on college-level biology or chemistry, or both, during the present school year.

JULIAN C. STANLEY
WILLIAM G. DURDEN

*Johns Hopkins University,
Baltimore, Maryland 21218*

Science Resources for Schools does not claim that it can alleviate the shortage of scientists in the near future. This is one of several projects and activities that AAAS is undertaking to help bring some improvement in science education in the schools in the long run. Improving junior high school science teaching may not quickly solve the supply and demand problem, but eventually it could help make a difference.

The purpose of this particular AAAS project is to help the teachers, principals, librarians, and counselors in the schools do a better job of bringing science to all students. Goodness knows, much else remains to be done if there is to be real reform, including the use of part-time instructors and the challenging of gifted and talented students. Improvement ultimately depends upon many different people and organizations, including scientists and their professional organizations, working on various dimensions of the problem for an extended time.

F. JAMES RUTHERFORD

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Large-Scale Extinctions

The earth has been the scene of many extinctions during its long history. Some of them have occurred relatively slowly and are readily explained, for example, by gradual large-scale climatic changes or the appearance of successful competitors for ecological niches. But extinctions have occurred that have involved a large fraction of the existing life-forms. Suggestions have been made that such events might have been due to impacts of large bodies from elsewhere in the solar system. However, it was only a few years ago that evidence was presented for the simultaneity of a very large asteroid impact and extinctions at the end of the Cretaceous period (65 million years ago).*

The evidence took the form of a very large iridium anomaly in a thin layer in marine sedimentary rocks laid down at the end of the Cretaceous. This work was followed by reports of related occurrences in both marine and nonmarine sedimentary rocks in many different localities around the world. Attention was accordingly focused on questions about the frequency of large-scale impacts and their immediate and longer term signatures. These important questions came to involve efforts by geologists, geochemists, geophysicists, paleontologists, chemists, and physicists and led to a very lively interdisciplinary meeting in Snowbird, Utah, in October 1981. The papers presented at the meeting were recently published in a book† that would make good reading for a wide audience.

There are about 1000 asteroidal bodies with diameters greater than 1 kilometer whose orbits cross that of the earth. About three of these hit the earth every million years. Smaller bodies are more abundant and collide more frequently. The postulated Cretaceous projectile had a diameter of about 10 km. Objects of this size are not very abundant and they may strike the earth about once every 40 million years. A 10-km object having a velocity of 25 km/sec would bring with it an energy of about 4×10^{30} ergs.

Evidence of many collisions is found on the moon, Mars, Mercury, and Earth. On the earth the best studied impact feature is the Ries crater in West Germany. It is 26 km in diameter and about 800 meters deep and was formed about 15 million years ago by the impact of an object 1 to 2 km in diameter. Studies of the ejecta provide a picture of tremendous manifestations of energy in the form of high pressures, high temperatures, and high-velocity projectiles.

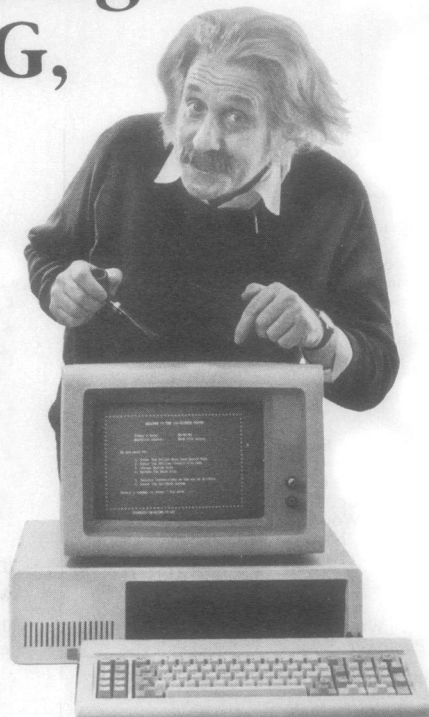
Aside from the iridium anomalies, the principal evidence for a major event 65 million years ago comes from paleontology. Effects differed widely among the various genera on land and sea. Those most affected were planktonic calcareous shelled organisms living in near-surface regions of the tropical oceans. Benthic creatures and siliceous shelled organisms were less affected. John Lewis and colleagues have suggested that a substantial lowering of the pH of surface waters was involved. They point out that, with the high temperatures associated with a large impact, tremendous quantities of nitrogen oxides would be formed. These would be converted to nitrous and nitric acids and would descend to the earth in the form of acidic precipitation. On land the large buffering capacity of soil would neutralize the acid, but at sea the top layer has little buffering capacity and mixes only slowly with deeper waters.

