

Titania— The largest satellite of Uranus, is shown here in its highest resolution photograph yet.

## Voyager Returns Fabulous Photos

by Paul Gillespie

This week mankind got its first close-up view of the planet Uranus. From the data sent by Voyager 2, we now know considerably more about this distant planetary system than ever before. In addition to the spectacular photographs of the Uranian satellites, rings, and cloudy surface (some of which can be seen on pages 6 and 7) Voyager also produced some startling new information. According to Mark Marley, a noted planetary scientist and Caltech alumnus, there have been five major discoveries as a result of the Voyager fly-by. 1)

The helium abundance in the Uranian atmosphere was found to be approximately 15 percent. Scientists had previously calculated the helium content at 40 percent, an unexplainably high figure. 2) The planet's magnetic pole was found to be offset from the inclination axis by an angle of 55 degrees. 3) The satellites were found to have significant internal activity as evidenced by their surface characteristics. 4) One new ring and nine new moons were discovered. 5) Data was sent which will enable scientists to determine the rotations speed of Uranus.

## Burnout, Social Life Probed by Survey

by Ted George

The Student-Faculty Conference is scheduled to take place on February 22nd in Baxter Lecture Hall. One of the major panel discussions is going to be on the low morale shown by Caltech students. A subcommittee has been formed to investigate the problem, and has been meeting regularly since the middle of first term. The discussion of student morale has been broken into three different subject areas. They are academic burnout, social problems associated with life at Caltech, and faculty-student relations.

directed towards finding plausible solutions to them, so that practical recommendations could be made at the Student-Faculty Conference for improving the quality of student life at the Institute.

The discussions during the meeting of the Student Morale Subcommittee have focused on trying to understand the problems associated with each topic. What causes academic burnout? Why are so many students unhappy with their social life at Caltech? While trying to understand the problems, the discussions have also been

This past week a student survey was circulated in the houses, polling student attitudes and opinions on problems concerning the topics mentioned above. Using the results from the survey, and input from the committee members, another short poll is coming out next week to sample student opinions on possible solutions to the morale problem at Caltech.

The remainder of this article is a short explanation of the possible items that will appear in the upcoming survey, so that you will have the time to think about them, discuss them, and form your own opinions of them before you actually receive the survey next week.

continued on page 4

## Peace Group Meets

Quite unexpectedly, the Y lounge was packed with enthusiasts when STRIVE, the Society To Reduce International Violence, held its first meeting on Wednesday. Some suspected that the big turnout was due to a relative lack of similar activities in the recent past. "We all got burned out," said Charles Hershey, a senior in Ricketts, when asked why politically concerned groups on campus had troubles continuing their works. The World Affairs Forum and the Caltech Nuclear Freeze Campaign had been very active, carrying out various educational and political projects, before the lack of interest and support ex-

hausted their energy and enthusiasm. Although some graduate students went on to form the Space Weapons Study Group, which is still working on projects dealing with "Star Wars" and other related topics, the rest of the Caltech community has been largely silent.

STRIVE aimed to provide a new input to the peace movement here, and its first attempt was apparently successful. Among the thirty people who showed up, twelve were undergraduates (mainly from Blacker and Ricketts), including some freshmen. In addition, two alumni and three staff members were there. The "new faces" are becoming an integral

continued on page 4

## Commentary

# Unforgettable Fire

by David Hull

There are words and phrases we use that we don't really mean. For example, "flaming death." A tough midterm, loss of turn at a video game. Meanwhile, back in reality, seven people aboard *Challenger* remind us what we're saying.

For me, and I suspect for a lot of us, it still didn't register. As I watched the instant replay (ain't the Information Age just grand?) I caught myself thinking "What a pretty fireball," or worse, seeing a Feynman diagram of a space shuttle decaying into two solid fuel boosters. Both were ways of conveniently forgetting the people aboard. This denial is one form reaction to a catastrophe often takes.

Alternatively, for fear of becoming numb, we remind ourselves of the emotional impact in histrionic detail. Thus do the networks show us the the schoolchildren watching Christa McAuliffe's dream come true turn into a nightmare. They tell us of "profound grief" and "horrible tragedy," endlessly reminding us how bereaved we should feel, until it all becomes a haze. The numbness sets in all the harder.

Reality is somewhere between. Seven people died when *Challenger* exploded, far fewer

than would be murdered, or be killed in car wrecks, or die of natural causes on the same day. And despite their celebrity, and the rhetoric to the contrary, these peo-

ple were total strangers to the vast majority of us. What makes them special is that everyone was watching. continued on page 4

## ASCIT Nominations Open

Nominations are now open for the remaining ASCIT officers. All nominations must be submitted to the present ASCIT secretary Lisa Cummings care of the Dean's Office (102-31), by Tuesday, February 4th.

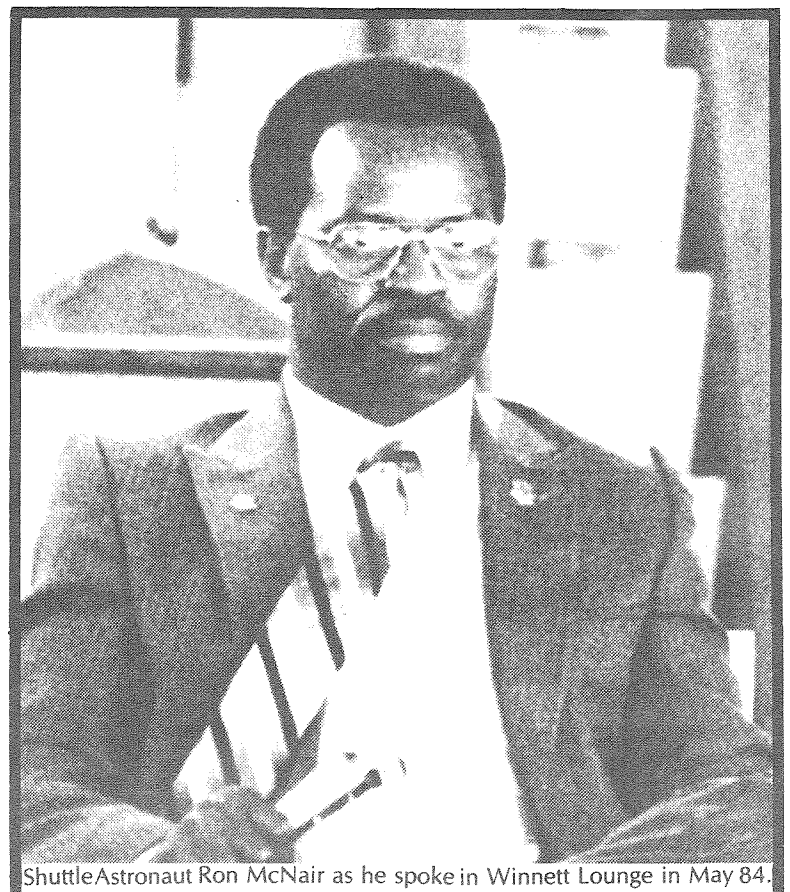
The seven ASCIT board of directors positions are: vice president, secretary, IHC chairman, director for academic affairs, director for social activities, and two directors-at-large.

The other ASCIT elected offices are activities chairman, athletic manager, BOC secretary, and Tech editor.

For more information, consult the *little t*, or a current office holder.

## Presidential Runoff Today

See photos on page 9.



Shuttle Astronaut Ron McNair as he spoke in Winnett Lounge in May 84.

photo by Ron Paz

# OPINION

## Letters to the Editor

### Tracers

To the Editors:

In your theater review by David Hull [issue of January 24] you never mention:

- 1) where the thing is playing;
- 2) how much it costs;
- 3) when it's playing;
- 4) who the author and/or directors and/or producers are.

Hopefully no one who reads the review will be interested in seeing the play because it might be difficult for them to find it.

—Michael Wengler

[Oops! The missing info is:

1) Coronet Theater, 366 N. La Cienega Blvd.;

2) Call the theater, (213) 659-6415, for the price;

3) Tuesday through Friday at 8 pm, Saturday at 7 & 10 pm, Sunday at 3 & 7:30 pm.

4) The writers include Sheldon Lettich, David Berry and John DiFusco, as well as a half-dozen others. Sorry, but there were no and/or's in the credits.—Eds.]

### BOC

To the Editors:

I read with interest the interview with members of the Board of Control published in the 17 January California Tech. Several misconceptions were aired about the graduate Honor System which I believe merit redress.

The first topic I would like to address is education of graduate students about the Honor Code. In the published interview, it was stated that "the education the grads receives pales in comparison to what the undergrads receive." In-

coming graduate students were exposed to the Honor System three times: 1) There is a six-page section on the Honor System in the Graduate Handbook, *The Technique*, which is mailed to new graduate students before their arrival on campus. 2) They received a handout on the Honor Code with their registration materials. 3) They heard a speech by the GRB Chair on the Honor System during the post-registration orientation fair. This would seem to be comparable to the undergraduate orientation at Frosh camp. Perhaps undergraduates receive additional education during Rotation?

Second, the Graduate Review Board (GRB) meets whenever a potential Honor Code violation needs consideration. For recent years, the data are—1982-83: 0, 1983-84: 2, 1984-85:0, 1985-86 (to date): 2. Comparing this to the number of BOC cases cited in the *Tech* interview, it is apparent that the GRB meets less often than does the BOC. This is in part due to the different tone of graduate life. Graduate students take fewer formal courses than do undergraduates and their homes tend to be dispersed throughout the surrounding communities.

Third, some of the antipathies and suspicions that unfortunately injure relations between graduates and undergraduates were raised during the interview. Additional suspicions could doubtless be raised by both student bodies, but I ask all readers to consider instead what we have in common as students at Caltech. We share a commitment to excellence in academic endeavors. The reward for this excellence is achievement of goals which at first appear to be beyond reach. The price of this excellence can be tremendous pressure and sacrifice, imposed

from both within and without. Sometimes the pressure leads to considerable emotional distress which in turn can incline someone toward an Honor Code violation. Perhaps both the GRB and the BOC should be asking themselves the questions: 1) Are we doing enough to prevent Honor Code violations? (Both Boards might do more to educate and inform their constituencies. Mr. Ferrante raised the possibility of information sessions in student residences, an idea with which I agree.) 2) How can we encourage students who feel inadequate or fear failure to seek help from their peers, faculty and the Counseling Center before they commit a violation? 3) How can we encourage members of the Caltech community to use the Honor System when they suspect that a violation may have occurred?

In an ideal sense, the Honor System exists to nurture an atmosphere of trust and respect within which creativity and excellence can flourish. As undergraduate and graduate students have courses and research projects in common wherein they share this commitment to excellence, they also share a need to guarantee fair, firm and compassionate enforcement of the Honor Code. The BOC and the GRB are the bodies elected by students to perform this duty. Though their caseloads and operating "styles" may differ, the BOC and the GRB have the above goal in common.

