February 1988

CALTECH NEWS

Rare Domesday archive a gift of Richard Hayman

Caltech has received a modern replica of the Domesday Book — an archive considered England's most important historical treasure — as a gift of Richard L. Hayman, class of 1936. The facsimile is part of a limited edition published in London to commemorate the record's 900th anniversary. Approximately 800 pages in length and in two volumes, the Domesday Book is written in Latin.

The oldest public record in Britain, the Domesday Book is a comprehensive land register and demographic survey of England, commissioned by William the Conquerer 20 years after the Battle of Hastings. It is ranked by historical authorities along with the Bible and the Koran as one of the world's three most famous books, and has been termed "the most remarkable statistical record produced in any medieval kingdom."

The Domesday Book is much more than a dry statistical record of 34 English counties. It offers glimpses into a world where rents were paid in sticks of eels and sesterces of honey by tenants called Ralph the Haunted and Olwyn the Rat, where pigs were fattened on acorns, and where the fine for shedding another Englishman's blood was 10 shillings on weekdays and 20 on the Sabbath. It reveals such details as that the Sheriff of Trent allowed the Lady Aelgar to live on his land free of charge, provided she taught his daughter how to do gold embroidery.

Previous gifts from Mr. Hayman and his late wife, Dotty, have been the Dotty and Dick Hayman Professorship of Engineering, the Richard L. and Dorothy M. Hayman Professorship in Mechanical Engineering, and the Hayman Lounge in the Athenaeum in memory of Hayman's brother, Earl S. Hayman (BS '24). The Haymans have also contributed generously to the Caltech Alumni Fund, The Caltech Associates, and

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The 1985 Vega balloon mission, according to Ingersoll, marked the Soviet space program's first active international collaboration. While working on the project, Ingersoll (fifth from left) and his colleagues visited the Moscow suburb of Zagorsk. Al Hibbs, recently retired from JPL, is at left.

Andrew Ingersoll's Moscow Diary

The planetary scientist shares his impressions as a guest at the Space Future Forum to celebrate the Sputnik anniversary.

In early October, the USSR marked the 30th anniversary of the launching of Sputnik by holding an international meeting in Moscow. Among the American, European, and Japanese scientists invited to Moscow to attend the Space Future Forum was Andy Ingersoll, Caltech professor of planetary science.

During his five-day visit, his third trip to Russia in as many years, Ingersoll kept a diary in which he recorded his impressions of the meeting, his conversations with Soviet citizens, and his discussions about the future of space science. Ingersoll's diary is reprinted here.

Ingersoll has been involved in a number of U.S. space missions, including Pioneer, Viking, Voyager, Galileo, and Mars Observer. He first visited Moscow in 1985 as a member of the team of Soviet, French, and American scientists working on tracking balloons in the Venus atmosphere as part of the Soviet Vega mission. It was during one of the earlier visits that he first met Soviet space scientist and administrator Roald Sagdeev, the moving force behind the October forum. Appointed head of the Soviet Institute for Space Research in 1973, Sagdeev is the man many Western observers credit with the recent dramatic advances the Russians have made in space.

Other Caltech scientists attending the Space Forum were Roger Blandford, Bruce Murray, Gerry Neugebauer, Anthony Readhead, Anneila Sargent, Wallace Sargent, Maarten Schmidt, and Gerald Wasserburg.

I am sitting in my hotel room late at night waiting for the start of the Space Future Forum on October 2. My sense of unreality is greater this time than on either of the other two trips to Moscow, or anywhere else, for that matter. The irrepressible Roald Sagdeev, fearing the budget cutters in his own country, has convened this forum to celebrate the 30th anniversary of the launching of Sputnik. Sagdeev is the head of the Institute for Space Research (IKI), which is like being the head of JPL except that his power is much greater than his position. The Russian scientists say that he talks directly to Gorbachev. The list of American scientists (all of whose expenses will be paid by the Soviets) has 150 names on it. My knowledge of Russian was useful in spotting my own name in Cyrillic characters. Translated back it came out "Indgerson, Endru Perri."

I am here one day before the Aeroflot planeload is due to arrive from Washington, D.C., loaded with American scientists. My ticket was paid by The Greve Foundation, which gave money to Caltech to foster cooperation between Soviet and American scientists. However, the logistical task of putting on the show may tie up our Soviet colleagues so much we may not get beyond the ceremonies into the scientific substance. Or maybe the ceremony is the substance. We are cooperating with them in putting on a show to dramatize and perhaps help their space science and exploration program. The Forum was organized at a frantic pace over the past two months. The fact that the Aeroflot offer came one working day

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Moscow Diary

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before my departure date made me choose the independent route on Pan Am.

The flight into Moscow earlier today had a group of families on it. They looked Russian, talked American with Russian accents, and wore flashy American designer-label sports clothes in poor taste. My guess is they are emigres returning as tourists to visit old friends and relations, but who knows? I don't remember any such groups in 1985. At the Moscow airport, I immediately ran afoul of the law because the entrance date on my visa is tomorrow. Just as all was about to be lost, an attractive young lady paraded by on the other side of the fence holding a sign, "Space Future Forum." She was there with three accomplices and two drivers to meet two people (me and someone I didn't know). They pulled rank and got me into the VIP line, where the guards smile and all is sweetness and light. This was definitely the best treatment I've had at Soviet customs out of three occasions.

The Soviet Union still has a long way to go before they become a consumer society. My team of escorts got me past numerous minor obstacles at the airport and the hotel (finding my name on the right list at several points). The escorts are stopping work for two weeks just to look after us. They are shielding us from the interminable lines that ordinary citizens and even ordinary tourists have to face. My escort team had been drafted from remote parts—the lady with the sign is an economist at the African Institute, but her English is good so she was drafted. I am to meet someone in the lobby of the hotel tomorrow morning for a sightseeing tour. Alas, my foot is still ailing and I won't be able to go jogging around Moscow. We will have a driver, but even museums and palaces require walking.

Wednesday, Sept. 30, 1987

Today I had two Soviet citizens—the young lady from the Institute (her name is Irina and she is married, with two small children, a large family by Soviet standards) and a driver who speaks only Russian—whose sole job was to show me around Moscow. Either the authorities made some mistake and confused me with Carl Sagan, or else they had lined these people up one day too early, or perhaps they were embarrassed that the Soviet scientists were tied up today and tomorrow. In any case, I was given a grand tour including the Tsar's treasures, Chagall paintings at the Pushkin museum (her choice, I suspect), a park and a department store (my choices), and a free lunch (actually dinner in these parts of the world). Very correct but very nice. Irina's job may be something like working for the State Department in Washington—she gathers information about the economies of countries in sub-Sahara Africa. Guiding people around is not her main job—this is the first time she has been called. Pleasant as it is, it strikes me as a gross inefficiency to pull so many people off their normal jobs on to this one.

The Space Future Forum is in progress at the USSR Institute for Space Research. Photo by Lou Friedman of the Planetary Society.

The buses from the airport arrived around 9 p.m., just as I and some Canadian film makers (the inventor of IMAX, a wide- screen projection technique, and two of his staff) finished supper. Many of my scientific colleagues are here now, and I suspect tomorrow will not be as cozy as today. No one has a clue as to what's going on or what's going to happen next except that the Forum (in Russian it is the International Forum on Cooperation in Space in the Name of Peace in the World) is supposed to produce a document with imaginative ideas to guide future Soviet space activities. NASA sent an official delegation of six, and NASA is paying their airfare and hotels. The rumor is that individual scientists at NASA centers like JPL were told not to go, even if the Soviets paid their expenses or even if the scientists paid their own expenses. International cooperation is apparently a bad phrase again in Washington. Publicity has hurt rather than helped the cause of scientific exchange.

At 11 p.m. I receive a phone call from my Venus balloon colleague Slava Linkin, who wants me to visit IKI tomorrow. Vasily Moroz had called four hours earlier to say don't come, they were busy with meetings. Linkin says he will make time. He is a gentleman and a scholar, but is signing an agreement tomorrow with European space scientists (represented by Jacques Blamont from Paris) for cooperation on their Mars 1992 mission.

Thursday, October 1, 1987

While I was eating breakfast with five Americans, a man from Moscow Radio came over and asked to interview me. My American colleagues were impressed. Later it turned out he got my name from a group of artists—space artists—who were sitting nearby. Also, he was in Pasadena for the Voyager encounters and remembered me from those. The interview had some tough questions—for instance, did I think there should be treaties to outlaw weapons in space? (Answer: yes, but one cannot outlaw war; one must reduce tensions and build cooperation with peaceful activities such as space research, which is why I'm here.) And so it went. The interview will be aired on the evenings of October 3 and 4.

I took the Metro by myself out to IKI, feeling no more lost than on the New York subways. The main advantage I have over most other Americans here is that I can read the signs and recognize my station without paying constant attention. I met briefly with Linkin, Blamont, and Victor Kerzhanovich, colleagues from the 1985 Venus balloon science team. But most of my time was spent with Boris Zhukov, a member of the Soviet 1988 Phobos camera team. I learned a lot about the opportunities for imaging Mars after the primary mission is over (Phobos is one of Mars' moons). It is not clear that NASA will support my participation in another Soviet mission or that I will have access to the data, but there is the Caltech-IKI agreement (part of The Greve Foundation grant), and my colleague Bruce Murray is pushing hard to make it work.

In the late afternoon I rode the Metro over to the Soviet equivalent of the U.S. Air and Space Museum: lots of huge spacecraft sitting in a huge exhibition hall like Grand Central Station. One kilometer away, at the museum of cosmonautics, I joined a Russian-speaking tour after introducing myself as an American space scientist. The tour ended with a film of photos from space, including many photos from the U.S. Voyager spacecraft. As we were filing into the room where the film was, the guide took me aside and apologized for the anti-American propaganda that I was about to see. Sure enough, the closing scenes were of flowers, trees, children, and American bombers dropping their loads, followed by flashing lights and noise, then darkness and silence. On the way out the guide explained that it was an old film and now, with Gorbachev, it would show bombers of both countries. I pointed out that bombers of any kind were inappropriate in that film, but I don't think he got my point. His English was only twice as good as my Russian.

Friday, October 2, 1987

The meeting began today with many uplifting speeches about the achievements of the space age and the benefits of international cooperation in space. Carl Sagan was the most uplifting. After awhile the meeting became boring. The working groups in the afternoon were only slightly less boring, since we all know about each other's current programs, and the future is reserved for tomorrow's discussion.

The fun part was the evening at the home of Slava Linkin—twenty people squeezed into a three-room apartment (bedroom, living room, kitchen) the size of our downstairs hallway. The Venus balloon team was represented by me, Jacques, Slava, Victor, two of the instrument specialists, plus the wives of the four Russians and Slava's daughter and grandson. Also present were the Murrays, Lou Friedman, Vern Suomi, Hank Revercomb, and Tom Heinsheimer—American scientists, some of whom are fairly heavy hitters. One interesting discussion concerned the value of individual initiative (capitalism?) as an economic system. Everyone agreed it was a good thing for the Soviet Union—the only disagreement was how long it would take and whether Gorbachev could pull it off. Some of the Soviets were rather pessimistic.

The other interesting discussion was what we should do for the remainder of the Forum. The Americans had come to help, but they didn't know what was needed. We all agreed that more space science was what we wanted—whether it was done with joint missions or complementary missions didn't matter as much. Healthy programs in many countries is the best plan, and we were all happy to do what we could to support each other's programs and perhaps share in them. We disagreed on the theme—save the earth, colonize Mars, unlock the secrets of the universe. I still think these have a hollow ring—the easy stuff in space was done ten to twenty years ago. Now the questions require a PhD to appreciate, and the equipment requires a billion dollars to build. We split six different ways, but not along political lines. The lack of differences between the Russians and the Americans, per se, was impressive and very gratifying.

Saturday, October 3, 1987

Phoned home at 7:30 a.m. (9:30 p.m. Friday in Pasadena) to find out about the earthquake. Spoke for two minutes and paid for three minutes, which came to 18 rubles or $25. Not fair! But Sarah sounded fine and I felt better. Today the Americans, feeling under-utilized, tried to agree on a ringing call to arms for planetary exploration with international cooperation as its theme. Instead we fell to intramural squabbling. My Caltech division chairman, Jerry Wasserburg, didn't like my emphasis on weather and climate, especially when I mentioned oases with liquid water and possible life (past or present) on Mars. He is more interested in the river channels and lava flows that are billions of years old. The Russians, Moroz and Linkin, got into a heated debate over the choice of instruments to be flown—probably a turf battle. Perhaps it doesn't matter. The ceremony is the substance. We showed up and that's what counts. It was announced that 850 people are here—most from the Soviet Union, many from the Eastern bloc, the rest from Europe, America, and Japan.