Not all scholars agree that a major impact occurred at the end of the Cretaceous.‡ We are only at the beginning of discovering and interpreting phenomena connected with impacts of large bodies on the earth. The new book provides a valuable benchmark of the state of knowledge and speculations in this important field.—PHILIP H. ABELSON

*L. W. Alvarez, W. Alvarez, F. Asaro, H. V. Michel, *Science* **208**, 1095 (1980). †L. T. Silver and P. H. Schultz, Eds., *Geological Implications of Impacts of Large Asteroids and Comets on the Earth*, Special Paper 190, Geological Society of America, Boulder, Colo., 1982 (\$40). ‡For example, see C. B. Officer and C. L. Drake, *Science* **219**, 1383 (1983).

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Tours

General Tour Information

Tours are limited to meeting registrants only. To order tickets, please complete the form on the next page.

Since some of the tours are taking place in nonpublic, restricted facilities, it is requested that persons of foreign nationality (visitors as well as U.S. residents) give their place and date of birth, in addition to name and address, in the appropriate space provided on the order form.

Tickets will be mailed to you directly. Orders received after 20 May 1983 will be held at the AAAS Ticket Desk in The Westin Hotel. Tickets may be refunded for full value up to 24 hours before tour departure; no refunds will be made after that time. Handicapped persons who need assistance with tours should consult the staff at the Resource Center for Disabled Registrants in the Westin Hotel.

All tours depart from and return to The Westin Hotel. Comfortable walking attire is recommended.

1. General Motors Proving Grounds Headquarters. Friday, 27 May, 8:00 a.m.–1:00 p.m. (Limit: 42 persons)

The GM Proving Grounds incorporate the most modern and complete facilities available for vehicle testing, covering more than 4000 acres with a road network of more than 128 miles. Test roads include Belgian block, concrete block, engineered pothole, and other special surfaces; water and mud baths; vehicle-handling test roads; hill test sections of up to 21 percent grade; and a 4.5 mile perfect circle for high-speed testing.

2. General Motors Technical Center. Friday, 27 May, 8:30 a.m.–12:30 p.m. (Limit: 42 persons)

The Tech Center is where GM brings its scientific and technical resources together. Areas of interest include the Semiconductor Clean Room, Metal Physics Laboratory, Engine Test Cells, robotics testing and development facilities, and the first full-scale automotive aerodynamics wind tunnel in the Western Hemisphere.

3. Warner-Lambert, Inc. Pharmaceutical Research Division. Friday, 27 May, 8:00 a.m.–2:00 p.m. (Limit: 42 persons)

This tour will visit pharmacology and chemistry laboratories and follow the course of a new drug candidate through these and other departments. Company representatives will be available at a "Q&A" session. The scientific and administrative support required to market a new drug will be explained, and the effects of drug regulations will be discussed.

4. Detroit Arsenal Tank Plant (USATACOM). Friday, 27 May, 12:30–3:30 p.m. (Limit: 42 persons)

The M1 tank is built in this plant. Visitors will see the interior of the M1 and its predecessor, the M60 tank, and the M1 manufacturing process. The M1 design incorporates a digital computer ballistics system, neodymium laser range finder, a special armor capability, and a number of electronic control components.

Restricted tour; some foreign nationals may not participate.

5. Ford Motor Company. Friday, 27 May, 1:00–4:00 p.m. (Limit: 42 persons)

Ford's two newest research and development facilities: the Diversified Products Operations Technical Center, which

concentrates on automotive electronic research and development, and the Robotics Center, designed to assist Ford facilities throughout the world in identifying the most sophisticated robotics and automation equipment for computer-aided manufacturing.

6. Stroh Brewery, Inc. Friday, 27 May, 5:45–9:00 p.m. (Limit: 120 persons)

Dinner at the famous Strohaus, followed by a tour of the brew house and packaging area. The featured speaker of the evening will be Dr. Morten Meilgaard, Vice President for Research and Development, who will talk about the chemistry of beer flavor. More than 240 separate flavor elements, each one linked to specific chemistry, contribute to the distinctive flavor of different beers. *This tour is of particular interest to biologists.*

7. Greenfield Village/Henry Ford Museum. Saturday, 28 May. Buses depart hourly, 8:30 a.m.–3:30 p.m.

Greenfield Village is a living history book, with 19 historic homes and shops, such as Thomas Edison's Menlo Park laboratory and Orville and Wilbur Wright's Cycle Shop, that have been removed from their original sites and carefully reconstructed at the Village. Walk through the Village at your own speed, following a map provided, or take advantage of the trains and horse-drawn carriages.