Very sincerely yours,

—David E. James  
Chairman, GRB

### KISMET

To the Editors:

Thanks for getting the correct spelling on the name of my snake, Rhys, who will be appearing in

TACIT's production of *Kismet*. However, Rhys would like you to know that, although his *name* is a Welsh one, his actual ancestry is South American; he's a Colombian Red-tailed Boa (although he's no recent immigrant; his family has been in this country for three generations).

Sincerely,

—Amy Carpenter

### Challenger

To the Editors:

Last night at the Caltech basketball game, I noticed that the team wore black armbands in remembrance of the Challenger's crew. This small symbol helped me overcome the huge inadequacy I experienced following the accident. Everyone who felt that it just wasn't enough to tell the families of those astronauts how sorry we were knows what I mean by inadequate. The armbands made me realize that remembering those who perished is at least, if not more, important than showing our sorrow. We will always remember these heroes and why they worked so hard, and because we remember they will always live on with us.

Thanks team. And thanks Dick, Michael, Judy, Ronald, Allison, Gregory, and Christa.

To the Editors:

Attending college here at Caltech, we students are in contact with science every day. Looking at my own personal experience with science, I can only marvel in awe at the complexity of the universe around me. It continuously amazes me how little I actually think I understand. To think that the average person understands even less than I do is incredible. I cer-

tainly do not feel intelligent in the environment that I am in. Because we students at Caltech are so intimately involved with science, we of all people should continuously remind ourselves of the fallibility of science. I think, however, that many of us fell into the trap of feeling supreme and godlike. Many of us were shocked to learn of the terrible explosion of the space shuttle *Challenger*. I was personally chilled to the bone; I found I could not concentrate for the rest of the day on anything at all. I do not mean to sound callous or uncaring when I say that something had to happen sooner or later. Science is NOT infallible. But why did it have to be so tragic? God has certainly taught humans a lesson about pride. Let us not be lulled into a false sense of security again, no matter how perfect our inventions and machines can seem.

More tragic still and more important than the horrific lesson that

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## Tonight's Movie

### Ghostbusters

from your ASCIT movie people

Well, here it is, our blockbuster of the term. If you don't already know, *Ghostbusters* is a great movie. It's fast, funny, and exciting; basically, 103 minutes of

enjoyment. So everybody put your pencils down this evening and come over to Baxter Lecture Hall and have a good time. In addition to our regular shows at 7:30 and 10:00 p.m., we will have a special presentation at midnight.

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### The Caltech Y Fly-by

Friday... January 31

**Noon Concert**—La Bottine Souriante—Canadian folk music from Quebec. Lunchtime on the Quad.

**L.A. Philharmonic**—Music by Pergolesi and Stravinsky. If you got tickets, go. Y-Car leaves at 7:15 PM. Concert starts at 8:00 PM.

Saturday... February 1

**"Romance Language"** See a play at the Mark Taper Forum. 8 PM. A few tickets left at \$5. The Y-Car leaves at 7:15 PM.

Friday... February 7

**Noon Concert**—Have "Big Fun" at lunchtime on the Quad.

Saturday... February 8

**Whale Watching**—Boat leaves at 1:30 PM. See birds and fish and maybe even some whales! Sign up before noon today.

Monday... February 10

**"The Social Isolation of the Scientist."** Author/Physicist Ronald Kahn of U.C. Berkeley will discuss the problems of personal relationships confronting scientists in the 1980's. (As he wrote about them recently in *The New York Times Magazine*.)

**Movies! Movies! Movies!** The Y has discount passes at \$3 each for the Mann and Pacific Theatres.

**Credit Card Applications!** Juniors, Seniors, and Grads! Apply in the Y for plastic money so that you too can be in debt on your own!

**Sailing Trip!** Saturday, February 15. Watch for signups, coming soon.

Any questions, comments, or ideas?  
Come see us in the Y office or call x6163

# Peter Dervan Wins \$15,000 Award

[CNB]—Peter B. Dervan, professor of Chemistry here at Caltech, was just named recipient of an Arthur C. Cope Scholar Award. These awards recognize

and encourage excellence in organic chemistry. Each consists of a certificate and a \$15,000 unrestricted research grant.

Currently, in his research, Dervan is developing techniques for analyzing very precisely where and how antitumor, antiviral and antibiotic drugs bind to DNA, the basic material of genes. Such binding is fundamental to their work in fighting tumors, viruses, or bacteria. Thus, Dervan's work has major applications in developing novel chemotherapies for treating cancer and viral diseases.

A native of Boston, Dervan received his B.S. degree from

Boston College in 1967 and his PhD from Yale University in 1972. He conducted postdoctoral research as a National Institute of Health fellow at Stanford and joined the Caltech faculty in 1973. He received an Alfred P. Sloan fellowship in 1977, a Camille and Henry Dreyfus teacher scholar grant in 1978, and a Guggenheim fellowship in 1983.

Known as a clear and enthusiastic lecturer, he has won two awards for teaching excellence from ASCIT. He was co-winner of the 1985 ACS Nobel Laureate Signature Award for Graduate Education in Chemistry.

# Letters

from page 2

we have been forced to learn is the fact that eleven children lost one of their parents and six people lost their spouses and all of us lost seven heroic friends. For those of you who have gone through the agony of a loss like this before, remember that loss and sympathize with those close to the six astronauts and the school teacher. For those of you who have never really experienced that before, imagine how it would have felt if your mom had been that school teacher (my own mother is a 38-year-old teacher) or if your dad had been an astronaut. Yes, we have also been retaught the lesson of our mortality. Caring for these people in their time of loss, though, is much, much more important than all the delays and setbacks that will be caused to science and the space program. There is always time in the future to get back on schedule. Without people, science cannot go on anyway, so let's make people our first priority. Each human being is mortal and must die, but if we are careful and we can learn to love, I am convinced that humans as a race can achieve immortality.

Sincerely,

—David Cole  
Blacker House

To the Editors:

My first impression upon hearing that the shuttle Challenger had exploded was disbelief, soon followed by shock and some grief. Unfortunately, though, after watching the networks' coverage of the disaster I became more angry at

television journalists' gall than sorry about the Challenger's demise. I watched every network's coverage of the event at some point between the explosion and NASA's press conference, and saw several types of vulture-like journalism from every network. ABC, NBC, and CBS all showed footage of either relatives or students of Christa McAuliffe as she and her six fellow astronauts were incinerated. At least two of the networks also showed interviews with the victims and their families before the disaster, including one with McAuliffe husband in which he praises NASA's safety precautions. I found both of these practices to be callous, cruel, and completely unnecessary.

The thing which bothered me the most about the coverage of the shuttle disaster, though, were the knee-jerk hounding questions and accusations which most of the reporters either aimed at the people who were working at finding the cause of the explosion or were said only to give the impression that the reporters knew any more than the general public about the accident. The most blatant of the hounding questions were at the NASA press conference. The speaker was a NASA official who, having just seen a good portion of his life's work and several of his associates destroyed in a dramatic and completely unexpected explosion, had been responsible for doing as much as possible to find out the cause in the first four hours after the explosion. Yet the reporters, seemingly ignorant of this, asked him several offensively inane questions. One morbid gentleman asked how much TNT the fuel and oxidizer in the exter-

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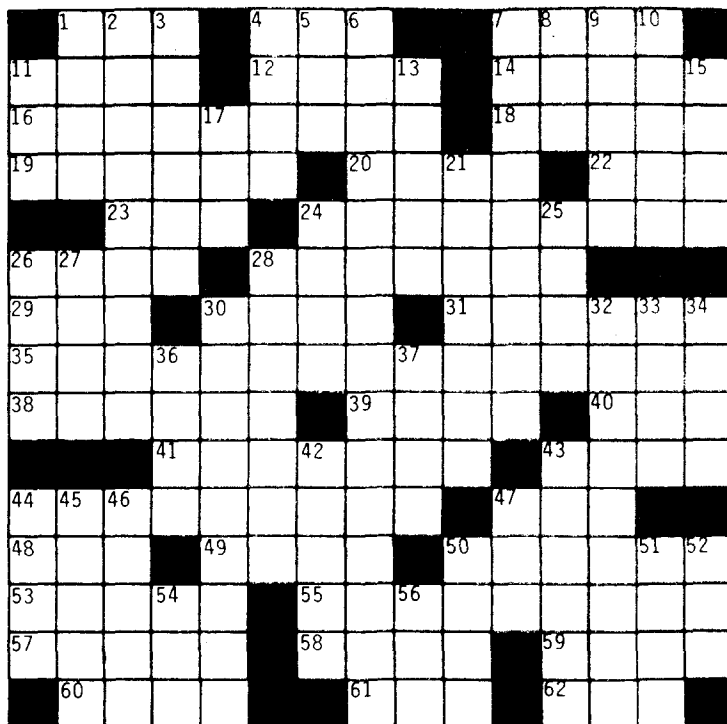
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## collegiate crossword



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ACROSS

- 1 "Treasure Island" author (init.)
- 4 College degrees
- 7 Mazatlan dwelling
- 11 "Cat on \_\_\_\_\_ Tin Roof"
- 12 Ancient kingdom
- 14 Having wings
- 16 Decoration with paper cutouts
- 18 West Virginia worker
- 19 Intimidates
- 20 Babylonian war god
- 22 Feather's partner
- 23 Driving area
- 24 Waiting places
- 26 Receipt word
- 28 Accumulated
- 29 Military entertainment group
- 30 \_\_\_\_\_ hammer
- 31 Blood disease
- 35 Washington landmark (2 wds.)
- 38 Turkish military commanders
- 39 \_\_\_\_\_ du Salut
- 40 Bilko or York (abbr.)
- 41 Onslaughts

- 43 Uncles, in Uruguay
- 44 Sorrow
- 47 Chocolate-colored (abbr.)
- 48 Building wing
- 49 Indian wild buffalo
- 50 African area
- 53 Geometric measures
- 55 Flagrant
- 57 Pilfer
- 58 Former pitcher Johnny \_\_\_\_\_
- 59 "Star \_\_\_\_\_"
- 60 Sea eagles
- 61 "Ask \_\_\_\_\_ what your country..."
- 62 Sergeant majors (abbr.)

- 10 George Peppard TV series (hyph.)
- 11 Do arithmetic
- 13 Lehr and Parks
- 15 Is human
- 17 Shoshonean Indian
- 21 Begins again
- 24 "\_\_\_\_\_ for all Seasons"
- 25 Polish river
- 26 Part of a tooth
- 27 Europe's neighbor
- 28 July baseball game (hyph.)
- 30 Ride on the \_\_\_\_\_ of
- 32 Give incorrect information
- 33 Shakespearean villain
- 34 Heights (abbr.)
- 36 Burn
- 37 Ms. Sommer
- 42 Skin ailments
- 43 Characteristics
- 44 Towel term
- 45 Make happy
- 46 Swamp tree
- 47 Part of BMOG
- 50 Propensity
- 51 Regrets
- 52 Invite
- 54 Hunter or Fleming
- 56 Famous resort city

DOWN

- 1 Ostrichlike bird
- 2 Things said or written
- 3 Pelted with rocks
- 4 Rock group equipment, for short
- 5 Nonvenomous snake
- 6 Midwest city (2 wds.)
- 7 Waiters: Sp.
- 8 Boxing great
- 9 \_\_\_\_\_ Domingo

# STRIVE for Peace

from page 1

part of the new group, along with the veteran graduate students including Mark Cohen, Allan Van Asselt, Craig Steele, Cindy Strong, and Marty St. Clair.