The discussion groups include solar system science (my group), astronomy, man in space, space manufacturing, space and ecology, etc. We are treated exquisitely. There are guides and drivers for every sightseeing whim, buses to take us to the Armand Hammer Conference Center, free hotels and meals, a travel bureau especially for us, and young English- speaking Russians seemingly eager to meet us. I enjoy the conversations with the Russians about culture, customs, and politics. Only once did I get the glazed-over eyes and polite silence when straying on to some forbidden topic in a group. One Russian man, a guide, says that the enthusiasm to meet foreigners is genuine—they are starved for contact. I seem to be having more fun than the other Americans, who feel underutilized, are bothered by the poor service, and haven't met many Russians. We cap the evening at the Bolshoi Ballet—magnificent, of course.

Sunday, October 4, 1987

The last day. Carl Sagan is in the hospital. During the closing session, with all groups back together, Tom Donahue, an American, answers the question "Why are we here?" His answer, delivered from the podium, is "to pay tribute to Sagdeev, who has forged an exciting space program in the Soviet Union." Vern Suomi says "Thanks, Soviets, for Sputnik—it energized our science, education, and technology." While listening to the closing speeches and the earlier hassles in our solar system group, I wonder about my future. Should I cast my lot with French or Soviet space science (lots of traveling) or stay exclusively with NASA? How much do I believe in space science, now that the easy stuff (in our own solar system) has been done? Should I change fields? Am I afraid to tackle difficult problems? Then I wake up and discover I am nodding off in the auditorium (still partly on Pasadena time). Lots of astronauts (U.S.) and cosmonauts (Soviet). An incredible banquet in the evening (food sculptured into animal shapes, caviar, sturgeon, infinite variety, but no alcohol). Tomorrow I will have a driver and guide take me to the airport at 6:30 a.m.

Monday, October 5, 1987

Writing in the airplane now. Soviet customs hasn't changed much. The Americans are waved through, but Soviet citizens are searched thoroughly. Perhaps for bundles of foreign currency, which they acquire in black market money exchanges from foreigners, to be spent on Western goods, which are smuggled back and sold to Soviet citizens. The other reason for the search is just to show who's in control. Everyone likes Gorbachev. The Soviet guides were extremely proud of their capitalist experiments—mom-and-pop businesses and art fairs—but these are few in number and must be licensed to operate. Token capitalism, at most. The Soviet citizens refer darkly to Gorbachev's enemies, hoping he can overcome them. Both sides engage in exaggerated self-deprecation at times. I don't like it, and find myself defending the U.S. when one of my American colleagues makes an exaggerated remark. My large family* is viewed as a capitalist luxury by the Soviets (Moscow apartments are too small and both partners work hard for economic survival) and as a personal eccentricity by the Americans.

It all adds up to a stupendous bash by Sagdeev—building friendships on a grand scale. Sort of like a Mafia Don giving a party for a few of his friends. Still, he is a great promoter of science, and I hope he succeeds.

*The Ingersolls have five children.

Spending an evening at the home of Soviet space scientist Slava Linkin are, from left: Linkin, U.S. space scientist Tom Heinsheimer, Ingersoll, and Suzanne and Bruce Murray. Photo by Lou Friedman of the Planetary Society.

Bradley Foundation gives $500,000 to experimental lab

Caltech has received a gift of $500,000 from the Lynde and Harry Bradley Foundation of Milwaukee, Wisconsin, to support the establishment of the Institute's Laboratory of Experimental Economics. Research in the laboratory focuses on such issues as the dynamics of decision making and marketplace behavior, and is expected to have a broad range of applications in industry, government, business and commerce, and the academic community.

Director of the laboratory is Charles Plott, professor of economics and a pioneer in the relatively new field of experimental political economy. According to Plott, a major aim of the new facility will be to examine the extent to which theories of economic and political behavior can be investigated under controlled laboratory conditions. Traditionally, these disciplines have been treated as largely descriptive sciences. However, work by Plott and his colleagues over the past 15 years has demonstrated that political and economic phenomena can be studied by employing laboratory methods and that such laboratory-generated data can be important for public policy decisions.

The Bradley Foundation was established in 1985 by Lynde and Harry Bradley, founders of the Allen-Bradley Company, now a part of Rockwell International. The foundation supports research in the fields of national public policy and international strategic policy, and sponsors programs that promote excellence in higher education and enriched educational opportunities for gifted children.

Major funding for the laboratory has been provided by General Motors, the Alfred P. Sloan Foundation, the Pacific Telesis Group, the National Science Foundation, NASA/JPL, and Caltech.

Domesday archive

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the Summer Undergraduate Research Fellowships (SURF) program.

Hayman is a contributing life member of The Associates and a member of the President's Circle. He recently completed a two- year term as president of The Associates and he is a member of the Alumni Association.

Among guests at the second annual McLean Brothers scholarship luncheon were (from left) McLean Scholar Diane Chu; Mrs. William McLean, widow of William McLean; McLean Scholar David Bruning; Caltech Trustee James E. Robison; McLean Scholar Christopher Nolle; and Mrs. John McLean, widow of John McLean.

Luncheon honors McLean Brothers Scholarship Fund

Family members, donors, and student beneficiaries came together for the second annual McLean Brothers scholarship luncheon, held in the Athenaeum library during November.

The McLean Brothers Scholarship Fund was established in 1985 by friends and family in honor of the late William McLean (BS '35) and John McLean (BS '38), both of whom received Caltech's highest honor, the Distinguished Alumni Award.

William McLean became head of the aviation ordnance department five years after joining the Naval Ordnance Test Station in China Lake, California. He later became technical director of the station. He accepted the same position at the Naval Undersea Center in San Diego in 1967 and then went on to serve as consultant there until his death in 1976.

He received the Maximum Federal Government Award for development of the Sidewinder air-to-air missile, which he invented in his garage workshop.

John McLean rose through the ranks to become chairman of Continental Oil Company in 1972. Under his leadership, Conoco became one of the world's leading producers of energy.

The McLean Brothers Scholarship Fund benefits several juniors and seniors each year. The students are chosen for outstanding service to the Institute and excellence in their academic work. Eight $5,000 scholarships will be awarded next fall, to four seniors and four juniors.

President Thomas E. Everhart and Theodore Hurwitz, vice president for Institute relations, represented the Institute at the dinner. President Everhart drew parallels between his career and those of the McLeans, and thanked Caltech Trustee James E. Robison for his leadership in the development of the fund. Robison is chairman of the fund's Founders Committee.

Guests included Mrs. John McLean and Mrs. William McLean, widows of the two men whom the fund honors, and other McLean family members and friends, in addition to the six current McLean scholars. William A. Fowler (PhD '36), the Institute Professor of Physics, emeritus, and a former adviser and instructor to William McLean, joined the occasion.

Johnson Professorship selection celebrated

Members of the Kelly Johnson family and representatives of the Lockheed Corporation were guests at a dinner at the Alumni House hosted by President and Mrs. Thomas E. Everhart in December. The cause for celebration was the naming of Hans Hornung, the director of GALCIT, as the Clarence L. Johnson Professor of Aeronautics.

Benjamin R. Rich, director of advanced development projects, Lockheed, presented the first payment toward a $350,000 pledge for the professorship. Hornung thanked the donors and expressed his pride in holding a professorship named for such a famous aeronautical pioneer.

The professorship was made possible through gifts from Clarence (Kelly) Johnson and the Lockheed Corporation. During a long career at Lockheed, Johnson, now 77, was one of the world's most celebrated designers of high-performance aircraft. As vice president in charge of advanced development for Lockheed, he pioneered the production of some of the United States' most revolutionary military aircraft, including the P-38, F-80, F-86, F-104, U2, and SR-71.

Rockefeller House in Catalina II Complex dedicated

Rockefeller House, one of the Catalina II graduate residences, has been dedicated in honor of the late William C. "Rocky" Rockefeller (BS '32, MS '34) and Mrs. Rockefeller. A plaque naming the house was unveiled recently at a dedication ceremony in the recreation center of the Catalina II complex.

Mrs. William C. Rockefeller at dedication services for Rockefeller House.

Rockefeller, whose major interest was aviation, was the founder and president of Via Computer, Inc. He died in 1982. Mrs. Rockefeller is a contributing life member of The Associates and a member of the President's Circle, and in November was the sponsor of The Associates' regional dinner at the La Jolla Country Club. The Rockefellers have made generous unrestricted gifts to the Institute.

The student residences are on Del Mar Boulevard at Catalina Avenue. Each contains 15 apartments clustered around a central recreation building.

Moseley Professorship focus of dinner

The appointment of Maarten Schmidt as the Institute's first Francis L. Moseley Professor of Astronomy was the occasion for a dinner at the Athenaeum in December with President and Mrs. Thomas E. Everhart as hosts.

Peter Moseley, son of the late Francis Moseley, spoke at the dinner on behalf of the family, and President Everhart emphasized the importance of the professorship to Caltech, as well as the ties between the Institute and the Moseley family members. He noted that J. Beverley Oke, professor of astronomy, was a friend of the Moseley children when they were growing up.

The professorship was made possible by a bequest from Louisa Moseley, the late wife of Francis Moseley, and a grant from the Flintridge Foundation, a Moseley family foundation.

Francis Moseley was an inventor in the fields of air navigation and electromechanical devices and controls. He founded the F. L. Moseley Company, which was purchased by Hewlett-Packard and is now its San Diego division. Mrs. Moseley was an artist with a particular interest in gardens and the ocean as subject matter.

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Quest for a legacy

Stu Jamieson searches in a remote Chinese province for traces of his missionary grandfather's music.

"God was good to keep me alive for this day," said a 94-year-old Chinese man when he met Stu and Carol Jamieson in Yao-Ba, a Christian village in the Ginsee Province. Decades earlier, the man, now gravely ill, had been a good friend of Jamieson's grandfather. Above: Carol and Stu Jamieson with the old man and his great grandson, who has carried his great grandfather on his back to the reunion. Photo by Mao Jia. Right: William Wallace Simpson, Jamieson's missionary grandfather who used his music in making converts.

By Winifred Veronda

Returning to his birthplace in a remote Chinese province to search for traces of his missionary grandfather's folk music had long been a dream of Robert "Stu" Jamieson, a Caltech patent attorney. Last summer he fulfilled that dream, thanks to a grant from the Durfee Foundation.

The Durfee Foundation is the family foundation of R. Stanton Avery, chairman emeritus of the Caltech Board of Trustees and founder of Avery International, N.Y.S.E. The Avery family members established the American/Chinese Adventure Capital Program to give others the chance for the kind of travel adventure that Stanton Avery experienced when he spent 12 months in China as a college student.

Nine members of the Caltech community with deep personal interests in China were able to pursue their dreams on site, through the Durfee Foundation grants. For Jamieson, who retains his capacity to speak Chinese, the grant meant retracing the footsteps of his missionary grandfather and searching for remnants of his music among present-day inhabitants of the province. He also gave a series of folk-music concerts at Chinese universities in an attempt to generate good will between people of the United States and China.

For use in the concerts, Jamieson and his wife, Carol, both talented folk singers, took with them to China an assortment of instruments — a conventional banjo, a fretless homemade banjo, a dulcimer, an autoharp, several harmonicas, and a lumberjack doll made of wood with loose leg joints and a dowel in the back. The doll dances when tapped on a surface.

First on the Jamiesons' itinerary were the concerts. An original series of concert bookings was cancelled in the wake of a disorderly episode at an American rock concert in Shanghai — the cancellation was part of an action affecting all concerts sponsored through the government-controlled China Media Service — but a rapidly assembled informal series of appearances, put together by mutual friends, replaced the original bookings.

The Jamiesons performed concerts at the Tinjin College of Music, at Nankai University, and later at the American Baptist College in Hong Kong. At Nankai University, Jamieson conducted a folk dance class, teaching the Navajo squaw dance, the Virginia reel, the clog, a square dance, and a pioneer-era play-party game.

"Students really enjoyed the classes," Jamieson says. "They were quick and not at all physically inhibited, and their attention span was phenomenal."

A star of the concerts was the dancing lumberjack doll. "Everywhere we went, it received a tremendous reception," says Jamieson. "People swarmed around and wanted to make it perform. It danced so often that, three times, we had to apply new coats of epoxy to its feet."

The Jamiesons found that two American folk tunes were known throughout China — "Oh Susannah" and "Red River Valley." "These were great for audience participation," he says. Jamieson also involved the Chinese in singing the hammer crew song, in which the audience shouts "Ha!" as they pantomime swinging a hammer.

Universities showered the Jamiesons with ceremonial gifts, and Nankai University made the couple honorary members of the faculty. At Nankai University, in a change of pace, Jamieson presented a slide show on the history of space exploration. The show was such a success that he was asked to repeat it at the Beijing Institute of Aeronautics and Astronautics. There he was also asked to talk to the patent attorneys on the faculty — a new group formed after the initial contingent had been wiped out by the Cultural Revolution.

Then came the core reason for Jamieson's trip — his travel back in time to the places where he had lived during the first five years of his life. A long train ride carried the couple to Langhon, where Jamieson was born — then a walled town of 50,000 people, now an industrial city of two million.

Now the Jamiesons were ready to enter Kansu Province, which is near the Tibetan border, and is where Jamieson's grandfather, William Wallace Simpson, lived and worked for 57 years. Ninety-five years ago, in 1892, Simpson walked into the province via the old silk route. There he won converts through his singing and banjo picking as well as through his oratory, and his music was adapted by the Chinese to their own folk music. He stayed until 1949 when, at the age of 79 and during the midst of the Communist revolution, he walked out under sentence of death. He had intended to live out his years among the people to whom he had ministered.