The Henry Ford Museum features 12 acres of historical collections, including carriages, bicycles, motorcycles, automobiles, trains, and aircraft. Artisans frequently give demonstrations of 19th-century machinery.

Separate tickets are required for the Village and the Museum (see order form).

8. University of Michigan. Saturday, 28 May, 9:00 a.m.–2:30 p.m. (Limit: 42 persons)

This guided tour of the University's Ann Arbor campus will include visits to the Highway Safety Research Institute, the Gerald R. Ford Presidential Library, biological science laboratories, and SCRIPT, a computer-aided subject information data bank. There will be a hosted luncheon at the Michigan Student Union restaurant.

9. Wayne State University Campus. Saturday, 28 May, 8:30 a.m.–1:00 p.m. (Limit: 42 persons)

This tour will include the Walter Reuther Library; the Van de Graaff accelerator/positron experiments; nonlinear optics and photoacoustics experiments; laser facilities used for art verification, analytical tools, and laser chemistry; the Radiation Oncology Laboratory and x-ray crystallography work; electron microscopy; and the university's safety automatic sled crash tester. A buffet luncheon will be served.

10. Greenfield Village/Henry Ford Museum. Sunday, 29 May. Buses depart hourly, 8:30 a.m.–3:30 p.m.

For details, see Tour No. 7.

11. Detroit Medical Center/Wayne State Univ. Medical School. Sunday, 29 May, 1:30–4:30 p.m. (Limit: 42 persons)

The Detroit Medical Center is one of the largest and most widely recognized institutions of its kind in the nation. Included in this tour will be the Wayne State University School of Medicine; the emergency medicine department of Detroit Receiving Hospital; the Radiation Oncology Center; the Comprehensive Cancer Center of Metropolitan Detroit; the Wayne State University Comprehensive Sickle Cell Center; and the Kresge Eye Institute.

12. Enrico Fermi 2 Nuclear Power Plant. Monday, 30 May, 12:30–4:30 p.m. (Limit: 42 persons)

Scheduled for completion in 1983, the Fermi 2 nuclear power plant is now under construction near the historic Fermi 1 development fast breeder reactor. Conventional electric generating processes and equipment are combined with a boiling water reactor to generate up to 1,100,000 kw—enough electricity for a city of 1 million people. *Due to safety regulations, no one under the age of 14 will be permitted on this tour.*

Restricted tour; some foreign nationals may not participate.

13. Michigan State University. Monday, 30 May, 1:00–9:00 p.m. (Limit: 42 persons)

Some 16,000 plantings—7,800 species and varieties of trees and shrubs—make the MSU campus a botanical showplace, especially in the month of May. This tour will include Beal Botanical Gardens, the oldest continually operated teaching

facility of its kind in the nation, with 6 acres of more than 5,000 plant species; the Horticultural Gardens; and the new Wharton Center for the Performing Arts. In addition, there are optional tours of the National Superconducting Cyclotron Laboratory, the Mass Spectrometry Facility, the Energy Plant Research Laboratory, and the experimental farms. An authentic midwestern barbecue will be served (outdoors, weather permitting) at the end of the tour.

14. General Motors Assembly Plant. Tuesday, 31 May, 8:30 a.m.–12 noon (Limit: 42 persons)

A firsthand view of the state-of-the-art technology and processes used to assemble Buick Skylarks and Oldsmobile Omegas, and the people who make it all work. Visitors will see the complex conveyor system that carries car chassis, bodies, and components to the appropriate point in the assembly process; the parts inventory and storage systems that keep assembly operation running without delays; and the complete automotive assembly process in operation.

Tour Tickets Order Form

Name _____

Institution or Company _____

Street Address _____

City _____ State _____ Zip Code _____

Foreign Nationals, please list: Place of Birth _____ Date of Birth _____

Indicate any special requirements due to a handicap: _____

Tour No.	Ticket Price	No. of Tickets	Tour No.	Ticket Price	No. of Tickets
1. GM Proving Grounds Headquarters (27 May).....	\$ 9.00	_____	9. Wayne State University Campus (28 May)	\$ 9.00	_____
2. GM Technical Center (27 May) ...	9.00	_____	10. Greenfield Village or Henry Ford Museum (29 May)	10.00	_____
3. Warner Lambert, Inc. (27 May)...	9.00	_____	Additional ticket to Village or Museum)	6.50	_____
4. Detroit Arsenal Tank Plant (27 May)	9.00	_____	*Specify departure time: _____		
5. Ford Motor Company (27 May) ...	9.00	_____	11. Detroit Medical Center (29 May) .	9.00	_____
6. Stroh Brewery, Inc. (27 May).....	13.75	_____	12. Enrico Fermi 2 Nuclear Power Plant (30 May)	9.00	_____
7. Greenfield Village or Henry Ford Museum (28 May)	10.00	_____	13. Michigan State University (30 May)	14.00	_____
Additional ticket to Village or Museum)	6.50	_____	14. GM Assembly Plant (31 May).....	9.00	_____
*Specify departure time:					
8. University of Michigan (28 May) .	9.00	_____			

*Buses depart hourly, from 8:30 a.m. to 3:30 p.m., for tours 7 and 10.