All at the meeting seemed to agree that the tragedy of war must be stopped, but they had different

views on how to achieve peace. One member asked whether demonstrations would be organized; another expressed his worries about unilateral disarmament. It was made clear that STRIVE would make an open-minded and practical approach, without committing itself to narrow doctrines or

# Challenger

from page 1

Even if you weren't watching the actual launch, you've probably seen the footage. At any rate, you've at least heard or read the story. And when something catastrophic happens this visibly, everyone is compelled to react. Someone will ask "Did you hear about the shuttle?", and you have to say something. If you happen to be reporting the story live on national TV, you've got real problems.

The truth is, there's not much to say.

We seem to crave factual information. What happened to the fuel tank? How high up were they? Was there any chance of survival? Could there have been? And so on. But unless you're in the business of making sure it doesn't happen again, this fact-finding does little more than occupy the mind.

We want to know who was responsible. Find the cause, tie up the loose ends, convict the culprit. Say "case closed" and forget about it. If we know all the answers, we assume the illusion of control.

When I watch the reaction to the shuttle accident, or any other tragedy, I see a ritual. Find out all about it. Find a cause, someone or something responsible. Make sure we react appropriately. By

# Survey

from page 1

## Academic Burnout

Academic burnout is faced by many students at Caltech, particularly during high stress periods such as midterms and finals weeks. Long term disillusion and burnout are perhaps even more significant. The most obvious cause of burnout is a continually heavy workload carried over a prolonged period of time. In short, students have to take too many classes to have much time free of academic duress. There are several ways to combat this problem:

1) Classes could be scheduled more coherently so they would not be haphazardly spread from 8 am to 10 pm during the day, to give more blocks of free time each day. Maybe no evening classes would be allowed, so that every night would be free of classes.

2) Classes could be arranged so that none were scheduled on one day, say Tuesday or Friday, and the work week would be only four days long. This would give students a guaranteed extra day that could be used to catch up on homework, or sleep, or whatever.

3) There could be a short reading period immediately preceding finals week each term that would be free of classes, homework, and tests to give students the opportunity to study and rest before finals actually start.

4) There could be a recommendation made that midterms week be more strictly adhered to by instructors, with no homework being assigned or collected during the week.

The above solutions may make the present situation more tolerable, but to some degree they may only cure the symptoms of

performing this ritual, we put death neatly into the class of "things we can deal with."

But try as we might, we cannot really put the situation into our own terms. Seven people died Tuesday, and we can no more change that than change the weather. We must deal with it as it is. Being human, we pause to go through the ritual. And then we go on.

Most of our lives were not disrupted in a major way by the explosion. For those whose were, if I thought I could do anything to help, I would do it. For someone distant from the scene, like myself, it was a forced pause, in which to think awhile about the meaning of such an event. As I thought, many associations formed unbidden and without explanation. Among other things, the album *The Unforgettable Fire* came to mind:

*I'd like to be around  
In a spiral staircase  
To the higher ground.  
And like a firework, explode  
Roman candle, lightning lights  
Up the sky.*

*See you stare  
Into space  
Have I gotten closer now  
Behind the face?*

(from "4th of July" by U2)

academic burnout. The real problem is that students have to take an extremely heavy workload to graduate in four years. To accrue 516 units in 4 years, a student must average 43 units per term, and if they insure against dropping some classes, or want to take a particular elective, then they must take a lot more than 43 units per term. Most students here average five to seven classes a term while at many schools five classes constitutes an overload. This is all well and good for patting ourselves on the backs, but may very well be the reason why so many students are unhappy at Caltech. To solve this problem, a very serious recommendation could be made to lower the total number of units required for graduation. The options and humanities would be asked to scale back their requirements as well, so there would still be space for electives within the total graduation requirements. This recommendation could go a long way towards reducing the workload at Caltech.

## Student-Faculty Relations

Students often complain that many of their instructors do not seem to be aware of the needs and/or expectations of their students. Many do not seem to understand the honor system, and many are simply poor instructors. Many students have problems with their advisors as well. How can these problems be solved?

1) The ombudsman system can be overhauled so that it works more efficiently.

2) The faculty could produce a short booklet for new professors to read about teaching undergrads: midterms week, finals, the honor system, what students want/expect, etc.

continued on page 9

excessively aggressive means of expression.

The second half of the meeting was devoted to the planning of the Alternative Job Fair. The purpose of the Job Fair was seen to be twofold: making people more conscious about their possible future involvements in the military-industrial complex, and actually providing concrete job opportunities. It was also suggested that they should point out top military contractors among the companies which will be invited for Career

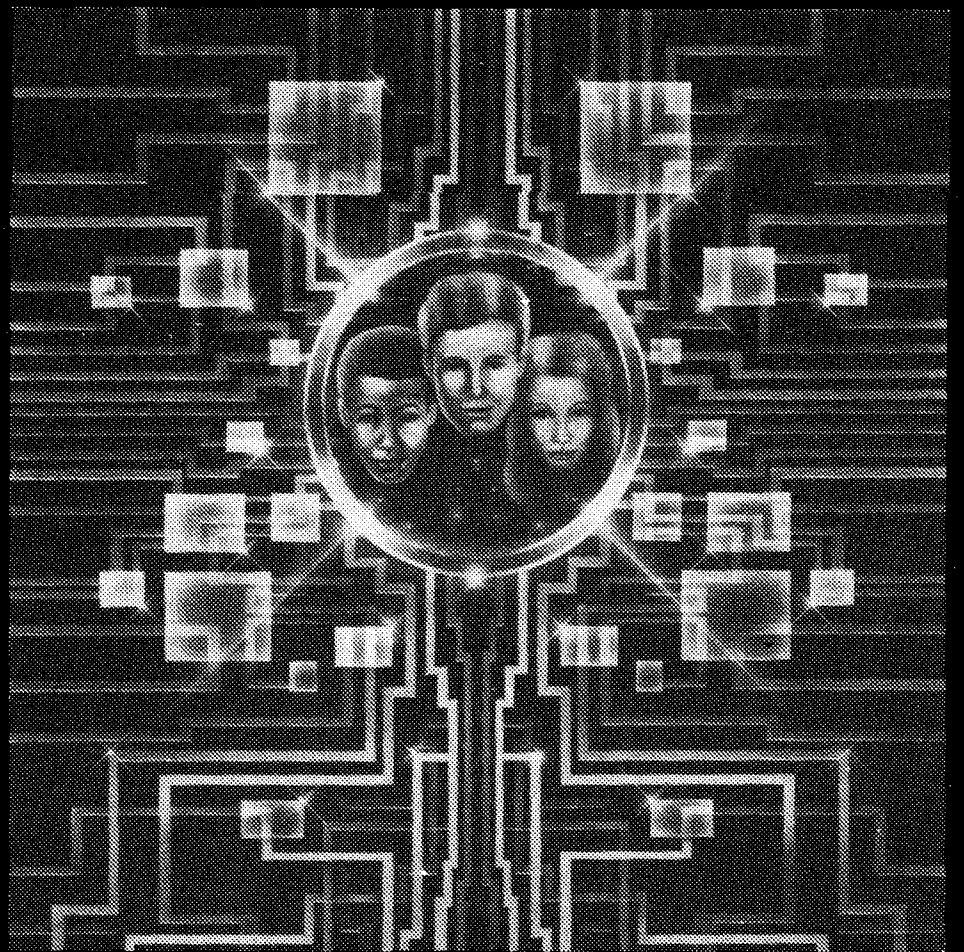
Day in February. People wondered how many Caltech graduates would take morally disagreeable jobs for a thousand dollars of extra pay. Nobody seemed quite sure, but it was certain that the quality of our conscience was at least questionable.

Before the meeting was over, a rough outline for organizing the Job Fair was made. The proposed date was a weekday in the second or third week of spring term. Plans to have a speaker or a workshop, and to distribute pamphlets before

and during the event were discussed. The task of locating and approaching the companies had to be put off to the next meeting, which will be in the Y lounge at 5:00 on next Wednesday.

This meeting was a clear indication that Caltech people do care about the world outside, despite the contrary assumption often made by outsiders and some insiders. Manifest in the faces and words of people who gathered, there was a potential for further growth of social conscience in this "cloister".

## TOP ENGINEERING AND TECHNICAL GRADUATES



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CAMPUS INTERVIEWS  
February 11, 1986

# Math Prizes Announced

The Mathematics Department is pleased to announce two categories of prizes to be offered again this year to Caltech undergraduate students.

**1. The E. T. Bell Undergraduate Mathematics Research Prize** - A cash prize of \$500 awarded for the best original mathematics paper written by a Caltech junior or senior.

Contestants for the Bell prize must be nominated by a faculty member familiar with their work. Students who wish to be considered for this prize should contact a member of the Mathematics faculty prior to the end of the second term to discuss the nature of the research. If the entry is sufficiently worthy, the faculty member will nominate the contestant and act as sponsor. Each student is entitled to only one entry. All contestants nominated must submit their papers in final form to their faculty sponsors by the end of the fourth week of the third term. A faculty committee will then judge the papers and announce its decision before the end of third term. The commit-

tee may award duplicate prizes in case of more than one outstanding entry. The name of the winner (or winners) will appear in the commencement program.

**2. The Morgan Ward Competition.** Any Caltech freshman or sophomore may enter this contest. An entry may be individual (submitted by one student) or joint (submitted by a group of two or more students). Each student is entitled to at most three entries, of which at most two may be individual.

An entry is to consist of a mathematical problem, together with a solution or significant contribution toward a solution. The problem may have any source, but this source should be stated in the entry. The entries will be judged on the basis of the nature of the problem and originality and elegance of the solution. Any outside references used should be indicated. (The Honor System applies here.)

Entries from each contestant or group must be placed in an envelope and delivered to the

Mathematics Office, 253 Sloan, during the fourth week of the third term. The name of the contestant, or the names of all participants in the case of a joint entry, must be written on the envelope only, not on the entry. The Judging Committee will consist of three volunteers, approved by a vote of the Caltech Mathematics Club. Each judge must be a junior or senior and a member of the Mathematics Club. The judges will select a group of finalists and submit their entries to the Mathematics Department faculty who will make awards to the winners. Prizes will ordinarily be awarded for the two or four best entries, the value of each prize being \$75. Prizes for individual entries will be limited to at most one to a contestant, and no group may receive more than one prize.