The Jamiesons were initially denied permission to go into Kansu because it is considered too primitive to be placed on the official tourist

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Quest in China

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itinerary, but eventually permission was granted. They discovered themselves to be the first foreigners to enter Kansu since Jamieson's grandfather had left it.

At Labrang, culturally and ethnically Tibetan, they visited a lamasery where Jamieson's grandfather had shared insights and information with the Buddhists. The couple were guests at the palace of the spiritual leader who is called the Living Buddha. There they showed the monks photographs taken decades ago by Simpson and were touched as the monks bowed before pictures of the man who had been revered as the Living Buddha several generations earlier.

Next the Jamiesons drove to Lintan, built on the site of the town where Jamieson's mother was born. Her birthplace was destroyed by bandits and Lintan later replaced it. There Jamieson mused about how Chinese was his mother's first language, and how, near the end of her life when she no longer responded to English, she would answer Jamieson when he spoke to her in Chinese.

Everywhere in this region the blonde, blue-eyed Mrs. Carol Jamieson, wearing a touch of blue eye shadow, drew crowds; in coloring and makeup she resembled the golden-haired, blue-eye-shadowed Tibetan Buddhist statues that were so prevalent. Soon the Jamiesons' driver reported that he had found a small Christian church. The Jamiesons learned that the church, with its congregation of 10, had been built by Simpson. Several miles away they found a nucleus of Christians worshiping in a house — a focal point for Christians from throughout the area who had survived persecution at the time of the revolution. There the Jamiesons attended a service where they met survivors of Simpson's converts who remembered Jamieson's mother and grandfather. The U.S. visitors sang from hymnals hand-copied from those brought by Simpson, and destroyed by the Communists when they took control of the region.

Later that day, older members of the congregation located themselves in a going-away photograph of Jamieson's grandfather with some 200 members of his flock, and then everyone sat down together to enjoy a meal. But Jamieson could locate no traces of Simpson's folk music in the local music of today. The blending of the two that he recalled as a boy had vanished.

Visits to a mission church where his uncle and aunt were buried (the headstones had been removed when the Communists took over) and a search in a regional museum for a banjo left by Simpson (the museum refused to allow Jamieson to see the banjo, which had been brought there during the Cultural Revolution) were other milestones in the Jamiesons' walk back into personal history.

After donating copies of photographs from family archives to the provincial museum in Lanjo, the Jamiesons left on a long train trip to the end of the province to visit Buddhist caves. They flew to Lhasa, the capital of Tibet, traveled by car to Xigaze, near the border of Nepal, and had an audience with the Panchen Llama, who is one step below the Dali Llama. After visits to Canton and Hong Kong, they returned home.

Jamieson was five years old when he left China, and he had not been back for 60 years. Often on the journey he would be asked, "Where are you from?" and he would answer in Chinese, "I'm from the United States, but I was born in Nanjo." Invariably the response would come, "Welcome home."

When the Avery family members established the travel-to-China program through the Durfee Foundation, they hoped its participants would encounter the kind of life-changing experience that Avery had found when he traveled to China in 1929. For Jamieson, this hope became a reality.

"We look at many things much differently than we did before," he says. "In China we frequently heard life-and-death stories. We talked with a lot of survivors. Now we find ourselves suddenly realizing that things that seemed important to us before are three levels up from life and death.

"We're amazed at the number of overweight people we see in the United States. We only saw one overweight person while we were in China. Of course, riding bicycles takes care of the weight problem. We could use more of that here.

"We're constantly struck by the tremendous amount of oral and visual stimulation for commercial purposes in this country. We're amazed by how much we have, materially, but we find it means less to us than before. We've seen what useful, productive, hopeful lives the Chinese lead with so little, and that material possessions can't compare with the strength and satisfaction they find within their families. The family in China is as strong as ever."

Now that the Jamiesons have been to China they definitely plan to go back. "We're not the same as we were when we left," he says, "and now that we've had a taste of this kind of experience, we want some more."

Who wrote those famous 12th century love letters?

Research suggests Abelard composed all the letters in his correspondence with Heloise.

By Winifred Veronda

A carving from a historical building in Paris, dating from about 1300 and often said to depict Heloise and Abelard.

The 12th-century romance of Heloise and Abelard — considered one of the great love stories of all time — is known primarily through a famous correspondence between the two. Now John Benton, professor of history at Caltech, believes that the entire series may be a "literary fiction" written by Abelard, who himself composed the letters attributed to his wife, Heloise.

Benton's theory on the authenticity and authorship of the letters is based on a comparison of word frequencies, phrases, quotations, and other stylistic devices used in letters attributed to the two individuals, as well as on concepts expressed and on a computer-assisted analysis of vocabulary and style and a study of cursus patterns (the use of verse meters to end prose sentences — considered an elegant device in Latin). Benton says, after concluding his analysis, that he finds no stylistic differences in the letters attributed to Abelard and those attributed to Heloise.

According to the traditionally accepted story about the lovers, Heloise was the niece of Fulbert, canon of the cathedral of Notre Dame in Paris. A beautiful and learned young woman of 16, she fell in love with her tutor, philosopher-theologian Peter Abelard.

They were married secretly after she gave birth to his illegitimate son, although, according to Abelard, she begged that the marriage not take place, in order to protect his career.

In a tragic outcome to the affair, Heloise's father, enraged that his trust had been violated, arranged for ruffians to attack and emasculate Abelard. Heloise entered a convent and Abelard became a monk.

His later years were filled with turmoil and theological controversy. As a monk and abbot, he was unpopular. After founding a school and church dedicated to the Paraclete (the third person of the Trinity), he later gave the property to Heloise to serve as a convent. He was twice charged with heresy, but had made his peace with his opponents when he died in 1142.

Most of this accepted account is recorded in a series of eight letters preserved in a 13th century manuscript in Troyes, France. The first is supposedly from Abelard to a friend, recounting the calamities of his life, including his tragic romance with Heloise. The second through fifth letters are intimate communications between Heloise and Abelard in which Heloise expresses her longing for her former lover.

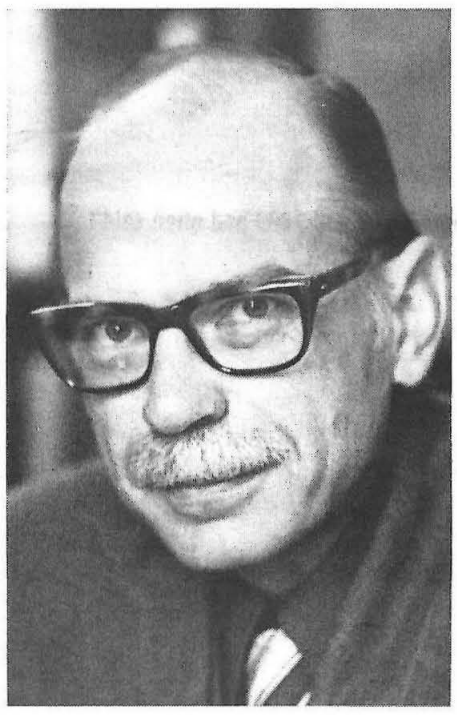
In the sixth letter Heloise requests a rule for proper governance of the Paraclete, and guidelines for the

women there to follow, and in the final two letters Abelard provides a history of religious women and the rule for which Heloise had asked.

In the rule Abelard expresses his belief that women are weaker than men and therefore should not be governed by the same dietary rules, for example. He also expresses the opinion that a male should set ultimate policy for the convent.

In a study over a decade ago, Benton concluded that the whole series of letters might have been a forgery, compiled from both authentic and fabricated material a century after the couple died. He has since discounted this hypothesis, because, he says, "I found nothing further to support it and I came to consider it defective in a number of ways."

In arguing that the "correspondence" was written by only one author, Benton challenges a frequently offered explanation for stylistic similarities in letters attributed to



John Benton

the two lovers. This is the theory that, as Abelard's student and wife, Heloise wrote in the same style as her husband.

Benton points out that, according to the correspondence, contact between the two was minimal after their conversion to monastic life, and that Heloise was already educated in Latin when Abelard began to tutor her. According to both Abelard and his critics, the tutor was initially more involved in seduction than in education. When Heloise soon became pregnant, she lived separately in Brittany, and when she returned to Paris the two lived apart, each converting to monastic life about two years after they met.

"There was really little time or occasion in those early years for Abelard to teach Heloise his personal style of cursus and his favorite constructions," says Benton.

Moreover, Abelard's style and reading matter changed significantly after his conversion, and the style of the letters attributed to Heloise is that which Abelard used 20 years after the brief period when he was in close contact with Heloise.

Benton acknowledges the possibility that significant personal and intellectual contact between the two existed after their monastic lives began, but notes that the contents of the letters themselves deny that such contact took place. For instance, the first letter from "Heloise" states the matter categorically when she asks, "Why have you so neglected and scorned me that you neither hearten me with conversation when you are here nor console me with a letter when you are away?"

"Paradoxically," says Benton, "if Heloise had enough intellectual contact with Abelard to be able to write in his style, using his pattern of cursus and his favorite quotations, she would not have needed to write a letter complaining about a lack of contact."

Benton points out that, until recently, the series of letters has been subjected to scant historical analysis. "Little analysis has been established about these two people as compared to the amount that has been written about them. The later literary history of Abelard and Heloise is so full of sentimentality, misrepresentation, and fraud that we must begin any research in the field by questioning the presuppositions inherited by our own culture.

"If we are ever to settle the major issue of the authorship of these letters, it will not be through discussions of what might be plausible behavior for people of either the 12th century or today, but on the basis of the most technical and unemotional issues — questions of style, dating sources, and so on."

Benton points out that the correspondence presents difficulties for the scholar pursuing the traditional theory that both Heloise and Abelard shared in writing the letters. For example, there is the difficulty of explaining why Abelard, in letter seven, addresses his wife as "my brothers and fellow monks," or repeats in letter eight practically verbatim two passages supposedly written by Heloise in letter six.

According to Benton, these two passages are in accord with Abelard's known style of composition, and with his tendency to repeat himself and to include in one work quotations and passages that he had earlier developed elsewhere.

Benton also found, in analyzing the quotations, that, with one exception, all the authors cited in the letters of Heloise are favorites of Abelard.

In his research, Benton has avoided any discussion of why Abelard might have undertaken to write a literary fiction, the degree to which he might have been representing the actual thoughts of Heloise, and what reactions Heloise might have had to such a composition. He has kept his focus strictly on the technical issue of whether the correspondence was written by one author or two.

"If further analysis does confirm the case for Abelardian authorship," says Benton, "we would then be faced with the challenging task of understanding the literary and psychological basis for writing such a curiously contradictory work. We would also want to understand how Abelard could have felt free to build a monument to his own reputation on the foundation of his beloved wife's intimate revelations."

Lee DuBridge portrait hung in Athenaeum

A portrait of Lee A. DuBridge, president emeritus of Caltech, was unveiled in ceremonies during December in the Athenaeum lounge, where President Thomas E. Everhart welcomed Dr. and Mrs. Lee A. DuBridge and other honored guests.

The painting hangs on the west wall of the lounge. It was painted by Ruth Munson, a local artist who has recently moved to Texas.

The painting is the first of three commissioned portraits of Caltech presidents. All of the paintings will eventually be placed in the Athenaeum, where a portrait of Caltech's three founders, Millikan, Hale, and Noyes, already hangs in the main dining room. Everett Kinstler, a New York artist, has been commissioned to paint Harold Brown's portrait, while Richard Stone, an English artist, is painting that of Marvin L. Goldberger.

Members of the class of 1936 are participating in the portrait project through their reunion gift to the Institute. The class raised approximately half a million dollars, a portion of which is helping to pay for the paintings. Several members of the class reunion committee attended the unveiling. Victor V. Veysey (BS '36) spoke for the class, expressing the members' pleasure in being part of the project.

Grove of trees planted in memory of Darlene Oliver

A grove of five gold medallion trees has been planted on campus in memory of Darlene Hubbard Oliver, the late wife of Robert W. Oliver, professor of economics and master of student houses.

The project was funded by Pasadena Beautiful Foundation, an organization in which both the Olivers have been active. The grove is between Beckman Auditorium and the Watson Laboratories of Applied Physics.