Charge to my ☐ VISA or ☐ MASTERCARD. Enclosed is my check ☐ Total amount enclosed or charged: \$ _____

Total No. of tickets ordered: _____

Account No. _____ Cardholder's Name _____

Expiration Date _____ Signature _____

MAIL TO: Tours, AAAS—Dept. R, 1515 Massachusetts Ave., N.W., Washington, D.C. 20005

AAAS Science Film Festival

The Science Film Festival continues to be a popular feature of the Annual Meeting; it presents a unique collection of recent educational and entertaining films that deal with the natural and social sciences, the technologies derived from them, and the social issues they raise. The 1983 Festival includes a wide variety of productions in each of these subject areas.

The Science Film Festival will run from 10:00 a.m. to 4:00 p.m., Friday, 27 May, through Sunday, 29 May, and from 10:00 a.m. to 3:00 p.m., Monday, 30 May, in the Cabot Room. Admission is free.

Detailed information about the films presented at the Festival will be printed in the Annual Meeting Program.

Friday, 27 May

10:00 a.m. Brooklyn Bridge
11:00 a.m. Flight to Survival
11:30 a.m. Microscope: Making It Big
12:01 p.m. Coral Reefs:
Understanding Their
Passage Through Time
12:13 p.m. Prehistoric Mammals
12:31 p.m. Reflecting on the Moon
12:48 p.m. Project Puffin
1:03 p.m. Ships and Seafaring
1:29 p.m. Portrait of a Coast
2:00 p.m. Lovins on the Soft Path
2:38 p.m. Why America Burns

Saturday, 28 May

10:00 a.m. Settling Down
10:58 a.m. Indiana Dunes
11:14 a.m. Project Impact: The
Overview

11:44 a.m. Kilowatts from Cowpies:
The Methane Option
12:11 p.m. Acid Rain: Requiem or
Recovery
12:40 p.m. Suzhou
1:10 p.m. Galápagos: The Enchanted
Islands
1:37 p.m. Solar System
2:07 p.m. Last Stronghold of the
Eagles
2:40 p.m. Chillysmith Farm

Sunday, 29 May

10:00 a.m. How Much Is Enough?
11:00 a.m. Bighorns of Beauty Creek
11:27 a.m. Energy and Rockets:
Exothermic Reaction
11:53 a.m. Night of the Sun
12:15 p.m. Water Walkers
12:42 p.m. Black Holes and Quasars

1:13 p.m. Old House, New House:
Energy Conservation at
Ecology House
1:42 p.m. Gulf Stream
2:12 p.m. Bears of the Ice
2:37 p.m. Notes of a Biology
Watcher: A Film with
Lewis Thomas

Monday, 30 May

10:00 a.m. Finding a Voice
11:00 a.m. Women in Medicine Series
11:45 a.m. The End of an Aquifer
12:15 p.m. The Pleasure of Finding
Things Out
1:15 p.m. Changes
1:27 p.m. High Country Swan
1:45 p.m. Comets: Time Capsules of
the Solar System
2:00 p.m. Gorilla





*American Association
For The Advancement Of Science*

ANNUAL MEETING

**Detroit, Michigan
May 26-31, 1983**



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Annual Meeting
Detroit
26-31 May 1983

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REGISTRATION
(A)**

Name of Registrant: _____
(Last Name) (First and Initial)

Registrant's Institution or Company: _____

Registrant's Mailing Address: _____
[For receipt of program(s), badges, and *Science* (for new applicants)]
(Street) _____
(City/State or Province) _____ (Zip Code) _____

Name of Spouse Registrant: _____
(Last Name) (First and Initial)

Other Additional Registrants: _____
(With same mailing address. Use new form if address differs.)

Convention Address: _____
(Where you can be reached) (Hotel and/or Phone No.)

Check days Thu Fri Sat Sun Mon Tue
attending: ☐ ☐ ☐ ☐ ☐ ☐

☐ Please check here if you need special services due to a handicap. We will contact you prior to the meeting.