The foregoing prizes are all financed by funds accumulated by Caltech teams that have participated in the William Lowell Putman Competition over the last few years. Previous winners of the E. T. Bell Prize are:

- 1963 Edward Bender
- John H. Lindsey II
- 1964 William R. Zame
- 1965 Michael Aschbacher
- Richard Stanley
- 1967 James Maiorana

- Allen Schwen
- 1968 Michael L. Fredman
- 1969 Robert E. Tarjan
- 1972 Daniel J. Rudolph
- 1973 Bruce Reznick
- 1974 David S. Dummit
- 1975 James Shearer
- Eric Williams
- 1976 John Gustafson
- Albert Wells
- H. Woodin
- 1977 Thomas G. Kennedy
- 1980 Eugene Loh
- John Stembridge
- Robert Weaver
- 1981 Daniel Gordon
- Peter Shor
- Thiennu Vu
- 1982 Forrest Quinn
- 1983 Mark Purtill
- Vipul Periwal
- 1984 Bradley Brock
- Alan Murray
- 1985 Charles Nainan

## The Inside World

**Dabney:** I went into the office of the president of Dabney House. I found myself standing at the end of a twenty-foot table in a dimly lit room. At the other end stood the President, arms in the air. He spoke with a resonant oratorical voice: "You have meddled with the primal forces of Nature, and You Must Atone." I shrunk back, confused. "Oh, sorry, wrong person. Please, come in and have a seat. Now, Mr. Wayne, I'd like to talk some business with you."

He walked to the far wall and closed the blinds, rendering the room almost completely black. Upon his pushing some buttons, a slide was projected on a large screen: a photograph of a man in a Hawaiian shirt and dark glasses. The picture was of poor quality, probably shot from a rooftop looking down on the street below; but I immediately recognized the man. It was my old nemesis, Dr. James Xi. "I see you recognize him," the President said. "Well, Patrick, Dr. Xi has become more dangerous than ever before. His days of petty larcenies and world nuclear domination are over; now he has taken to *real* crime." Another slide came on: a credit card bearing the name of Dr. Xi and the distinctive DarbCard™ logo. "Our experts were fooled completely by this card. It looks totally authentic, yet we never issued a card for Dr. Xi. Even more frightening: Dr. Xi is said to be nearly finished with his new software program which he calls VisiGoth™. It will be capable of infiltrating the whole DarbNet, rendering our defenses virtually useless. Patrick, he *must* be stopped. Can you do it?"

"I will have full access to House resources and personnel, I assume?"  
 "Of course."  
 "Full exemption from all local, state, and federal statutes?"  
 "Naturally."  
 "Unlimited personal entertainment account?"  
 "Always."  
 "Mr. President, consider the problem solved."  
 "I knew you could do it, Mr. Wayne. Oh, and Mr. Wayne - don't fail me. We do not tolerate failure in Dabney House."  
 I stared at the President for a long moment, then turned and left. Within hours, I would be at the very jaws of my enemy and quarry.  
 -"J"

**Fleming:** Congratulations to Rob Hawley, our newest frosh. Room pick was sure a lot of fun. The question is: Who paid off the secretary?  
 Next week's Question of the week: Get a new projection TV or is 26" console enough? Also, resurface and rebuild the old Al Fansome table or pop for a new one? Let's all consider these before the House Meeting so that we don't have to talk for an hour about the advantages of dishwashers.

Now, if only I could encode some secret message into the first letters of all of these sentences. Hey, that'd be really neat...  
 Waiting confidently for the Track Season to roll around.

Humbly submitted,  
 -Al Fansome

**Rroyd:** ... all the news that's prete to font.  
 And so we come to the end of a week of water in the house of Lloyd. What with Jeff's "wish and tell" attitude, the white water rafting expedition, Headquarters took its share of the deluge. Quote for the week from Brian is "if a thing's worth doing, it's worth overdoing."

The mathematicians triumphed, as John successfully manipulated the laws of probability and Theron moved up to *creating* unsolvable problems.

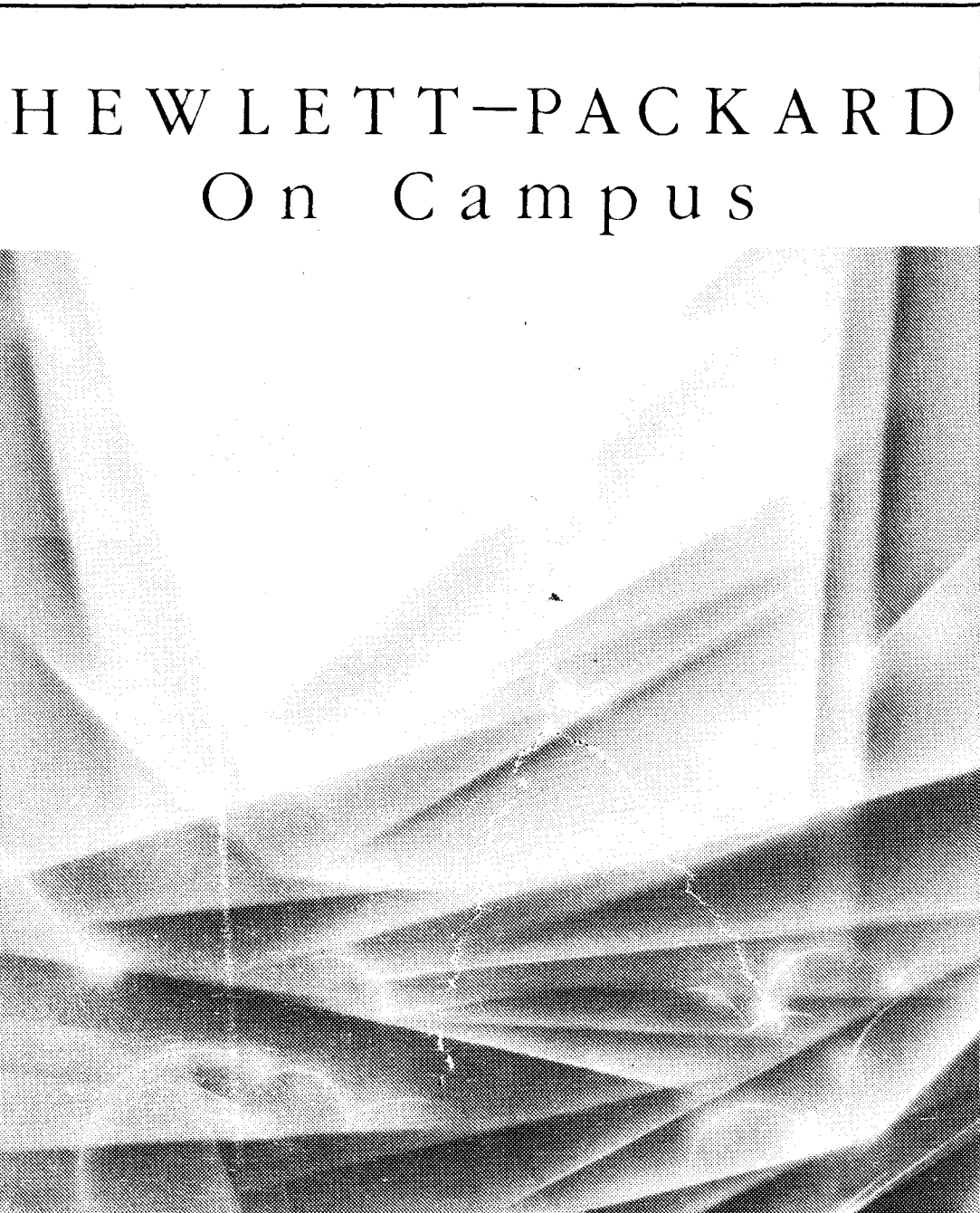
An excerpt from our GEOLOGY department report:  
 Valhalla: The California of the dead.  
 Headquarters: Pillow.  
 When last heard from, Michele had penetrated deep into the wilds of the volcanos of Argentina. Will she discover THE ROCK? Will she return? Tune in tomorrow!  
 STP (FAE)  
 -J.P.

**Page:** Most of the frosh have now experienced the icy chill of Mt. Wilson's grip. Strange that the mountain man himself should so vehemently refuse transport. We all missed you. Jean-Jacques had plenty of cold ones to warm himself on the journey. And only two were lost. **ROOKIES!**

House elections tonight. That means free pizza and beer for everyone who votes. Rumor has it that Brandon Mymudes may be around. Frosh, keep your eyes peeled. Oh yeah. Welcome to the house ... again.

The Louisville basketball team have lost six games and are *still* in the top twenty.  
 -Pervis Ellison

**Ruddock:**  
 Twas the night before super bowl and all through the Budd  
 Not a creature was stirring, not one single Rudd.  
 They all sat and stared at a huge TV screen  
 Watching Mozart play music and Jack be mean...  
 Sunday arrived and a discobolus game,  
 The Moles won, perhaps 'cause no Budd fans came (come on, ya'll!)  
 Bonzo said \_\_\_\_\_ is the way it goes,  
 But after "Roommates" and Frisbee-golf—who knows?  
 Saturday's the Ice House—come if you can,  
 Happy Birthday Taney, and what a great band!  
 Elections are coming, Valentine's the date.  
 And Rich, it's too late to fall in love with Sharon Tate.  
 -Butch



- from a place in your mind to a place in the market.

Hewlett-Packard is a special company looking for special people. We will be on campus the week of February 3rd interviewing CS, EE, ES, APh, and AMa majors for positions in R&D, Marketing, Manufacturing, Product Assurance, and Field Sales. Meet our recruiting team and hear what HP has to offer:

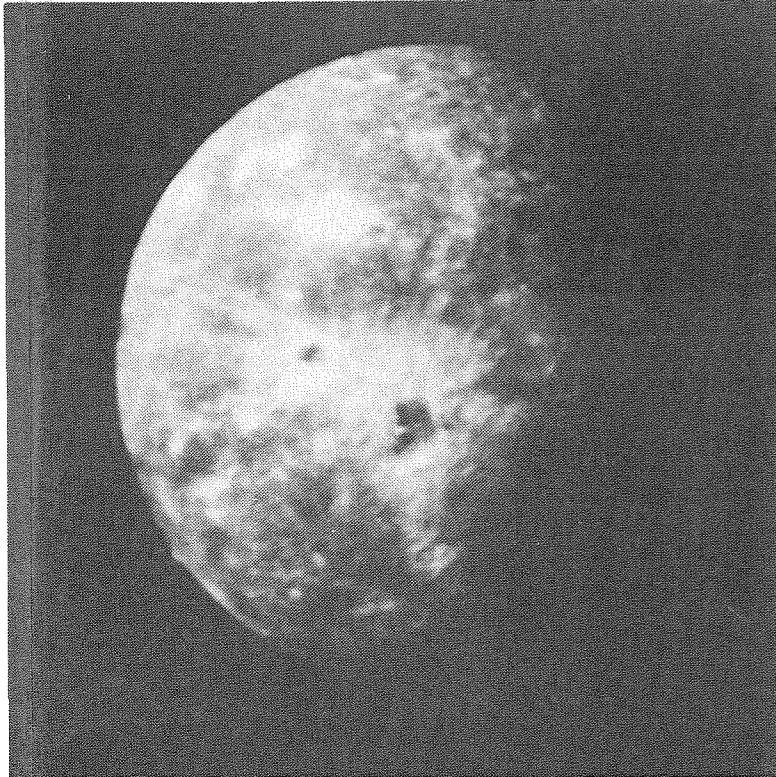
**Monday, February 3rd, 7:30 - 9:00 pm**  
**Ice Cream Social**  
**Chandler Dining Hall**