Dedication of the grove in October preceded a reception for 60 people, including the Oliver family. Richard Nevins, chairman of the committee to create the grove, and Robert Cheesewright, president of the foundation, spoke on behalf of Pasadena

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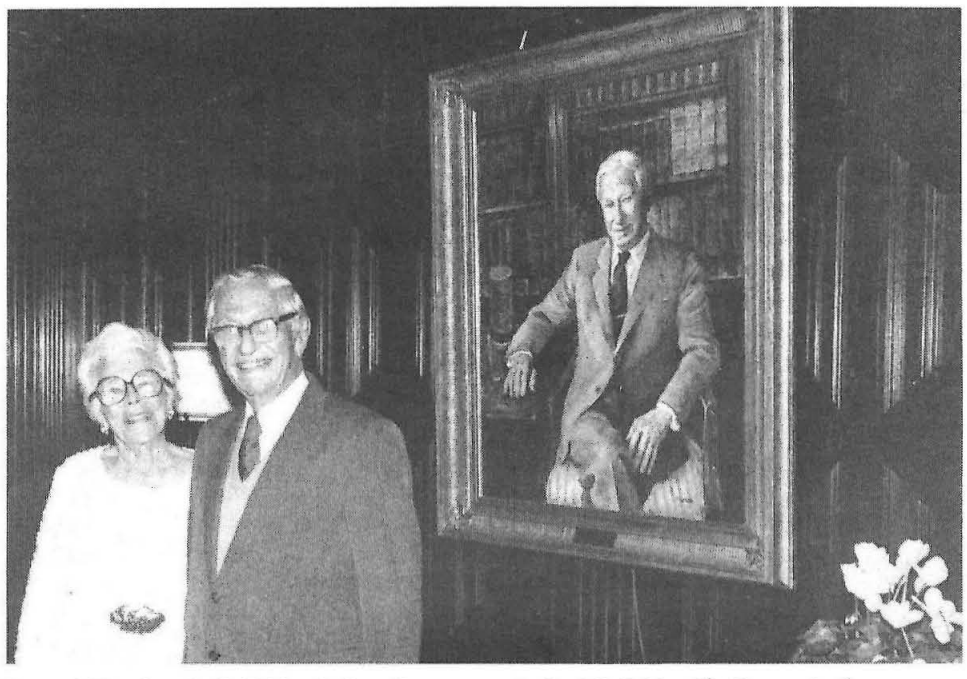


Dr. and Mrs. Lee A. DuBridge before the new portrait of DuBridge that hangs in the Athenaeum lounge.

Caltech in the News

The mysterious hole in the ozone shield over Antarctica is caused by a chemical reaction involving chlorine, apparently from gases used as propellants in spray cans, California scientists confirmed. The chemical reaction is possible only in the presence of polar clouds, composed of tiny ice crystals, and the amount of sunlight that reaches the South Pole area in the late winter and early spring, scientists reported. "It's only recently we began looking at ice particles as possible participants," said Mario Molina, an atmospheric chemist at the CALIFORNIA INSTITUTE OF TECHNOLOGY'S JET PROPULSION LABORATORY. *The San Diego Union.*

Marvin "Murph" Goldberger, distinguished scientist and former president of CALTECH, said Monday in a program held in his honor that "there is not now any defense against nuclear weapons, nor is there likely to be in the future." Upon receiving the Leonard I. Beerman Peace and Justice Award at the Mark Taper Forum, Goldberger . . . interpreted it as encouragement for him and the audience to continue addressing "the central issue of our time" — the avoidance of nuclear war, and with it, the destruction of civilization. The ceremony was sponsored by the Pasadena-based Interfaith Center to Reverse the Arms Race. The Pasadena *Star-News.*

Jenijoy La Belle

Jenijoy La Belle, an associate professor of literature at CALTECH, wrote *A Dialogue of One — Women, Mirrors and Identity* after concluding that literature accurately reflects the roles that mirrors play in real life. Women tend to see their selves when they look at their reflections, La Belle said, while men, both in literature and reality, seldom see anything more than a mirror image. For her scholarly work . . . La Belle researched books, poems, and essays written during the past 200 years. *Los Angeles Times.*

Edward B. Lewis, a professor of biology at CALTECH, has received a 1987 Gairdner Foundation International Award for his pioneering research in genetics. He shared the award with Walter J. Gehring of the University of Basel in Switzerland. Each received a $20,000 prize. Lewis's research focuses on "master regulators," genes that control the development and growth of embryos. The Pasadena *Star-News.*

Edward B. Lewis

A procedure for determining aldehydes present in natural water sources such as fog, clouds, and rainwater couples high-performance liquid chromatography with a postcolumn reaction detector. Manabu Igawa, associate professor at Kanagawa University, Japan, who spent the 1986-87 academic year at CALIFORNIA INSTITUTE OF TECHNOLOGY, developed the method with his CALTECH coworkers J. William Munger and Michael R. Hoffmann. *Chemical & Engineering News.*

"What drives science isn't the individual, but development of new instrumentation, new technologies and chemistries. Science then exploits these in a zillion different ways," says Leroy E. Hood, chairman of the Division of Biology and the Ethel Wilson Bowles & Robert Bowles Professor of Biology, in an interview in *Omni* magazine. "The sequencer ace of DNA is tracking down the secrets of human origins," relates *Omni.* "His souped-up machines will enable scientists to read our genes and predict our futures before we're born."

Caltech radio show airs on KPCC

Beginning last month, Caltech is featured monthly on KPCC's hour-long talk show, "AirTalk." The Caltech segment is called "AirTalk: The Caltech Edition," and airs on the third Wednesday of the month, from 6 to 7 p.m.

The program features at least two interviews a month with people associated with Caltech or JPL, including faculty, staff, students, and alumni.

Other brief features included on each month's program are Caltech Almanac, a look at the people and events that have shaped Caltech; Caltech Calendar, a look ahead at upcoming public performances and events scheduled on campus; and Caltech People in the News, a recap of recent news about the Institute that has appeared in the media.

The KPCC studio is located on the campus of Pasadena City College. Early this year, the station's transmitting towers are being moved from the campus to Mount Wilson, increasing considerably the range of its signal to include an area extending from Ventura to southern Orange County.

Mechanical Universe sequel wins two honors

Beyond the Mechanical Universe, the sequel to *The Mechanical Universe,* has won two international honors for its televised presentation of the history and laws of modern physics.

An episode of the Caltech television course entitled "The Atom" received the Silver Cindy Award, presented by the Association of Visual Communicators and considered to be the Oscar of its industry.

The series also received top honors at the 16th Japan Prize International Educational Program Contest, in Tokyo, for the show "The Lorentz Transformation". The Japanese Prize contest, sponsored by the Japan Broadcasting Corporation, is considered to be the only international competition established specifically for educational radio and television programming.

Letters

The reminiscences of Don Hyers concerning the matter of the power shovel on campus reported in the August 1987 issue of *Caltech News* weigh on my soul and compel me to confess all, but first let me explain the extenuating circumstances, of which there were three.

First be it known that in 1937, Linus Pauling, Richard Badger, Lindsay Helmholz, Lawrence Brockway, all of their students, and a postdoctoral, Simon Bauer, were all located in astrophysics along with their labs and research equipment. The start of Crellin Laboratory was therefore a cause for delight to the chemists, and this extended to the power shovel that was digging the deep hole for the new lab into which all would move. Thus the shovel was high in the minds of these students and something special needed to be done.

Second, it needs to be known that at that time one of the first of the big-time evangelists ran her "temple" in Los Angeles. Aimee Semple McPherson was the Tammy and Jim Bakker of that era, and quickly came to the notice of this same group of chemistry graduate students. They found it necessary to "be saved" on many a Saturday night. Hence the "Jesus Saves."

The third point is somewhat more troublesome and needs rather delicate treatment. Several months before the event of the shovel, Carl Anderson won his Nobel Prize for his discovery of the positron. A story that gained wide circulation on campus went on to say that Anderson wrote a letter to the editor of *Nature* magazine in London. When Robert A. Millikan, chairman of the executive committee of CIT, heard of the letter, he urged Anderson to withdraw it. He argued that surely something had gone wrong in Anderson's cloud chamber experiment. Possibly the polarity of the magnet was reversed during these experiments, or there was some other error.

It was too late for a retraction because the letter was already in press. Anderson won the Nobel and several weeks later a group in Europe had their letter in *Nature* of the discovery of the positron. Throughout all this Anderson was most gracious about the near-loss of the Nobel. He was supposed to have commented once that he appreciated the recognition of his work but that really "Millikan deserves the credit."

These were the elements leading to the message on the power shovel. The participants were Gene Eyster, Vern Schomaker, Norton Wilson, Henri Levy (I think), myself, and Lloyd Zumwalt (I think). My part was to paint some "eyes" on the bucket of the shovel to make it look like a friendly and beneficent creature making a new "home" for us. These "eyes" were quickly rubbed off by the first scoops of dirt. The literary message on the back of the cab of the shovel lasted well into the day before gray paint which matched the cab could be found and applied.

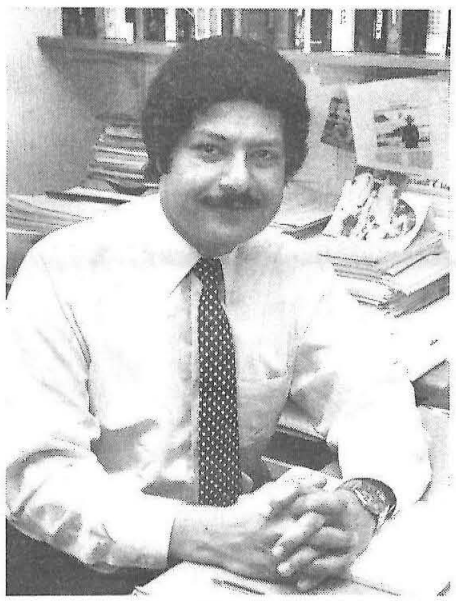
I would welcome comments from any of the conspirators to add to or to correct details which may be in error. After all, it was 50 years ago.

A. J. Stosick (PhD '39)

Caltech scientists observe molecular "Big Bang"

Using ultrashort pulses of laser light, Caltech researchers have for the first time observed molecules at the instant of their creation. "Observing the instant of a molecule's creation is for a chemist what observing the Big Bang would be for an astronomer," explains Ahmed H. Zewail, professor of chemical physics. "Molecules form our microuniverse, and it is of fundamental importance for chemists to know how atoms and molecules get together to form new molecules."

These studies have demonstrated that it is now possible to record in real time the fastest chemical reactions known to humans with a resolution of a millionth of a billionth of a second: a femtosecond. (To get an idea of how short a femtosecond is, remember that in one second, light travels almost the distance from the earth to the moon. In one femtosecond, light travels only one percent of the width of a human hair.)



Ahmed H. Zewail

"This is an exciting and important development," according to Richard B. Bernstein, professor of chemistry at UCLA and a Sherman Fairchild Distinguished Scholar at Caltech when these experiments were performed.

Two recent publications by Zewail and his colleagues have reported on the real-time clocking of two elementary chemical reactions that have a duration of picoseconds (trillionths of a second) or as short as 40 femtoseconds (40 quadrillionths of a second). In a new state-of-the-art laser facility at Caltech, the experiments were performed with a time precision of better than a few femtoseconds. Two laser pulses were used, one to initiate the reaction and determine time zero, and the other to "photograph" the reactions as atoms and molecules start the action to create newly born molecules.

The reactions observed by the Zewail group involved two classes — what chemists call bimolecular and unimolecular reactions. The bimolecular reaction involved the creation of new molecules from the attack of a hydrogen atom on carbon dioxide. The unimolecular reaction involved the decay of cyanogen iodide to form an iodine atom and a cyanide molecule.

The first announcement appeared in the July 16, 1987, issue of the *Journal of Chemical Physics* (Volume 87, page 1451), and was authored by N. F. Scherer, L. R. Khundkar, R. B. Bernstein, and A. H. Zewail. Norbert Scherer and Lutfur Khundkar are graduates in Zewail's group. In the experiment, atomic hydrogen reacted with carbon dioxide to produce a carbon monoxide and a hydroxyl molecule.

In studying the reaction, an important one in the upper atmosphere, the researchers used the laser in two ways. First, a pulse of laser light just a few picoseconds in duration broke the bond between hydrogen and iodine in a molecule of hydrogen iodide (HI) attached to the CO^2 molecule. This produced a hydrogen atom and defined the time zero — the instant that the reaction could begin.

The hydrogen atom reacted with the neighboring carbon dioxide, and the OH product of that reaction was detected by a second laser pulse, delayed in time. In this manner, the researchers determined that this reaction takes about five picoseconds.

Says Zewail, "The important new finding is that by clocking the reaction in real time, one sees that, following the step of creation, there is a happy encounter between the H and CO^2 for the few picoseconds before the new OH molecule is born."

Chemists have long theorized that there is an instant during chemical reactions in which the atoms involved are so closely associated that the aggregate can be considered neither reactant nor productive — the so-called transition state. Using even better time clocking with femtosecond lasers, Zewail's group was able to make the most direct observations ever made of a bond breaking in real time. According to a recent report in *Nature* (August 27 — September 2, 1987, Volume 328, page 760) by I. W. M. Smith of the University of Edinburgh, "These measurements open a new chapter in reaction dynamics."

In the second experiment, the Zewail group was able to observe the intermediate steps involved in breaking the chemical bond of the molecule cyanogen iodide.