SAVE TIME AND MONEY — REGISTRATIONS RECEIVED BY 20 MAY EARN A DISCOUNT.

- Please check appropriate boxes, complete remainder of form (type or print), and **enclose payment or charge to credit card below.**
- Preconvention Program, badge, and voucher for full Program and Abstracts, will be mailed to registrants in mid April.
- Full Program and Abstracts Volume can be picked up at *Advance Registrants' Desk* at the Westin Hotel.
- **Registrations received after 13 May will be held at the AAAS Information Booth at the Westin Hotel.**
- **Refund** requests for registration fees must be made by letter or telegram prior to 20 May 1983 and will be honored after the Annual Meeting. **No refunds are made on cancellation notices received after this date.**
- Special one-day attendance registration will be available at on-site Registration Desks only.

Registration Category	Registration Fee		Registration Category	Registration Fee	
	In Advance	At Meeting		In Advance	At Meeting
☐ AAAS Member	\$38	\$43	☐ Student # or Retired	\$21	\$24
☐ Non-Member (see below)*	\$48	\$53	☐ Spouse of Registrant	\$12	\$15

Student: Fulltime undergraduate or graduate student only.

* Non-members may join with this application and register at member rates by enclosing the following member dues in addition to member registration fee (membership includes 51 issues of *Science*; inquire about Canadian and other foreign rates):

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☐ \$70 _____
Double Membership—Your Name

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Student/Retired:

☐ \$35

☐ \$52

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HOTEL RESERVATIONS



Send confirmation to:

Name _____ Street _____

City _____ State _____ Zip _____ Phone No. _____

Other occupants of room:

Name _____ Name _____

Choice of hotel: 1. _____ 2. _____ 3. _____

Room: ☐ Single ☐ Double ☐ Twin **Suite:** ☐ 1 Bedroom ☐ 2 Bedrooms **Preferred Rate:** \$ _____

Please indicate special housing needs due to a handicap: ☐ Wheelchair accessible room.

Other: _____

Arrival Date: _____ **Time:** _____ ☐ a.m. ☐ p.m. Be sure to list definite arrival and departure date and time.

Departure Date: _____ **Time:** _____ ☐ a.m. ☐ p.m. Reservations will be held only until 6 p.m. unless accompanied by 1 night's deposit.

For Convention Bureau use only			
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Received at Housing Bureau		Received at Hotel/Motel	
Processed to Hotel/Motel		Confirmed to Guest	

MAIL TO: AAAS Housing Bureau, 100 Renaissance Center, Suite 1950, Detroit, Mich. 48243

- All hotel reservations must be submitted to the AAAS Housing Bureau in writing (**use form above; type or print**).
- Reservations must be received by the Housing Bureau **not later than 2 May 1983**; reservations received after that date are conditional upon space availability at the hotels.
- Rooms are assigned on a first come, first served basis. If the first choice hotel cannot accommodate you, the Housing Bureau will try to assign the second choice you requested.
- The Housing Bureau will send you acknowledgement of reservation received; confirmation of reservation will come to you from the hotel. All changes or cancellations must be made directly with the hotel.

HOTEL RATES*

Hotel	Single	Double & Twin	Parlor + 1 Bedrm.	Parlor + 2 Bedrms.	Parking (rates subject to change)
The Westin Hotel <i>Headquarters Hotel</i> Renaissance Center (No. of rooms blocked: 1,200)	\$65	\$77	\$170 and up	\$260 and up	\$4.00 per 24 hrs. — Parking Lot B (see "Meeting Information" for details; see map for location). Valet Parking also available.
Hotel Pontchartrain 2 Washington Boulevard (No. of rooms blocked: 200)	\$58	\$73	\$170 and up	\$240 and up	\$6.00 per 24 hrs.: Valet parking with in & out privileges for registered guests only.
Book Cadillac Hotel 1114 Washington Boulevard (No. of rooms blocked: 300)	\$42	\$52	\$135 and up	\$189 and up	\$6.00 per 24 hrs.: Valet parking with in & out privileges for registered guests only.
The Book Cadillac Hotel also offers these special rates: Triple occupancy, \$62; Quadruple occupancy, \$72.					

*Add 5%: 4% Michigan State Sales Tax plus 1% Transient Facility Assessment.

Charges for extra person in room: Westin and Pontchartrain, \$15/night; Book Cadillac, \$10/night. Inquire about roll-away beds.

Children are accommodated free of charge in same room with parents if no extra beds are required. Age limits are as follows: Westin, 17 and under; Pontchartrain, 18 and under; Book Cadillac, 16 and under.