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## Oberon

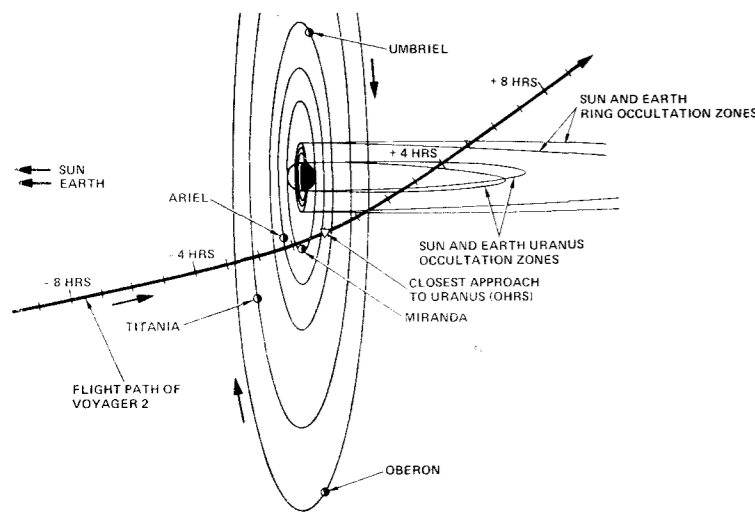
That very time I saw, but thou couldst not,  
Flying between the cold moon and the earth . . .  
—A Midsummer Night's Dream. Act II, scene 1, 155-56



Diameter: 1010 mi. Distance from Voyager: 410,000 mi.

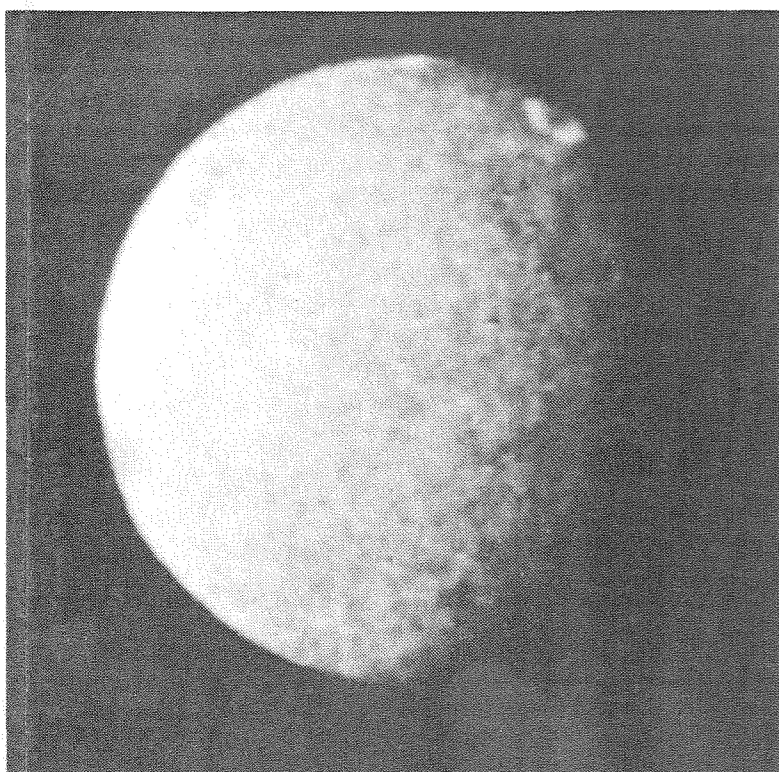
**OBERON**, the outermost known moon of Uranus, shows several large impact craters in its icy surface surrounded by bright rays—these are similar to those seen on Jupiter's moon Callisto. Quite prominent near the center of Oberon's disk is a large crater with a bright central peak and a floor partially covered with very dark material. This may be icy, carbon-rich material erupted onto the crater floor sometime after the crater formed. Another striking topographic feature is a large mountain, about four miles high, peeking out on the lower left limb.

### VOYAGER 2's FLIGHT PAST URANUS (VIEW IS VERTICAL TO PLANE OF FLIGHT PATH)



## Umbriel

Umbriel, a dusky, melancholy sprite  
As ever sullied the fair face of light . . .  
—The Rape of the Lock. Canto IV, 13-14



Diameter: 750 mi. Distance from Voyager: 650,000 mi.

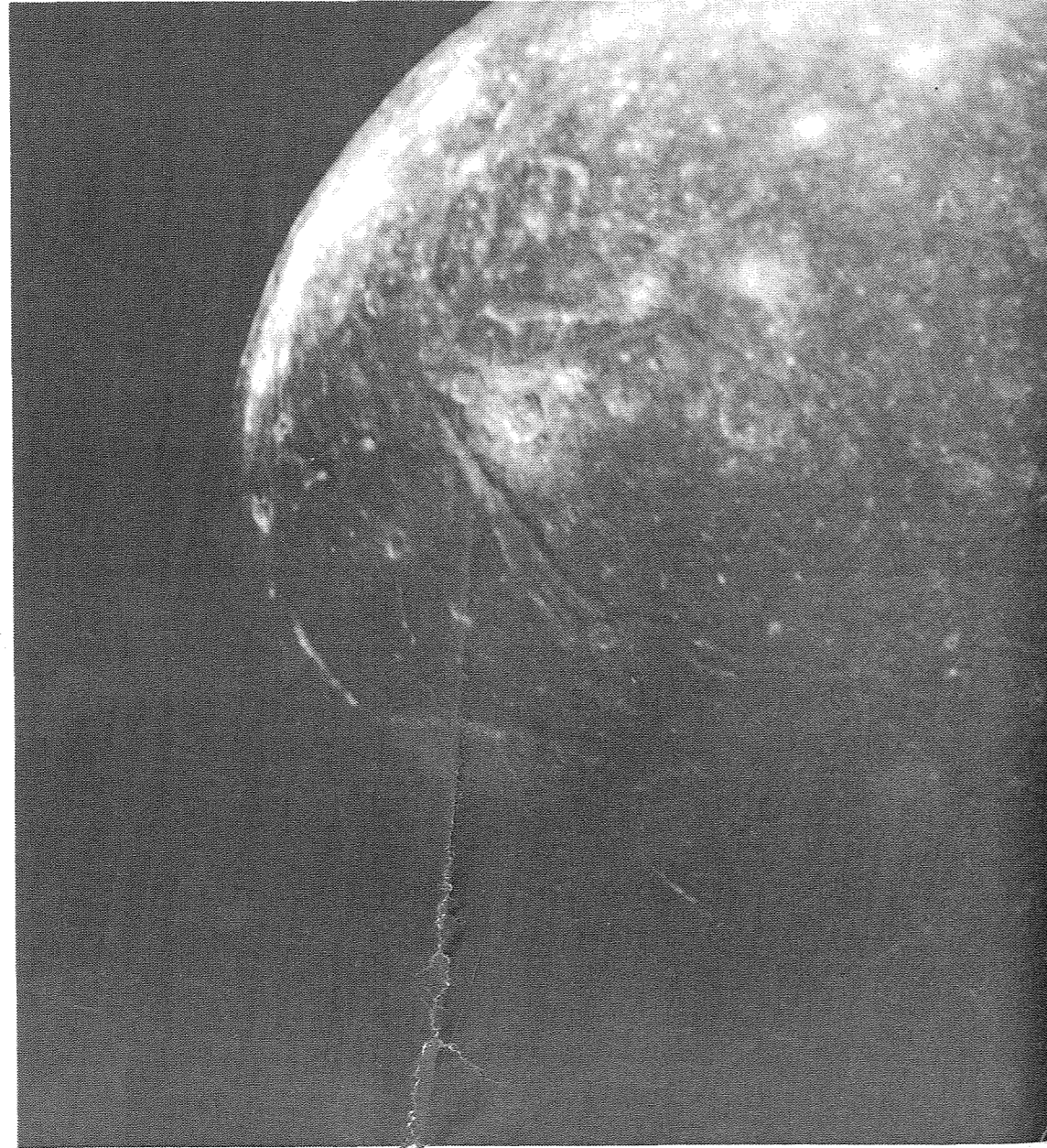
**UMBRIEL** is characterized by the darkest surface and smallest brightness variations of any of the large satellites of Uranus. The brightest spot (seen at top) appears as a bright ring and is near the moon's equator. Its geological significance is not yet understood. This picture was synthesized from frames exposed through Voyager's narrow-angle camera's violet and clear filters.

# A Voyager Photo Album

## Ariel

. . . For spirits, freed from mortal laws, with ease  
Assume what sexes and what shapes they please.

. . . Of these am I, who thy protection claim,  
A watchful sprite, and Ariel is my name.  
—The Rape of the Lock. Canto I, 69-70, 105-106



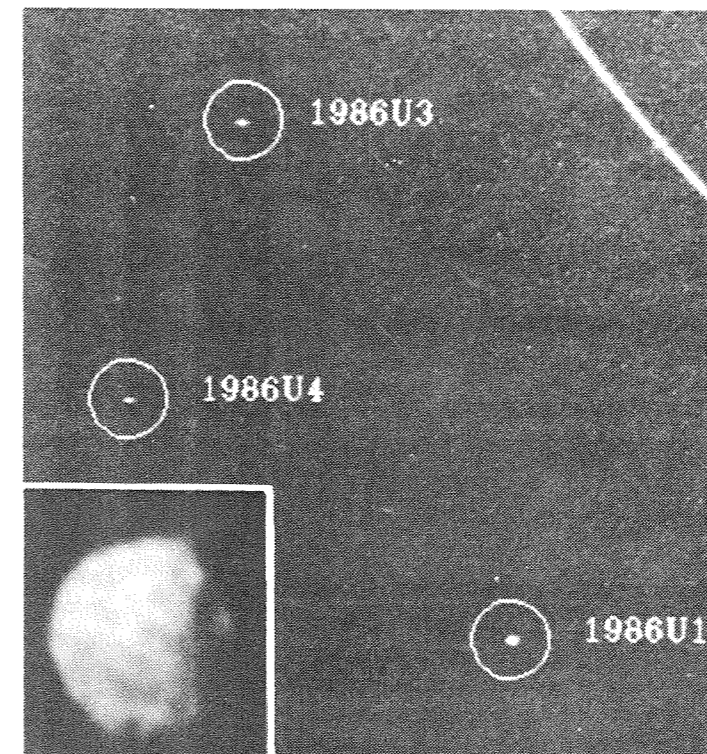
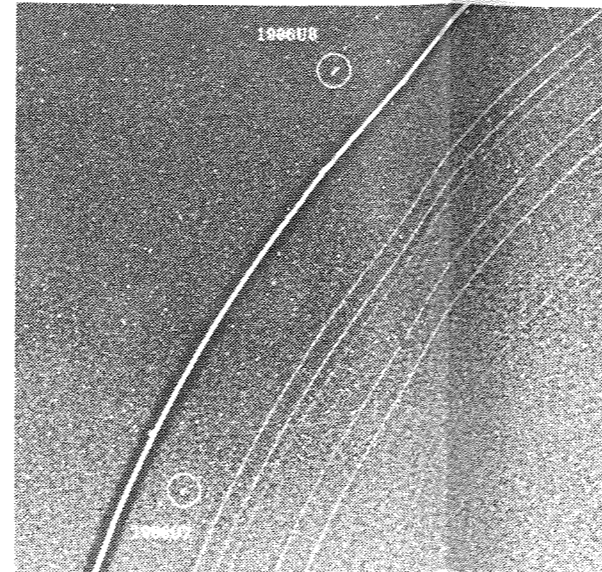
Diameter: 750 mi. Distance from Voyager: 105,000 mi.