This new technique has allowed the group to follow the creation of the molecule CN from the moment of the ICN "Big Bang," and to observe the fragments of I and CN as they leave each other en route to complete separation. The article reporting this work appeared in the August 15, 1987 issue of the *Journal of Chemical Physics* (Volume 87, page 2395) and was authored by M. Dantus, M. Rosker, and A. H. Zewail. Marcos Dantus is currently a graduate student, and Mark Rosker is a postdoctoral fellow (from Cornell University) in Zewail's group at Caltech.

The study of chemical dynamics of molecules constitutes one of the most active areas of fundamental chemical research. The Nobel Prize in chemistry was awarded in 1986 for contributions concerning the dynamics of chemical elementary processes, concentrating on the "before" and "after" of chemical events at the molecular level. It may one day be possible to use precisely tuned laser pulses to selectively create or destroy molecules, producing desired new ones.

"Observing the instant of a molecule's creation is for a chemist what observing the Big Bang would be for an astronomer."

Darlene Oliver memorial grove

Continued from page 7

Beautiful, while J. Kent Clark, professor of literature, emeritus, responded for the Institute.

"A grove of trees here on the Caltech campus is a rich and appropriate symbol for Darlene, like an elaborate metaphor in a poem by John Donne or Ben Johnson," he told the group. "It was to the Caltech family, as a family, that Darlene made her priceless contributions. She was a marvelous hostess, she had a gift for organization, and she served the family in a hundred different ways. Like one of her native cottonwoods, she seemed to absorb her total environment and to transmute a portion of it into something rich and rare."

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San Francisco Peninsula luncheons: Ming's Restaurant, Palo Alto, third Thursday of every month at 12:00 noon. Call Hugh Dubb, 415-362-3800 or 408-287-8278.

SANTA CRUZ CHAPTER
Luncheon meetings are held each month on the second Thursday at the Hollins House on Pasatiempo golf course at 12:00 noon. For reservations call Bob Shacklett at 408-722-6021.

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Everhart inauguration scheduled

Inauguration ceremonies for President Thomas E. Everhart have been scheduled for Tuesday, April 12, on Beckman Mall. Coverage will be provided in future issues of *Caltech News*.

Caltech divers plant abalone in restocking effort

Overharvesting has depleted the species almost to extinction.

By Winifred Veronda

A first in the annals of medical history might be claimed by five members of the Caltech dive club, who recently delivered 800 babies in a single hour.

The babies in question were 3/4-inch green abalone, fresh from incubation in warm seawater tanks at a commercial plant in Ventura. They were placed in friendly locations in 20 to 30 feet of water near the Isthmus of Catalina Island as part of an experimental project.

A member of the Caltech dive club receives a cooler filled with 100 baby abalone, ready to be planted in a friendly underwater location.

Divers in the first outing for what is to be an ongoing abalone project were Dale Prouty (MS '76, PhD '82); Roger Romani (PhD '87); Gordon Stewart (PhD '82), Ruth Erlanson, Wyman Williams, and Alan Yamamura, all graduate students in electrical engineering. They were ferried to Catalina with gear and abalone aboard the diesel-powered *Sidney C.* whose owner, Sidney Cooperman, volunteered both his time and his craft for the effort.

The Los Angeles County Fish and Game Commission gave the baby abalone to the dive club for planting as part of an attempt to restock this species in habitats off the California shore where conditions for its growth are favorable. A few decades ago, abalone lived in profusion off the coast, but overharvesting has depleted them almost to the point of extinction.

Caltech divers used a technique in their planting developed in Japan but not previously attempted in this country — a technique that protects the fragile abalone babies from damaging and sometimes fatal contact with human hands.

The tiny sea creatures were packed in a cooler in a pure oxygen atmosphere in plastic net bags, one hundred abalone to a bag. During the planting process, bags were removed from the cooler, cut open, and placed in plastic "delivery tubes." These tubes, about the size of a rolled-up newspaper, were wrapped in chicken wire. Each contained several exit holes through which the abalone could escape.

With the babies inside them, the tubes were carried by divers to planting sites selected as friendly spots for young abalone. "Abalone do best under overhanging rocks or in small caves," according to Wyman Williams.

Divers examined the sites with flashlights to be sure no possible predators were lurking there, and piled rocks around the tubes to conceal them. Planting sites were marked with milk-bottle floats tethered by string so the sites could be inspected and the floats retrieved the following day.

The Caltech group spent the evening in the dormitories of the nearby USC Marine Research Center, and returned the next day for more dives to check on the abalone. "We found some still in two of the tubes," said Williams, "but for the most part, the evacuation was total."

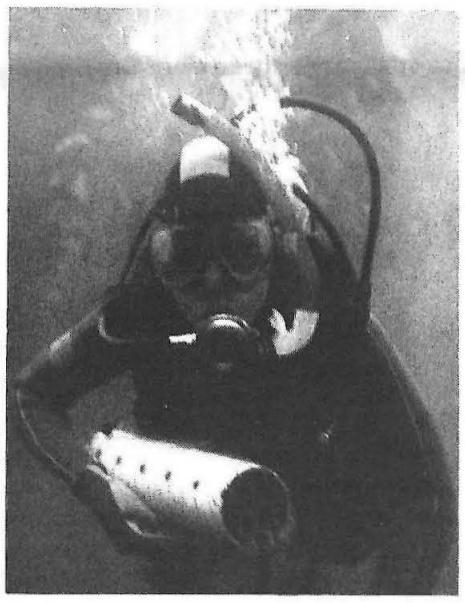
Several abalone were discovered sticking to nearby rocks, but most had hidden themselves under shelters. A few empty shells near one of the tubes provided the only sign of predators.

"It seems likely," said Williams, "that most of the abalone had left the tubes and found safe homes among the rocks."

Williams believes the project demonstrated that the planting technique can be used successfully, and club members laid plans for other "deliveries" in the late fall and early spring.

The 3/4-inch abalone will have several years to grow before they reach the 7-inch length which allows them to be legally harvested. In the meantime, their greatest threats are crabs, octopi, sea lions — and hungry divers who don't follow rules.

The Caltech dive club, whose membership consists of Caltech and JPL employees, graduate students, and undergraduates, is officially known as the Caltech Kelpers — reminiscent of past efforts on the part of members to help reestablish kelp along the southern California coast. The dive club was part of a project supervised by the California Department of Fish and Game to clear a hundred-square-yard tract and establish a kelp bed in an area that had been denuded for several years.



A dive club member seeks out a promising home site for young abalone.

Part of that effort involved going to the site — off Point Vicente on the Palos Verdes Peninsula — and bashing hundreds of kelp- destroying sea urchins with small hammers, the underwater equivalent of killing snails.

Planting kelp is no longer necessary, according to members of the dive club, because it is coming back in abundance all along the coast after major setbacks due to weather patterns and other problems that disrupted it.

Although good works have been a major item on the dive club agenda, a lot of its activities are for pure fun. The last dive on the day of the abalone planting was for relaxation and picture taking.

The club holds monthly meetings when members hear a talk or see a movie featuring scuba diving. They dive recreationally off a California beach once a month and occasionally organize boat dives. For member use, the club owns several underwater cameras and a computer that registers underwater depth.

But perhaps none of these activities is quite as satisfying as seeing several hundred baby abalone to safe home sites where they have the best possible chance of growing to maturity.

Catapult engine wins tug-o-war design contest

Designing and building the ultimate tug-o-war machine was the object this year of the ME 72 engineering design contest. The arena of battle was a track filled with white polystyrene pellets, and the machines were connected to each other by a piece of rubber surgical tubing hooked around a pulley.

Each student was given a "bag of junk" from which to build a machine. The bags contained ball bearings, springs, plexiglas, masonite, and two electric motors donated by the Schlumberger Corporation. Designs ranged from vehicles on tracks and wheels to sleds and catapult engines.

Erik Antonsson, assistant professor of mechanical engineering, the ME 72 instructor, has opted for a contest at the end of the term because he believes students learn more about design practices this way than through a conventional exam.

The contest was run as a double elimination. This meant that each student had to lose twice before being knocked out of the competition. Senior Keith Owens won the contest with a catapult engine while junior Leslie McCaffree came in second with an extending sled.

From the president

A column of alumni news by Alumni Association President David Harper

The Seminar Day Committee is busy at this time of year, planning the program for the 51st annual Seminar Day, May 21, 1988. Joe Dobrowolski (BS '49), Seminar Day general chairman, has announced that this year's general session speaker will be NASA administrator James C. Fletcher (PhD '48). Fletcher, who received the Distinguished Alumni Award in 1966, will give alumni and their guests insight into NASA and spaceflight. The full schedule of speakers will be announced in the April issue of *Caltech News*. Dr. Fletcher's participation will help to make this Seminar Day one that alumni should not miss.

Alumni chapters around the country have been very active this year. I am pleased to report that Walter A. Specht (BS '57, MS 61, PhD '65) has accepted the presidency of the Boston chapter. This chapter is looking forward to the second annual Beaver Cup" hockey game between Caltech and MIT on February 27. Later that day, President Thomas E. Everhart will address Boston alumni and their guests at a reception and dinner.

The Boston-area Caltech alumni cheering section will help the Beavers win, and the president's address should keep Boston alumni enthusiastic in their support of the Institute.

Portland alumni, led by Peter V. H. Serrell (BS '36, MS '39), president, held a chapter organizational meeting on October 28. These officers were chosen: Rick Smoody (Ex '74), vice president, and Robert E. Haas (BS '69), secretary-treasurer. Larry A. Westerman (BS '71) agreed to be the undergraduate admissions support contact. Keith Taylor (BS '60) also attended.

The committee agreed to begin meeting bi-monthly for lunch, and to plan for two major alumni events each year. Our best wishes to the new officers, and to the alumni in Portland who will enjoy the success of their efforts.

Chapter activities around the country are encouraged and supported by the Chapter Affairs Committee of the Alumni Association. Victor V. Veysey (BS '36) is chairman of this committee, which is composed of these members of the Alumni Association Board of Directors: E. Micheal Boughton (BS '55), Dale R. Burger (BS '55), Le Val Lund (BS '47), Lynette Schneider (BS '81), Peter Serrell (BS '36), Gary Stupian (BS '61), and Donna Wolff (BS '77).

The committee has been instrumental in revitalizing existing chapters and helping to create new ones. They have recently initiated a "mentor" program. Through this program, a member of the Alumni Association Board of Directors is aligned with a specific chapter to give support and encouragement to the chapter president.

We want alumni in our chapters to know that the board supports them

David Harper

and appreciates their efforts on behalf of the Alumni Association. We are making a special attempt to develop a strong relationship with the chapters. This effort also helps the Board of Directors to become more aware of the needs and of interests of alumni away from the campus, and to serve them better in the future.

As Alumni Association President, I'm extremely proud of the work of the Chapter Affairs Committee and what its members have accomplished, and thank them for a job well done. We look forward to expanding the chapter network in the future.

Airtalk: The Caltech Edition

Caltech alumni in the Pasadena area will have a new opportunity to learn more about the latest and best in news from Caltech. By tuning their dials to KPCC 89.3 FM at 6 p.m. every third Wednesday, they can hear *Airtalk: The Caltech Edition* with Larry Mantle as host.

Faculty, alumni, students, staff, and JPL scientists and engineers will be featured, sharing knowledge along with tidbits of Caltech history and news of seminars and events. Listeners will be able to call in during the show to ask questions of the speakers.

Second New England travel program scheduled

Last October a group of Caltech alumni spent several days studying the geological evolution of the tough old rocks of New England. Jo Laird (PhD '77) and Wally Bothner of the University of New Hampshire's department of geology led the excursion, assisted by Caltech's Robert Sharp, the Sharp Professor of Geology, Emeritus.

The first outing was so successful that a second trip is being planned for October 2-6, 1988. Once again Caltech alumni will be offered the opportunity to explore Vermont and New Hampshire amid glorious fall colors.

One thing they will learn is that the rocks are not really so old, geologically speaking. Rather, they have been badly mauled by the titanic forces that build and modify the earth's crust so that they look old. Their story is told by the structure of the rocks and by the chemistry of the minerals composing them. Alumni will learn how it is possible, for example, to create a shiny schist containing garnets as large as walnuts from a soft, fine-grained muddy shale. They will learn that New England was once the site of violent volcanic activity, and will have the opportunity to collect unusual minerals in an abandoned pegmatite mine. They will see what happens to fossil shells in rocks when they are recrystallized by metamorphic processes.

The classical concept of the geological evolution of the New England rocks will be contrasted with interpretations based on modern ideas of plate tectonics, continental drift, sea-floor spreading, subduction, volcanic island arcs, and fore- and back-arc basins.

Alumni will assemble at the Hanover Inn at Hanover, New Hampshire, at 5:30 p.m. on Sunday, October 2. During the following three days, trips into Vermont and New Hampshire will be conducted by bus out of Hanover and Lyndonville. The party will disband on Thursday morning, October 6, in Hanover.

Cost of the trip is $650 per person, double occupancy, and $800 per person, single occupancy. This covers all expenses from dinner on October 2 through breakfast on October 6.

Places will be filled on a first-come, first-served basis. To reserve a place, return the coupon below with a deposit of $150 per person to the Caltech Alumni Association, 1-97, Pasadena, CA 91125. We hope you will be able to join us.