**ARIEL** has clearly experienced a great deal of geological activity in the past. Most of the visible surface consists of relatively intensely cratered terrain transected by fault scarps and fault-bounded valleys (graben). Bright spots near the limb and toward the top are chiefly the rims of small craters. Most of the brightly rimmed craters are too small to be resolved here, although one about 20 miles in diameter can be easily distinguished near the center. Despite being the youngest features on Ariel, they probably have formed over a long span of geological time.

Another look at the terminator region on **TITANIA**. Among the features visible are long linear valleys perhaps 30-60 miles wide and several hundred miles long. The circular impact craters are attributed to cosmic debris.



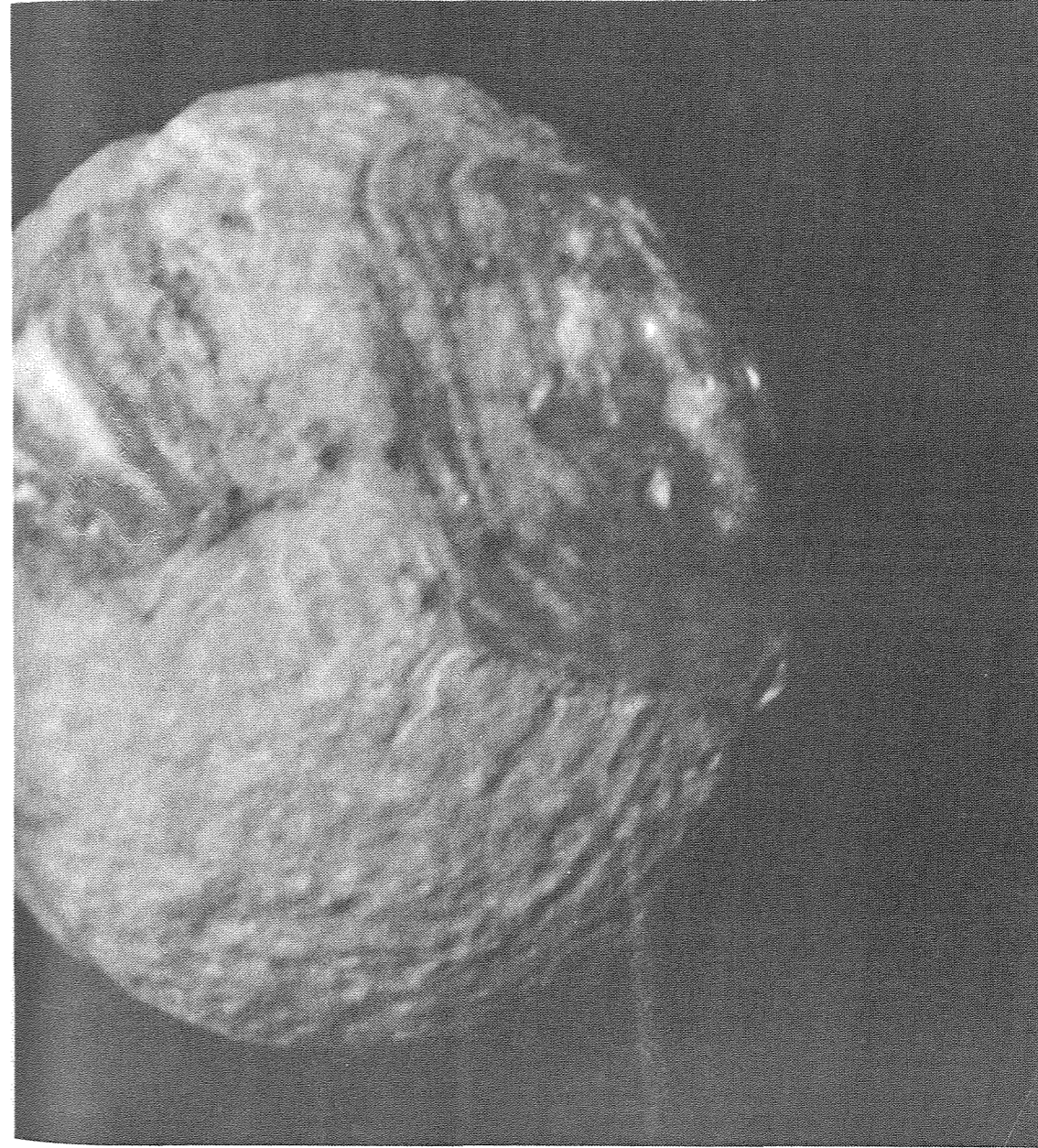
(below left) **VOYAGER 2** discovered two shepherd satellites on either side of the bright epsilon ring. Estimated diameters are 12 miles (1986U7) and 19 miles (1986U8). 1986U7 is close to the orbit of the newly discovered tenth ring, which is probably invisible at (right), but is midway between the bright, outermost epsilon ring and the next ring in (delta). After epsilon, the new ring, and delta come gamma, eta, beta, alpha, and the faint trio 4, 5, and 6. (below right) Three of the newly discovered satellites of Uranus: 1986U1 is an estimated 55 miles across; the other two are slightly smaller. They orbit outside the epsilon ring, which is also seen in the picture. (inset) The only "close-up" (from 300,000 miles) of a newly discovered moon: 1985U1, the first one found by Voyager 2, is about 90 miles in diameter.



Designed by Gavin Claypool and Nick Smith  
Special thanks to  
Jurrie Van Der Woude Henry Fuhrmann  
JET PROPULSION LABORATORY

## Miranda

O, I have suffer'd  
With those that I saw suffer: a brave vessel,  
Who had, no doubt, some noble creature in her,  
Dash'd all to pieces. O, the cry did knock  
Against my very heart. Poor souls, they perish'd.  
—The Tempest. Act I, scene 2, 5-9

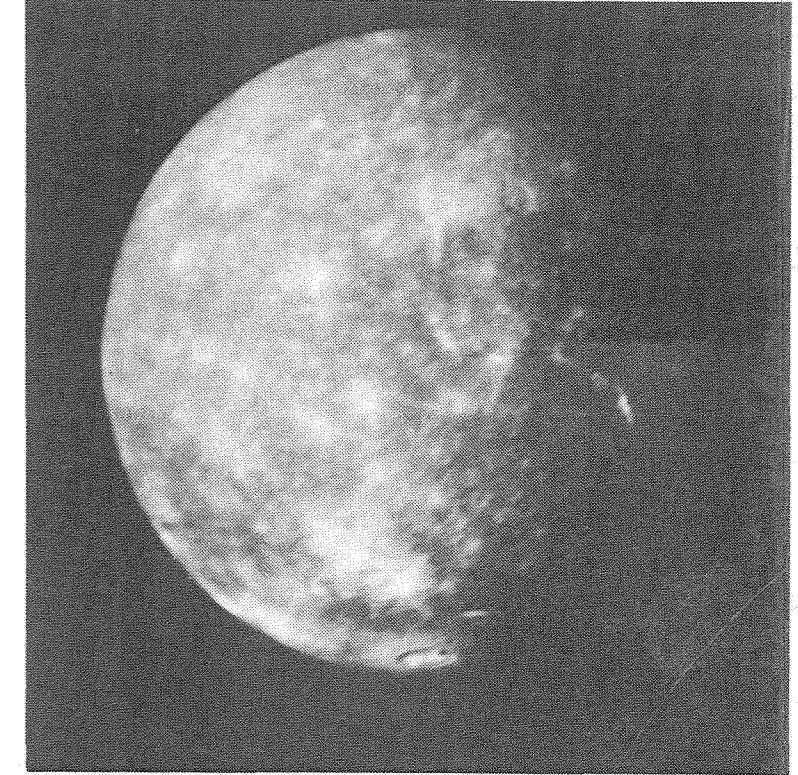


Diameter: 300 mi. Distance from Voyager: 91,000 mi.

**MIRANDA** is the smallest of Uranus's major satellites, and was not discovered until 1948. Its regional geologic provinces stand out in this view of the southern hemisphere. Higher-resolution pictures taken later show many fault valleys and ridges parallel to the dark and bright bands dominating one such region. Near the terminator (at right), another system of ridges and valleys abuts the banded terrain; many impact craters pockmark the surface in this region.

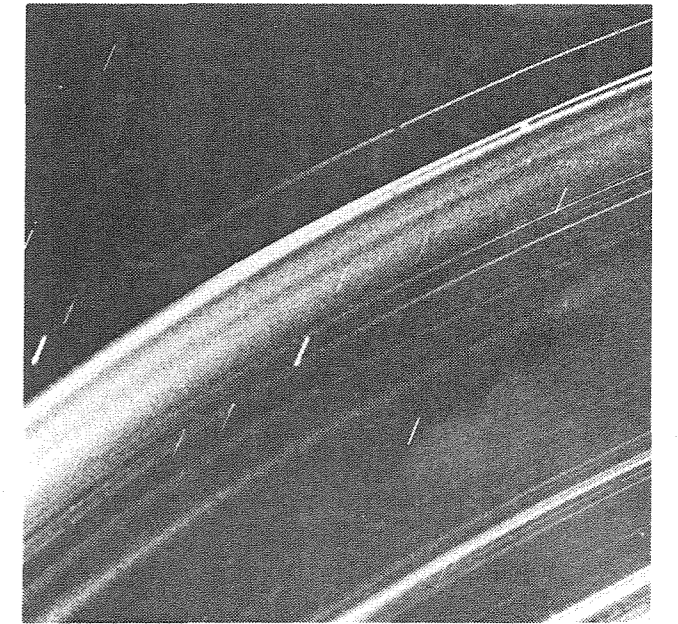
## Titania

Ill met by moonlight, proud Titania.  
—A Midsummer Night's Dream. Act II, scene 1, 60

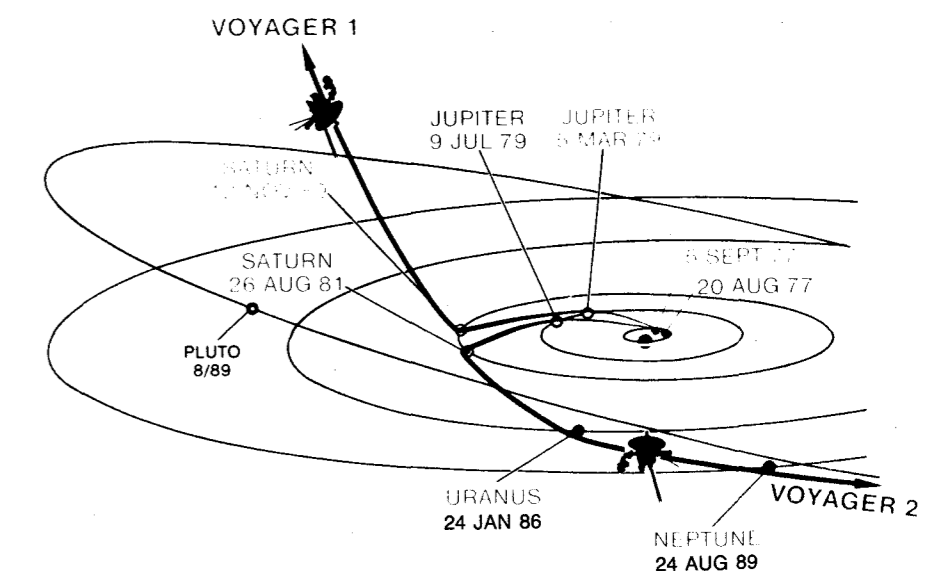
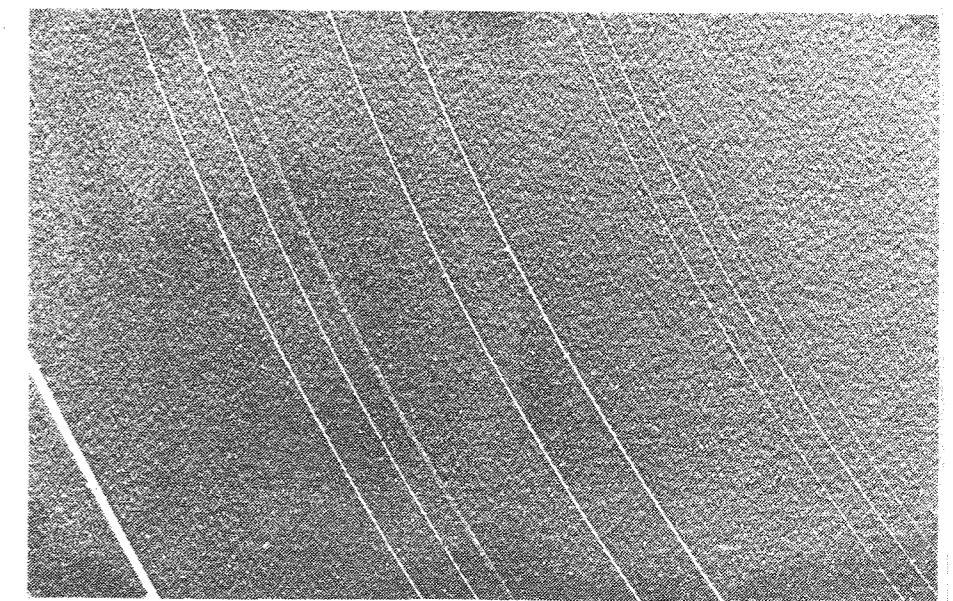


Diameter: 1000 mi. Distance from Voyager: 300,000 mi.

**TITANIA** is nearly Oberon's twin in size and is similar in appearance. In addition to many scars due to impacts, Titania displays evidence of other geologic activity, such as the trench-like feature on the terminator (see middle right). The basin-like structure near the upper right is evidence of an ancient period of heavy impact activity.

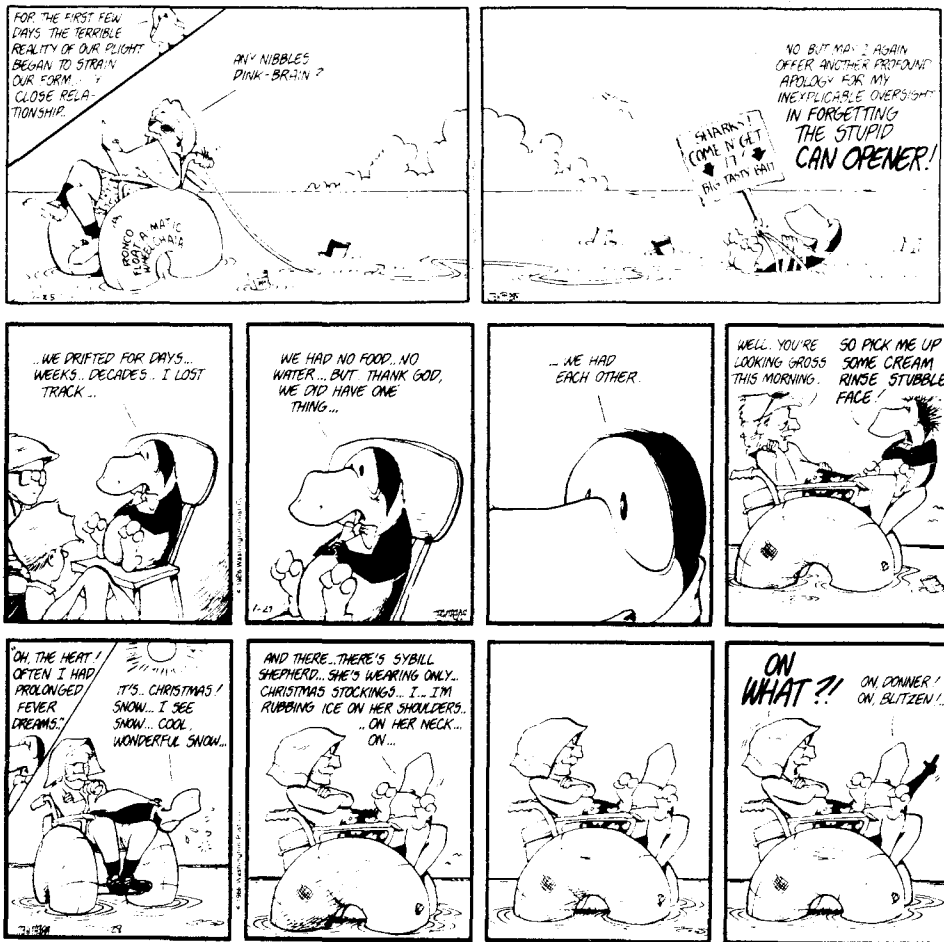


A 96-second exposure (causing smears and star trails) reveals a continuous distribution of small particles throughout the Uranus ring system.

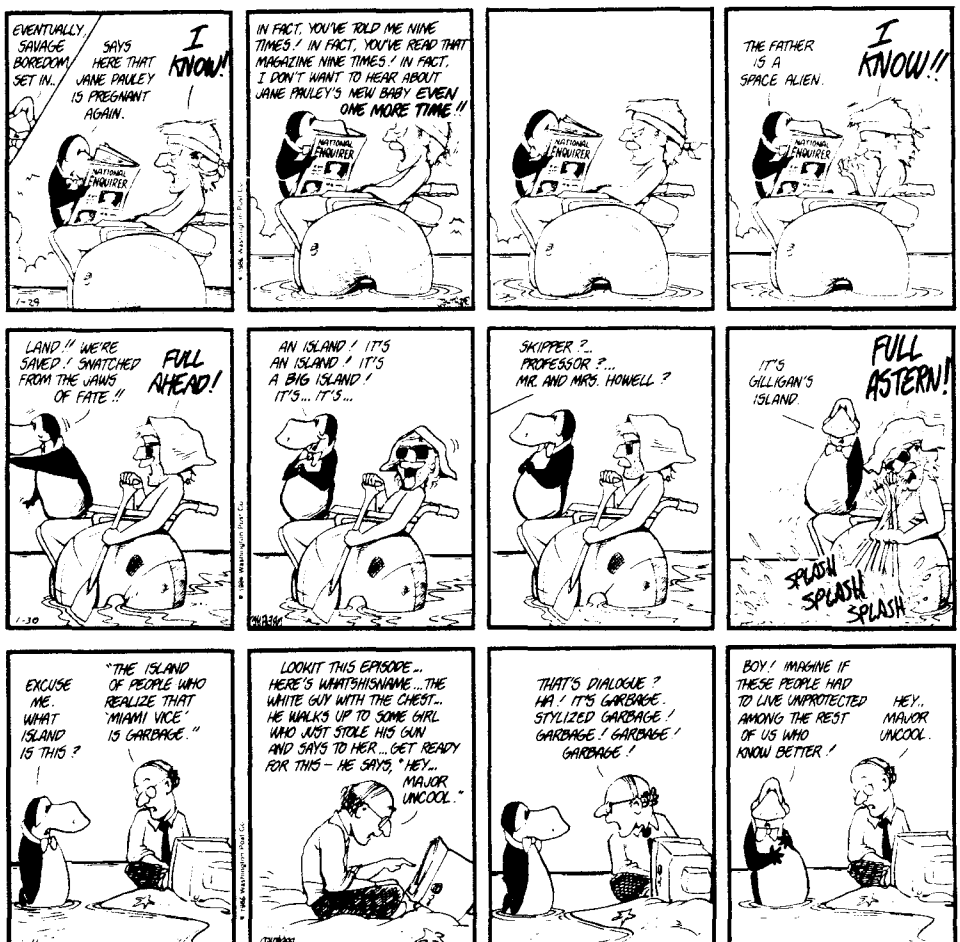


**BLOOM COUNTY**

by **Berke Breathed**



*Sponsored by the Caltech Y*



**Letters**

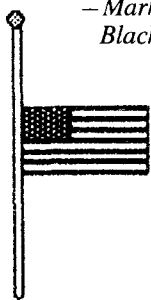
from page 3

nal tank would be equivalent to, assuming that in the last 4 hours the NASA officials were so bored that they could calculate it in case it happens to be in the next set of trivial pursuit questions. Another reporter hoarded two questions, rather than the one given to every other reporter, merely to accuse the the NASA committee of "covering up" the evidence which they could not possibly have yet, and which they are researching for the good of the nation, the space program, and the public in the first place. Probably the most offensive question, though, was a scapegoat-hunting reporter who asked, "who was the individual who was responsible for giving the go-ahead for the flight?" In addition to the fact that no one person was probably responsible for whatever problem caused the destruction of Challenger, looking for someone to blame is cruel and counter-productive.