Caltech to challenge MIT in second ice hockey contest

Caltech will challenge MIT on February 27 in Cambridge in the second "Beaver Cup Contest" in ice hockey. Last year, when the teams met for the first time, MIT defeated Caltech 11-3 at the Pasadena Ice Center.

Ice hockey is a student sport at MIT. The team practices daily at its own rink on campus. At Caltech, ice hockey is a club sport involving a broad range of the Caltech community. The members practice approximately once a week.

Simon elected to AMS office

Barry Simon, IBM Professor of Mathematics and Theoretical Physics, has been elected vice president of the American Mathematical Society. The 20,000 member organization was established in 1888 to promote the interests of mathematical scholarship and research through publications, conferences, and symposia.

CALTECH ALUMNI ASSOCIATION
NEW ENGLAND TRIP, OCTOBER 2-6, 1988

Please make _____ reservations for the alumni trip to New England.

Name(s) _____ Class Year _____

_____

Address _____

_____ Phone _____

I enclose a check for $ _____ ($150 per person) as a deposit.
Make check payable to the Caltech Alumni Association and mail to 1-97, Pasadena, CA 91125.

Beavers post 5-3 football record, winning cross-country season

Cross country

The men's and women's cross country teams posted identical records this year with 10 victories and 8 losses. This marked the second consecutive winning season for the men, and the first winning season ever for the women. Increased participation has allowed both of these teams to excel. With 40 men and 15 women in cross country, a significant percentage of the student body was out there racing.

Senior John Gehring, the men's team captain, set a school record on the home course in lower Arroyo Park, and was the top finisher on the team in every race this season. As women's captain, Bibi Jentoft-Nilsen led her team to an impressive conference finish.

The men posted a SCIAC-meet record of 2 wins and 4 losses, while the women managed to break even at 3-3. At La Mirada Park, in the pouring rain, both teams claimed fourth-place conference finishes. John Gehring ran an excellent race to finish seventh; he claimed first-team all-conference honors for covering 5 miles in 27:16. Jentoft-Nilsen placed 16th to earn her way onto the all-conference second team with an excellent time of 22:11 for 5 kilometers.

Alex Athanasopoulos was chosen captain of the men's team for 1988, while Jentoft-Nilsen was again elected to represent the women as captain. John Gehring was awarded the prestigious Paul Barthel award for the third year in a row — a feat accomplished only once before by a runner.

The award for most improved athlete went to Athanasopoulos, a talented junior who ran as the second man at the regionals. Senior Joe Shiang was presented the most dedicated athlete award. Shiang, out for his first season this year, ran in the top five all season. Honored as outstanding newcomers were senior Wayne Lukens and freshman Scott Kister.

It will be difficult next year to replace three talented runners from the top five on the team, but freshmen Chris Campo, Mark Lyttle, and Paul Socolow are up to the challenge.

Jentoft-Nilsen received an award as the outstanding woman athlete after a highly competitive season in which she improved her best time for 5 kilometers by more than 3 minutes. Sophomore Ami Choksi was named most improved runner, while sophomore Margi Pollack was judged most dedicated for her efforts in overcoming a stress fracture and returning in time to finish as second woman for Caltech at the regionals. Freshman Liz Warner brought her competitive spirit to the team, along with much talent, and was named outstanding newcomer.

The future looks bright for the women's team, because none of the runners are graduating seniors.

Elsewhere in the SCIAC, the Occidental men ran a strong race and claimed the championship with 31 points, while the women of Claremont narrowly edged out Oxy for the title.

Pavel Svitek battles to win a face-off in an ice-hockey contest with UC Irvine. At left, Dave Braun waits for Svitek to draw the puck back to him.

Football

The high level of competitiveness developed by Tech's football team since 1980 continued this year as the Beavers posted a 5-3 record and fell only two touchdowns short of a 7-1 mark.

The Beavers lost to the University of La Verne Reserves, 14-7, when their opponents went to their first-string Varsity split-end who caught a winning touchdown pass with 1:33 left in the game. The previous week, Caltech saw its first 10 points erased by penalties as Cal Poly Pomona, with its 17,000-member student body, won a spirited contest.

Tech football was in the news again this year. The 1987 "Battling Beavers" were ranked as high as sixth nationally in the weekly National College Football Association poll — the association of which Caltech's team is a member. (MIT was not ranked in the top ten). Local television news on station KTTV featured an interview with Coach Lin Parker and the team captains, Scott Miskovish and Dwight Berg. National sports interest also was centered on this season's team when the cable network, SCORE, broadcast a Caltech football feature.

A mid-season highlight was a team trip to Mexicali in Baja, California, to play in the "Bola Amistad." The Tech opponent, CETYS, a trade school, put up a good fight before falling 27-12. The host school, led by President George Zamudeo, treated the Beavers to a victory feast of carne asada after the game.

The Beavers continued their dominance over the Pasadena Police Officers' Association team with a 33-6 win that featured a school record 94-yard touchdown run from scrimmage by tailback Vincent Riley. The team closed with a rush, winning the final four games in succession.

Of the 54 men who began the season, 44 celebrated at the Alumni House with the annual awards barbecue. Scott Miskovish received a four-year letter award, which includes a lifetime pass to all Caltech athletic contests. Miskovish also received the coveted Wheaton Trophy for leadership and all-around excellence. The "Rookie of the Year" award went to Page House freshman Steve Harkness. In spite of playing offensive tackle, Harkness capped his first season by rushing for a touchdown against the Pasadena police on one of Coach Parker's famous surprise plays.

Fullback Eric Newman received the "Outstanding Freshman" award, while the "Best Defender" was Ernesto "Don" Thomas. The Irv Noren trophy for outstanding back was voted to Vincent Riley, and the Max West award for outstanding lineman was given to William Bly.

Elsewhere in the SCIAC, Claremont-McKenna and Occidental tied for the league championship.

Soccer

Considering the talent on the team, the soccer season was a disappointment. Tech finished fifth in the SCIAC, ahead of Whittier and Redlands. Claremont and La Verne tied for first place. Caltech came close to upsetting Claremont.

Two injuries affected the team seriously. Van Eric Stein, goalkeeper, missed most of the season because of a broken hand. Paul Cabral, hit man, was also out with an injury for much of the season.

For the second consecutive year, John Josephson was chosen first team all-conference, and Mike Keating was selected second-team all-conference. Flavio Noca, Konstantin Othmer, and James Ibbetson received honorable mentions. Bill Foster established himself at fullback and had an excellent season. Sam Weaver, who substituted in goal, gave 100 percent in effort. Gary Eastvedt was the team's most promising new player.

An excellent turnout of "old-timers" enlivened the game against alumni. In spite of an abundance of talent, the alumni team was overwhelmed by the varsity, 9-1. While supporting a losing cause, Manuel Acevedo (BS '85) showed that he has retained most of his skills.

Next season the team will lose these starting seniors: Van Eric Stein, Bill Foster, Mike Keating, Paul Cabral, Konstantin Othmer, and Doug Roberts. In spite of these losses, there will be a good nucleus of returning students around which to build.

Volleyball

The Caltech women's volleyball team was much improved this year, thanks to the efforts of nine returning players. After just one week of preseason practice, the women beat their first opponent of the season, squeaking by the Whittier junior varsity (JV) in a close 5-game match. This victory, the volleyball club team's first in more than 2 years, was

the result of Coach Laurianne Williams's continuing emphasis on fundamentals and clean, consistent play.

Senior Linda Schlueter, the team's most powerful hitter and hardest server, made major contributions as a starter and earned her fourth varsity letter in volleyball. Junior Karen Oegema and postdoc Courtney Smith both made many great blocks as starting center hitters. Staff member Jessica Graves and graduate student Lynn Hildemann, along with Smith, were consistent and accurate setters. Other veteran starters were junior Carol Choy, a defensive specialist, and power hitters Julianne Moses and Chris Wilson, both graduate students.

In her second year on the team, junior Betsy Andrews showed great promise in several games as a utility player. Newcomers Kathleen Kraemer, a sophomore, and freshmen Ruchira Datta and Su-Lin Wu showed remarkable improvement as the season progressed. Graduate student Linda Rowan, despite limited practice time, showed consistency and talent in her first year on the team.

The volleyball team's 3-7 season included two wins over the Whittier JV, and a surprising upset over the Redlands JV. The women, spurred on by a large partisan crowd, won the best-of-three match against the tall Redlands team (17-15, 11-15, 15-13) after being down 9-13 in the third game.

Many of its members will be returning next year, so the team looks forward to another competitive season.

Water polo

Sights were aimed high at the beginning of this year's water polo season. Almost all the schools in the SCIAC conference were hurt by mass graduations, while most of Tech's starters returned. After a smashing 16-10 victory over the alumni (a victory not achieved for the past five years), the Beavers felt that this could be the year for a strong finish in the conference.

Then began a series of easy victories and heart-breaking defeats. Soon the losses began to add up faster than the wins. Said Coach Clinton Dodd, "The lack of experience showed up when we couldn't hold our lead in the fourth quarter."

The Caltech team had a lead in every game, only to frequently fall short by one or two goals. Highlights included wins over Chapman, 12-7; UC Riverside, 10-9 in overtime; and Dominican, 20-13. Other close games included a 5-5 tie in the fourth quarter with NCAA power UC Davis; an overtime loss to PCC; a shootout with Chaminade, 17-16; and a sudden-death loss to conference power Whittier College, 13-12.

Although the team posted a disappointing 20-7 season and placed sixth in the conference, the men played hard and won respect.

Team leader was senior David Bruning, the captain, who was holeman and dished out many assists. The secondary holemen were juniors Clark Highstrete and Chris Habecker. Deep-wing duties were handled by senior Mark Holdsworth, who did an outstanding job all year long, scoring 61 goals and playing tough defense.

The speediest members of the team were junior Devin Leonard and sophomore Chris Edgington, who worked the fastbreak and got the ball on outlet passes from senior Eric Christensen, goalie. Christensen did a great job, blocking many shots and improving his passing. Chris Assad, who returned for graduate studies, played more water polo. He set wing and was a defensive star. Freshman Brian Shim steadily improved and became a starter midway through the season.

The junior varsity squad was led by sophomore David LaFollette and junior Tim Hochberg, goalies. Sprints were handled by speedy freshmen Dave Geraghty and Barry Stipe, while sophomore Mark Hause and freshmen David Amezcua and Graham Gitlin controlled the hole area. Setting the deep wings were freshmen Ian Dutton and Mark Chamness and sophomore Ted Rogers. The entire freshman and sophomore crew did a fine job and made great improvements.

This was the last year of David Bruning's water polo career. He has received three all-tournament honors in the past two years of play. During his freshman year he scored a total of 4 goals; as a sophomore, 56 goals; as a junior, 120 goals; and as a senior, 116 goals — setting a superior career scoring mark of 296 goals. This year he shot an excellent 52 percent from the field while drawing 119 kickouts on the opponents. Bruning was voted to the SCIAC all-conference team for the second year in a row.

Post-season awards went to Brian Shim as outstanding freshman; to Mark Holdsworth, who received the most-improved-player award and an honorable mention for the all-conference team; Devin Leonard, who was voted next year's team captain; and David Bruning, who received the "Coach's Cup" for his outstanding play and leadership.

Nocturnal activity on campus takes new form

This article was written by Betty Hyland, an administrative secretary in the Division of Humanities and Social Sciences. It is reprinted from the campus publication, On Campus.

I saw one not five minutes ago, peeking up at me from a Lily of the Nile patch. I tiptoed closer. It winked. I stood still as a statue, hoping that, like our mourning doves, it would accept my presence, but it

flipped its prehensile tail and waddled off.

The first anyone knew opossums lived on campus was after the insignificant rocks at the Throop site were replaced by geologically significant rocks.

Shortly after the rocks were moved, a baby opossum was spotted, hiding behind an air conditioning unit in a first floor classroom in Dabney. It appeared to have climbed in an open window, nibbled on a banana peel, then scurried for shelter when the door opened.

Someone suggested that engineering or behavioral biology be consulted. Instead, the emergency 5000 number was called. Two men from security came. While onlookers stood well back, the men rapped on the unit, called to the opossum to go home, and left when it didn't.

At 5 p.m. the opossum was still there, playing possum as best it knew how, given its age. So the door and window were left open and an Oreo cookie was tossed close by.

Later that night, a grad student was jolted from intense concentration by scratching sounds coming from his wastepaper basket. He peered in to see the opossum staring at him with pleading eyes, its pointed snout quivering.

He quickly clamped his dissertation over the basket, rushed outside, and released the frightened creature by the geologically significant rocks. He was later to say that he heard faint oinks of delight in the night.

Not long ago, visitors spotted an opossum on San Pasqual, nibbling something outside Chandler. This one was described as being smaller and plumper than the first. As the visitors screamed and pointed, it disappeared under the foundation, dragging a burrito supreme after it.

How many opossums are on the Caltech campus? No one knows. The creatures are nocturnal, and, like the toys in *Nutcracker Suite*, come out when the campus sleeps.

When the moon is overhead, do they come down from their dens in campus walls to frolic in Millikan Pond? Do the females stroll Olive Walk, their newborns peering from their pouches? Do the males toss frisbies in the quadrant while spectators hang from the jacarandas?

And is it possible that, like furry phantoms of the opera, the opossum may have viewed, from behind cracks in the hallowed walls, scenes that would alter the campus image?

ALUMNI ACTIVITIES

February 27, *Caltech-MIT ice hockey game* at the MIT ice rink, 2 p.m., Cambridge.

March 11, *Wine tasting* at the Athenaeum.

May 6, *10th reunion,* class of 1978.

May 14, *35th reunion,* class of 1953, 45th reunion, class of 1943.

May 20, *25th reunion,* class of 1963.

May 21, *51st annual Seminar Day* on the campus.

June 3-4, *50th reunion,* class of 1938.

June 4, *Half-Century Club luncheon,* the Athenaeum.

June 16, *Alumni Association annual meeting and dinner.*

October 2-6, *New England travel program.* See article in this issue.

Caltech legends: a second volume?

So you never heard about the alumni who financed their grad school educations by using superior statistical techniques on Las Vegas roulette wheels? And you're only dimly aware of rumors that some Techers put the Rose Bowl's scoreboard under remote control during "the game" a few years ago? But worse, you were embarrassed at a party because somebody asked you about how the Hollywood sign was modified last spring, and you had to admit this was the first time you'd heard about it? Well, you may be about to get a chance for a refresher course in Caltech legends.

Legends of Caltech was published five years ago because enough alumni submitted good stories to make it possible to produce a high-quality anthology that chronicles the history of Caltech pranks. Many good submissions wound up on the cutting- room floor — victims of space and budget limitations. Moreover, several "untold tales" were never brought to the attention of the editors of *Legends* — and other adventures have taken place since the book was published in 1983. So the Alumni Association would like to know: should we try for *Legends, Part II*?

The Association hopes to learn the answer by soliciting contributions to be included in a new volume. Stories of pranks pulled by students at any time since the Institute was founded are welcome.

If past tradition is an indication, the hallmarks of these pranks are uniqueness and ingenuity (sometimes with an unusual twist or kicker), no injury or permanent damage to property, a tongue-in-cheek lesson, or the accomplishment of an outstanding, if not always useful, "first."

Any alumni who remember pranks pulled while they were at Caltech that fit this mold should submit descriptions of them to Chip Smith, Lawrence Livermore National Laboratory, Box 808/F-626, Livermore, CA 94550, by March 31. Authenticity of the pranks should be corroborated by photographs or other material, if possible. Any material submitted will be returned to the sender.

If enough high-quality material is submitted by the deadline, the Alumni Association will proceed with the sequel to *Legends*. (By the way, *Legends* is still available from the Alumni Association for $9 a copy.)

Look at it this way. MIT is probably still trying to figure out whether it has enough original material for a *first* book.

Alumni reminded to return directory data

By now, all alumni should have received a request for the information required to assure that the new Alumni Directory contains complete data. The publication is scheduled for release in September/October 1988.

Publishing the directory is Harris Publishing Company, White Plains, New York. During the next few months, alumni who are not members of the Alumni Association will be contacted by telephone for verification of the information to be included. At that time — and only at that time — they will be asked if they want to purchase a copy.

Members of the Alumni Association will *not* be contacted by telephone for verification of their directory information. They should be sure to return their questionnaires in order to assure that Harris Publishing Company has access to accurate information. Members will receive a copy of the directory as a benefit of association membership.

Alumni who have not returned their questionnaires and who are not reached by telephone by the Harris firm will be listed in the directory with the information provided by alumni records.

Caltech remembers Dorothy Hayman

Caltech has lost a good friend who, with her husband, was involved in many aspects of Institute life. Dorothy Margaret Hayman, who died December 24, was a contributing life member of The Associates and a member of the President's Circle, and a generous benefactor who made numerous gifts to the Institute.

The late wife of Richard L. Hayman, class of 1936, Mrs. Hayman was born in Chicago and came to California with her family. Here her father purchased a vineyard northwest of Fresno where she grew up, graduating from Kerman Union High School. She went on to attend Whittier College and to graduate in 1938 from USC. After graduation she worked at Lockheed Aircraft Corporation, where she met her future husband. They were married in 1940.

In addition to Mr. Hayman, she is survived by her daughters, Sandra Nelson and Sheryl Everett, her son, Rick Hayman, four grandchildren, a great grandchild, and a brother and sister.

A memorial fund has been established in her memory. Contributions may be sent to the Dorothy M. Hayman Memorial Fund, Caltech, Attn: David Morrisroe, treasurer, mail station 212-31, Pasadena, CA 91125.

OBITUARIES

1918
GORDON R. MCDONALD, of Lexington, Massachusetts, on September 5. For 41 years he worked as an electrical engineer for the General Electric Company of Erie, Pennsylvania. Upon his retirement, he taught engineering for a year at the Erie branch of the Pennsylvania State University, and then began his second career. He worked as a maker of violas for 25 years, producing instruments of excellent quality.

1925
DWIGHT O. SMITH, of Redlands, California, on April 28.

1926
IRA E. TRIGGS, of San Clemente, California, on November 2.

1930
EUGENE M. THAYER, on September 6, of heart failure. A Life Member of the Alumni Association, Mr. Thayer lived in Hollywood, California.

1931
HOWARD E. SHIRLEY, MS, of Akron, Ohio, on August 31, 1986. He was president of Howard Shirley, Inc., also of Akron, Ohio.

1935
PHILIP A. COLMAN, MS, MS '36, of Los Angeles, California, on October 30, after a lengthy illness. He is survived by his wife, Mona; son, Philip; daughter, Cathy; and grandchildren, Jesse, Benjamin, Heather, and David. A memorial fund in his name has been established at Caltech. Those wishing to contribute should write to: The Philip A. Colman Memorial Fund, Caltech, 1201 East California Boulevard, 105-40, Pasadena, California, 91125.

ELMER L. LEPPERT, JR., MS '36, of Glendale, California, on October 24. Retired from JPL, he was a Life Member of the Alumni Association. He is survived by his wife, June.

1938
RICHARD W. FOLKINS, MS '39, of Mission Viejo, California, on June 23, of cancer. A Life Member of the Alumni Association, he worked as a senior transportation engineer for CALTRANS until his retirement in December of 1979,

STANLEY VAN VOORHEES, of Zephyr Cove, Nevada, on July 31, of a heart attack.

1947
ROY G. ANDERSON, Eng, of Neosho, Missouri, on June 17. He was retired from the U.S. Navy, having attained the rank of rear admiral.

1948
ROBERT I. KING, of Pebble Beach, California, on February 27. A Life Member of Caltech's Alumni Association, he achieved a 33- year objective in May of 1982 by receiving his PhD from the University of San Francisco.

1953
JOHN N. DELCAMP, MS '54, of San Clemente, California, on September 10.

1968
JAMES A. MAGNUSON, PhD, of Pullman, Washington, on September 8. Chairman of the chemistry department at Washington State University in Pullman, he was a noted cancer and immunology researcher, and a member of Phi Beta Kappa, Phi Lambda Upsilon, Sigma Xi, the American Society for Biochemists, and the American Association of Immunologists. He is survived by his wife, Nancy; his parents, Jean and George; and his brother, Jay.

1973
DAVID H. WHITE, PhD, of Santa Clara, California, on September 25. An associate professor of chemistry at Santa Clara University, he was doing research at NASA's Ames Research Center on the origin of life and chemical evolution. Previously he had taught at the University of Massachusetts and at Lawrence University in Appleton, Wisconsin. He is survived by his parents, Vivian and Halbert; identical twin, Neil; sister, Patricia; and brother, Stephen.

PERSONALS

1932
WILLIAM H. PICKERING, MS '33, PhD '36, former director of Caltech's Jet Propulsion Laboratory (from 1954 to 1976), was named to the Satellite Hall of Fame in October. Pickering, who lives in Flintridge, California, was recognized as one of seven people who brought America into the space era.

1933
JOHN R. PIERCE, MS '34, PhD '36, of Stanford, California, was recently honored as one of seven people to bring America into the space era, being inducted in October into the Satellite Hall of Fame.

1943
JOSEPH V. CHARYK, MS, PhD '46, was awarded the National Medal of Technology by President Reagan in a ceremony at the White House last summer. Charyk, recognized for his expertise in geosynchronous satellite systems, has been a director of The Charles Stark Draper Laboratory, Cambridge, Massachusetts, since 1981. In November, he was elected chairman of their board. Retired chairman of the board and chief executive officer of Communications Satellite Corporation (COMSAT), Charyk has held a number of posts in private

and government research facilities, including Caltech's Jet Propulsion Laboratory, where he served as engineer from 1943 to 1946. In 1966, Charyk received the Alumni Distinguished Service Award from Caltech.

1945
CHARLES M. DAVIS, MS '46, has taken early retirement from General Dynamics Electronics Division in San Diego. He's now doing part-time electro-optic consulting, saving time to enjoy his second home in the Sierras.

1947
DAVID O. CALDWELL, of Santa Barbara, California, has received the U.S. Distinguished Senior Science Award from the von Humboldt Foundation of West Germany. Caldwell will spend most of the 1987-88 academic year at CERN, in Geneva, Switzerland, with occasional visits to various German universities.

1948
WILLIAM J. "BUD" CARROLL, MS '49, was inducted into the National Academy of Engineering in October. A resident of La Canada Flintridge, California, Carroll was one of 82 engineers elected to membership last year. Also in October, Carroll was installed as president-elect of the American Society of Civil Engineers. Carroll's professional experience has been in the field of environmental engineering, with major emphasis on water and wastewater system planning and design. Carroll is a former president of the Caltech Alumni Association, past president of the American Academy of Environmental Engineers, and a past director of the Pasadena Chamber of Commerce.

HAROLD A. ROSEN, MS, PhD '51, of Santa Monica, California, was inducted into the Satellite Hall of Fame at an October conference called to celebrate 30 years in space. Rosen was recognized as one of seven people who brought America into the space era.

1949
ARTHUR E. BRUINGTON, MS '50, has been appointed vice president of Zone IV of the American Society of Civil Engineers (which includes ten western states and parts of western Canada). Bruington is a water resources consultant closely associated with the Irvine, California, Ranch Water District.

1952
RICHARD R. DICKINSON has been transferred to Texaco's White Plains, New York, corporate headquarters as vice president of technology. In September, Dickinson successfully competed in the Texas Hill Country Triathlon, taking first place in his age category in the 2-mile swim, 52-mile bike, 10-mile run event.

1954
ROBERT L. SMITH, MS '55, was recently promoted to vice president of program development at General Dynamics, the Pomona, California division.

1959
DONALD J. KETTER, MS, is working on the ATF program for Lockheed in Burbank, California.

1960
LAURENCE M. TRAFTON, MS '61, PhD '65, has been elected a fellow of the American Association for the Advancement of Science. Trafton's home is Austin, Texas.

1961
JAMES F. HAYS, MS, of Arlington, Virginia, is now serving as Senior Science Advisor at the National Science Foundation. He was formerly the director of the Division of Earth Sciences at NSF.

1964
MARK LEVINSON, PhD, is on phased retirement as professor of mechanical engineering at the University of Maine. He intends to continue work in the history of technology. His first article in that area was published in the April '87 issue of *Technology and Culture*.

1966
STUART W. GALLEY, along with his wife and son, built a cabin in the Maine woods last summer. Galley reports that there's no electricity, but plenty of firewood. Their year-round home (which has electricity) is in Arlington, Massachusetts.

1967
MICHAEL P. BURKE, MS, has moved to Phoenix to open a law office for his firm, Bryan, Cave, McPheeters & McRoberts.

NORTON R. GREENFELD, MS '68, PhD '72, and wife Ellen have a new baby boy, Alex. Their home is Wayland, Massachusetts.

DAVID A. HAMMOND's newly adopted baby daughter, Susan Anne, was born March 22 and came home (to Oakton, Virginia) 21 hours later.

1968
RICHARD B. LARSON, PhD, has returned to what he describes as "civilian life," after completing six years as chairman of the Astronomy Department at Yale.

1969
DANIEL H. ADDIS, working out of Corvallis, Oregon, started Talk of the Town Telegrams in May. Ownership follows six years as a singer for Songbird Express. Now he oversees a company that provides entertaining messages delivered by belly dancers, clowns, magicians, singers, and actors. "I know this doesn't sound like I'm using my BS in chemistry anymore," explains Addis, "but I found a Caltech education goes far beyond simple book learning. It's a way of understanding and dealing with this world."

1970
JAMES A. CONTE, MS, is teaching physics and advanced placement physics at Classical High School in Providence, Rhode Island. It's physics with a Caltech twist: Conte is using Professor David Goodstein's *Mechanical Universe television course* to "stimulate class interest in the subject."

JOHN L. FIRKINS, PhD, has accepted a new position in Memphis, Tennessee, where he is managing the New Business Opportunities Department of International Paper Company. Firkins reports that wife Sharon and daughters Jenny (16) and Jacqui (14) are settling into their new home after the August move from Wisconsin.

1972
CHARLES R. JOHNSON, PhD, has moved to Williamsburg, Virginia, to become the Class of 1961 Professor of Mathematics at the College of William and Mary.

1973
STEPHEN J. BISSET and wife Jenny celebrated Ground Hog Day in a special way this year, with the birth of their first child, Trevor Andrew. They're making their home (above ground) in Los Altos, California.

1974
ROBERT B. BREWINGTON and wife Grace recently celebrated the birth of their son, Bruce Xiangji. Brewington, a systems engineer with Hewlett Packard for the last eight years, has taken on a "second career" as the women's volleyball coach at the University of Rochester. His team was nationally ranked the last two years. Brewington himself plays volleyball competitively, playing on a Master's team that qualified for the USVBA Nationals last year.

DAVID A. DRAKE, of Escondido, California, has been promoted to unit manager at Digital Equipment, where he has worked for the past two years. Recently, Drake won a Software Services Excellence Award.

RENE C. GANDOLFI has just received specialty certification by the American Board of Veterinary Practitioners. He is one of five such specialists in the San Francisco Bay area, practicing in the Castro Valley. "While I rarely need to use Maxwell's equations," writes Gandolfi, "Biochem and Immunology sure come in handy. Thanks, Dr. Hood!"

1975
DOUGLAS D. HERBERT was recently promoted to the rank of Major in the U.S. Air Force. He is attending the Air Command and Staff College in Montgomery, Alabama.

1977
KATHLEEN K. FORGAC and husband MIKE ('76), of Stoneham, Massachusetts, are proud parents of a baby daughter, Rebecca, born June 18.

BEN S. FREISER, PhD, professor of chemistry at Purdue University, received the 1987 Leo Hendrik Baekeland Award. Freiser was selected to receive the award for his pioneering developments in gas phase metal ion chemistry. He received a gold medal and $1,000 cash award during an October symposium at AT&T Bell Laboratories in Murray Hill, New Jersey.

DON HAMASAKI married Joanie Jane Harrison on September 5. They are both working in San Francisco, Hamasaki as a structural engineer at PMB Systems Engineering, Inc. and Joanie as a medical assistant at Irwin Memorial Blood Bank.

1978
MICHAEL J. AZIZ has received a Presidential Young Investigator Award from the National Science Foundation. Having completed his PhD at Harvard in materials science and a postdoctoral appointment at Oak Ridge National Laboratory, Aziz is currently an assistant professor in materials science at Harvard. He is also a loyal Celtics fan and plans to remain in the Boston area until Larry Bird retires.

1979
LEONARD R. LEVY is now the Rabbi of Congregation Beth Emeth in Hewlitt, New York, where he and wife Lisa live. Levy is studying for his PhD in Jewish Law at the Jewish Theological Seminary and New York University.

BRUCE S. ROSEN, MS, and his colleagues Charles W. Boppe and Joseph P. Laiosa produced the hydro-numeric design of the keel and wings for *Stars & Stripes '87*, the 12-meter yacht that won the America's Cup. Rosen, living in Babylon Village, New York, is an aerospace engineer for Grumman Aircraft Systems division and is involved there with development and application of CFD (Computational Fluid Dynamics) methods. He was part of a group of engineers invited to join the Sail America Foundation as independent consultants. It was their wing design that was adopted just prior to the Challenger semi-finals. Rosen describes the design process: "To support the engineering design, for which Boppe deserves most of the credit, I developed a computational method for predicting the flow about complex 12- meter shapes, including the effect of free-surface waves. The code worked so well that competing methods were left 'dead in the water'. We are currently negotiating to develop similar capabilities for the Navy and for America's Cup syndicates worldwide."

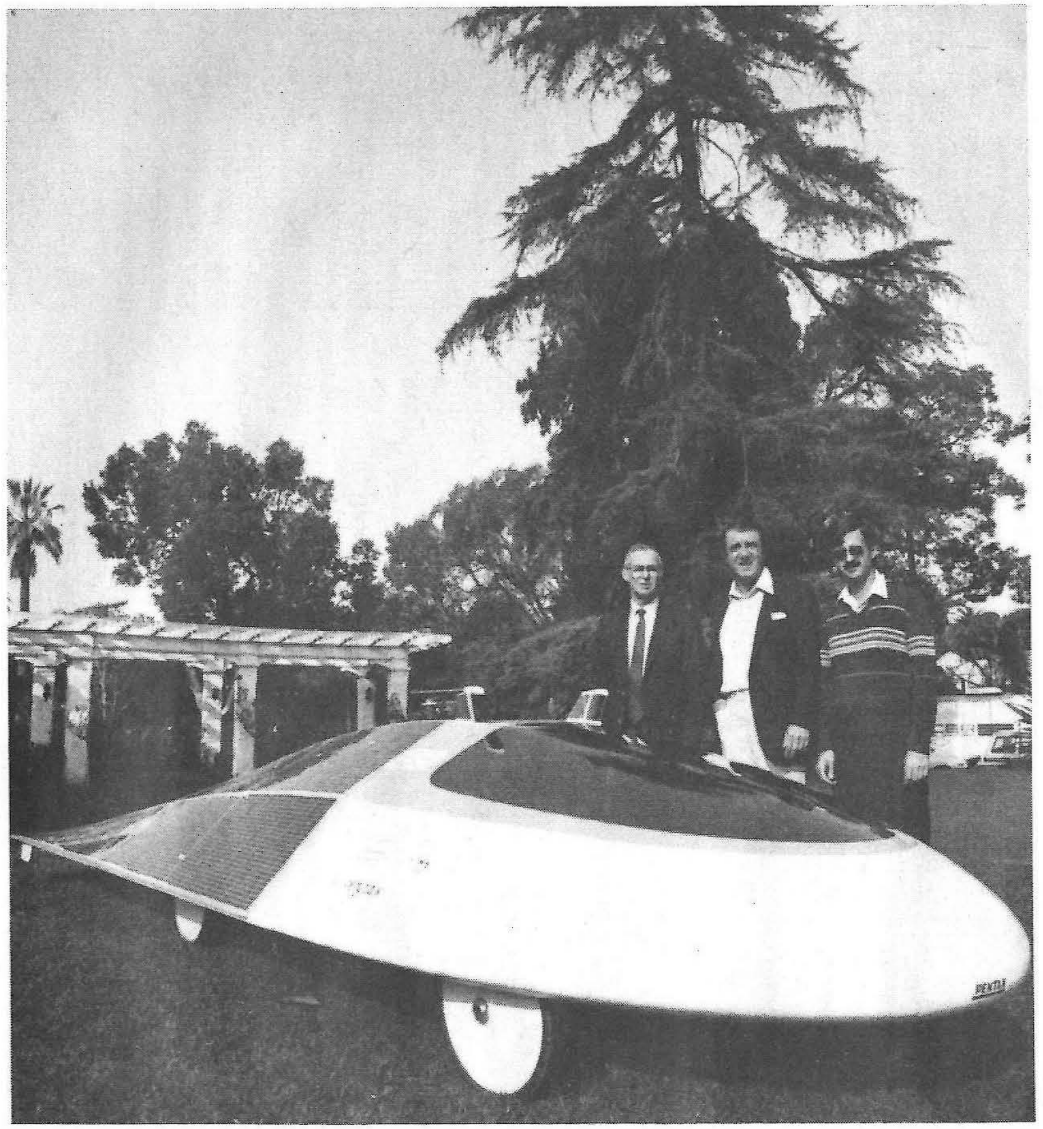
1981
BONNIE BLAMICK is doing graduate work in audiology at Northwestern University. In November, she married Si Wing "Ray" Siv, an electrical engineer with Intellitech, Inc.

PETER W. SHOR, is working at Bell Labs, doing research in theoretical computer science. He was married on October 31 to Jennifer Collins. Their home is Berkeley, California.

1983
DANIEL I. ZWILLINGER is author of *Handbook of Differential Equations*, a reference book published by Academic Press and due for release in March '88. Zwillinger is living in Burlington, Massachusetts.

1984
ELIZA L. SUTTON is a second-year medical student at Harvard, where she received an MA in Chemistry in 1986.

1986
KENNETH A. ADELMAN recently married GABRIELLE A. GORDON (BS '87). They are living now in Pasadena.



The Sunraycer, a solar-powered car built by General Motors and designed by Paul MacCready (MS '48, PhD '52) with members of his AeroVironment firm, sped across the finish line near Adelaide, Australia, in November to win the world's first sun-powered auto race. The car finished more than 600 miles — and about two and a half days — ahead of its nearest competitor. MacCready attributes the car's performance to aerodynamic efficiency, a complex electronic system, a small but powerful electric motor, and streamlined construction that allowed it to use its solar power effectively. With Sunraycer above are MacCready; Peter Lissaman (MS '55, PhD '66), who heads AeroVironment's Aerosciences Division, which handled the project; and Alec Brooks (MS '77, PhD '81), the Sunraycer project manager and one of six drivers in the race.

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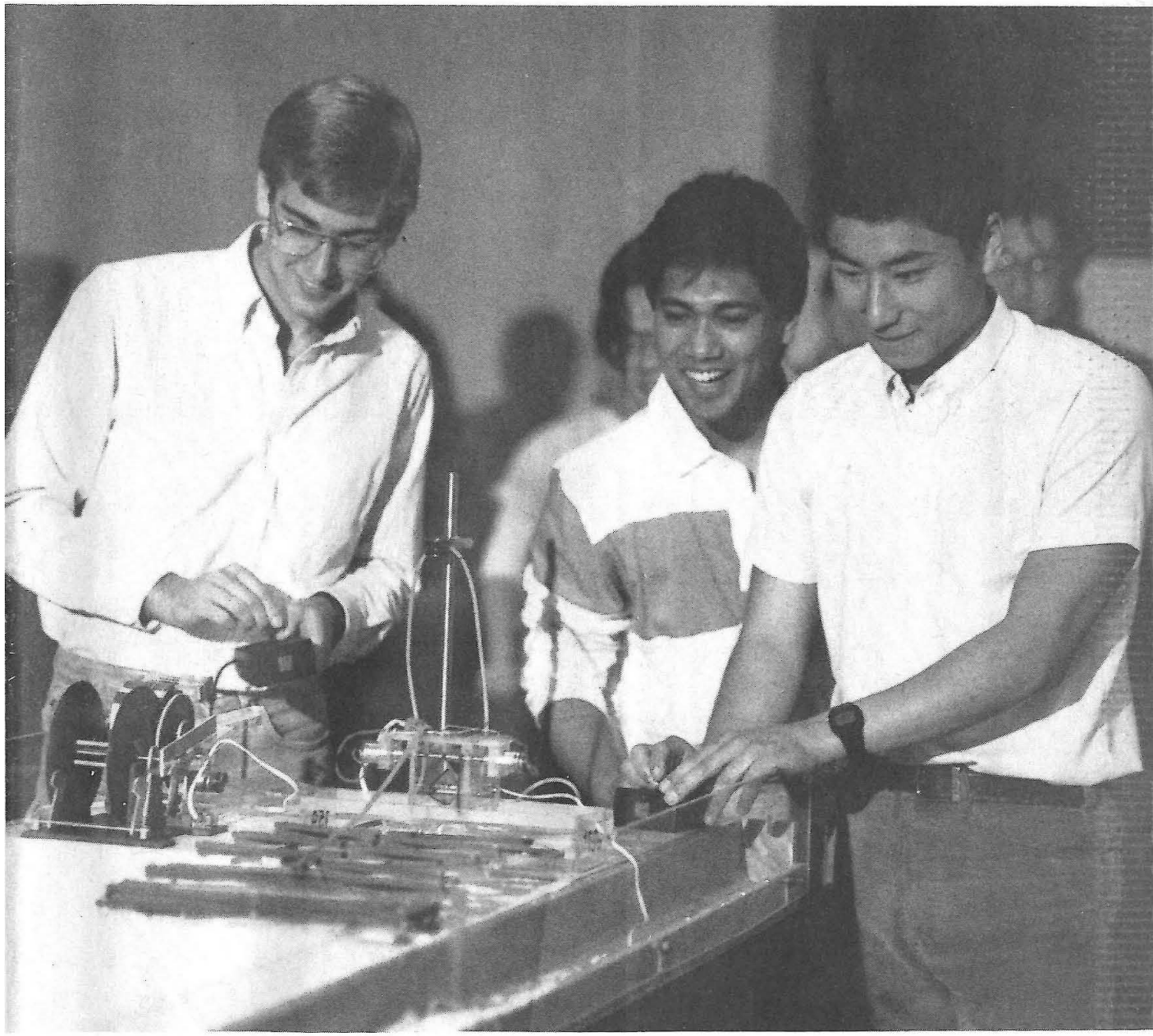

A tug-of-war between two miniature machines commands the attention of Michael Chandler (left), Saroj Manandhar (center), and Raymond Hu (right). Chandler and Hu are competing in the ME 72 engineering design contest; Manandhar is the class TA. Hu's lazy-tongs device downed Chandler's winch in this round of the class's final exam. See story on page 10.

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