Another annoying thing which several reporters did was questioning the future of the "civilians in space program," as if the fact that there was a teacher on board led to the destruction of the shuttle. This showed the reporters' lack of understanding of the problem, their reflex "effects on celebrities" journalism, and concern that the "journalist in space" program might be canceled, while what I would have liked to have seen would have been information like: someone intelligent discussing possible causes, the other payloads which the Challenger had been carrying, some confidence in NASA's attempts to find the problem, or even just some emotion from the reporters.

But all I saw was weak journalism and a room full of New Hampshire school kids watching their dream turn into a small ball of Hell and a small cloud of snow.

—Mark Montague  
Blacker House



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NSA will be on campus February 18, 1986. For an appointment, contact your placement office.



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# Survey

from page 4

3) The faculty could be asked to produce their own teaching quality reports so that a professor's teaching ability could affect tenure decisions and promotions, to encourage professors to really take their teaching loads seriously.

4) The division chairmen could be asked to have meetings once per term with the students in the division, so that students who are interested or who have suggestions/criticisms of the courses, professors, or requirements of their division could have the opportunity to express their ideas.

### Social Problems

There's no question that the social atmosphere at Caltech is quite different from the atmosphere at most colleges or universities, and that it is a prime contributor to the generally low student morale at Caltech. Many students feel that there are significant problems with the social environment here. How can those problems be overcome?

The most obvious problem is the female-to-male ratio; the most obvious solution: admit more women. This solution would be beneficial to the men of Caltech and the women, both of whom complain about the imbalance in the ratio. But Caltech already does well with its admissions; most of the women who attend prefrash weekend end up coming here. The problem, then, is not so much in Admissions, as in the fact that just not enough women apply to Caltech. The applicant pool for both men and women needs to be increased. But the question remains, should Caltech recruit potential applicants? Should Caltech make more strenuous efforts to attract women? Should there be special scholarships for women?

In particular, if Caltech does recruit more actively, should students be involved? Should

students be encouraged (or hired) to go back to their hometown high schools to recruit in September, before classes start here? Should alumni be involved? How else could Caltech increase the size of its applicant pool?

Some other possible ideas for improving the social environment at Caltech are:

1) Caltech could make motor pool cars available for student use on weekends, and put the charges on student accounts.

2) Caltech could bring in more events at Beckman Auditorium that more students would enjoy and attend.

3) Caltech could hire a professional, full-time Social Director for student activities. Most colleges and universities have them, usually in conjunction with their Student Center Organizations.

4) Caltech could remodel Winnett or build a new Student Center to better meet the needs of its students.

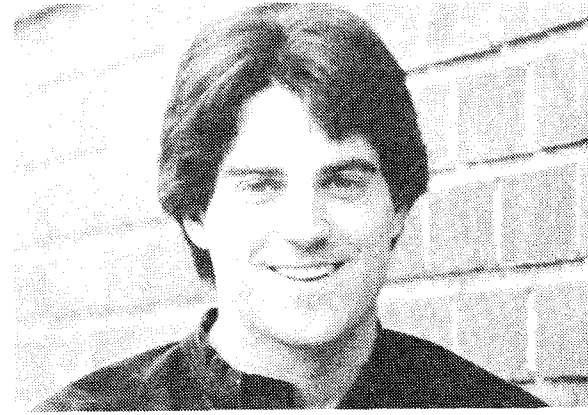
5) More activities to encourage creative, artistic expression by the students, such as the Right Brain Labs, could be started. Or appropriate credit could be awarded for journalism, poetry writing, prose writing, speech, or art classes.

All of the above-mentioned ideas are possible recommendations of the Student Morale Subcommittee for improving the quality of student life here at Caltech. They will be appearing in a survey that will be circulated next week. The discussions on all aspects of student morale are still open, so if you have additional ideas that you would like to be considered, please talk to a student member of the committee. The members are Bibi Jentoft-Nilsen (Bl), Frank Kragh (Fl), Joy Watanabe (Ri), Charles Budney (Ri), Steve Gomez (Da), Rob Fätland (Bl), Larry Siegel (Bl), and Ted George (Bl).

photo by Tech Staff



Clea Bures



Chris Schofield

photo by Tech Staff

The candidates shown above, Clea Bures and Chris Schofield, will go head to head in today's presidential runoff election.

# Burroughs Design Competition

Burroughs Corporation has announced the Second Burroughs Design Competition for outstanding examples of industrial design of products that incorporate computer capability and technology in the human/machine interface.

The competition is open to upper level industrial design students and recent graduates in North America. It has the official endorsement of the Industrial Designers Society of America.

"The purpose of the competition is to demonstrate how microprocessor technology can be used to reveal new product possibilities," said Paul G. Stern, Burroughs president and chief operating officer. "We also hope to show how the computer can make a product safer, more convenient, more functional and more responsive for the user."

First prize is a cash award of \$10,000 to the designer. The educational sponsor of the first prize recipient will receive a Burroughs B 25 business computer with printer. Second prize is \$5,000 to the designer, and third prize is \$1,000.

The three-man jury includes Stuart Brand, author of the Whole Earth Software Catalog, Niels Diefrient, FIDSA, who is design consultant to several international electronics firms, and Deane Richardson, FIDSA, chairman of Richardson/Smith Inc., a consulting design firm.

All entries must be received by March 31, 1986. Award winners will be notified by telegram after April 15, 1986.

First prize winner in the 1985 competition was an Interactive Musicbook, that combined a small

computer with the traditional music stand, to form the equivalent of a word processor. It enables musicians and teachers to add, change or erase notes and chords at will, add rhythm accompaniment, and play back part or all of a composition. Other award-winning products include an Image Acquisition system, a braille reader and writer, and an Agricultural Robotic Trimmer. These are described in a twelve-page color brochure, available free from Burroughs as long as the supply lasts.

Further information on the 1986 Burroughs Design Competition may be obtained from:

Competition Coordinator  
Corporate Industrial Design  
Burroughs Corporation  
41100 Plymouth Road  
Plymouth, MI 48170  
Tel. 313-451-4468

# James Beck on Earthquakes

by Gavin Claypool

The severe damage to buildings produced by last September's Mexican earthquake should not be blamed on inadequate building codes, James L. Beck, assistant professor of civil engineering at the California Institute of Technology, has concluded.

The codes in effect before the earthquake would have been considered adequate by most earthquake engineers, he contends. The catastrophic damage resulted mainly from a far-longer-than-expected shaking produced by two shocks at the earthquake source, and amplification of the waves by resonance within a layer of clay

beneath the most heavily damaged part of the city.

Dr. Beck based his conclusions on a tour of the city 12 days after the earthquake and on damage survey data and ground motion records supplied by earthquake engineers at the National Autonomous University of Mexico (UNAM).

The key geological factor in the damage was a layer of clay 50 to 100 feet thick that marked the old lake bed on which part of Mexico City was built. When earthquake waves enter this layer they resonate without it, amplifying some frequencies and damping out others. The layer beneath Mexico City is

just the right thickness to amplify those waves with periods of about two seconds—approximately matching the fundamental periods of vibration of high-rise buildings. Had the layer been much deeper or shallower, Dr. Beck thinks, the damage to high-rise buildings would have probably been far less.

Mexican earthquake engineers had allowed for this clay layer in developing building codes for the city. They had specified the most stringent design codes to allow for buildings with natural periods in the 0.8-3.3 seconds range. In contrast, U.S. codes usually decrease in stringency for building periods above 0.3 seconds.

However, none of the experts foresaw the long duration of the shaking that occurred, which was caused by the double-shock nature of the earthquake. This longer shaking worsened the damage in two ways. First, it gave the ground motions more time to be amplified as they resonated within the clay layer. Second, the buildings became more flexible as they were shaken, bringing some of them more into resonance with the long-period ground motions.

The city's old colonial buildings and the majority of old low-rise buildings—all built before modern seismic building codes—survived with little damage. This was mainly because they have such short natural periods of vibrations.

Despite the fact that the ground motions from the earthquake and the geology of damaged area are unusual, Dr. Beck believes that U.S. earthquake engineers may learn lessons from the Mexican earthquake. For example, the nature of the damage may spur closer studies of other areas underlain by sediments, such as river mouths along coastal areas of Los Angeles. At this time, little is known about the depths of sediments in such areas or the nature of resonances within them.



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Personnel Manager  
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ENTERTAINMENT

# Portrait of the Woman

*Antonia*  
a film by Jill Godmilow  
by Diana Foss

Next Thursday night, February 6, the Organization for Women at Caltech is proud to present the award-winning documentary *Antonia, A Portrait of the Woman* by Jill Godmilow. Ms. Godmilow is visiting lecturer under a Mellon Foundation grant, and is presently teaching a class here at Caltech with Robert Rosenstone: H131, History Through Film: The Documentary. *Antonia* concerns one of the very first women to conduct a major symphony orchestra. The film was shown at Filmex last year, when Professor Rosenstone saw it and subsequently invited Ms. Godmilow to Caltech for a term. *Antonia* was also nominated for an Academy Award, an unprecedented achievement for an independent film. The film screens at 7:30 p.m. on February 6 in Baxter Lecture Hall. There will be a reception following the film in

125 Baxter, where Jill Godmilow will be available to answer questions about her work. Refreshments will also be served.

Ms. Godmilow, a native New Yorker, has been an independent filmmaker since 1965. She says she "fell into" filmmaking when she and a friend decided to make a Spanish-language film that was radically different from the standard Spanish cinema fare of beautiful blonds, sexy Caribbean men, and lots of musical numbers to pad things out. Theirs was a street adventure set in Spanish Harlem, and it was reasonably successful film. Halfway through the making of the film, Godmilow had to get a job to finance the rest of it. She got a position as a film editor, and she has worked in film ever since. Her editing credits include major Hollywood films like *The Godfather*, but her real work is filmmaking itself; she has over ten films and videotapes to her name. Although she has primarily



**Antonia: A portrait of the Woman** will be shown next Thursday, February 6 at 7:30 p.m. in Baxter Lecture Hall. This highly acclaimed film by Judy Collins and Jill Godmilow—a lecturer this term in H131.

made documentaries ("Documentaries were just what independent filmmakers did in those days," she says), her next work will be a dramatic film about the life of Gertrude Stein.

Although she has never taught anything except film production before, Ms. Godmilow is finding her class here extremely rewarding. By all accounts, so are her students. She enjoys Caltech itself very much; she thinks it is a very beautiful place, and it's nice talking to such bright people. Jill Godmilow herself is a wonderful person to talk to, and next Thursday night should provide an excellent chance both to experience her work and to meet a remarkable woman.



## Movie Review

# Black Moon Rising

by Nick Smith  
*Black Moon Rising*  
Directed by Harvey Cokliss

The trailers for this film caught my eye, showing a lot of action and one of the most flashy cars ever filmed. I was primed a slick adventure movie, and I got one.

*Black Moon Rising* is a story of the *It Takes A Thief* type, with a government-employed thief who handles cases where legitimate means have failed. The 'hero' is played by Tommy Lee Jones, a lot more countrified and rugged than Robert Wagner was on TV. He's hired to steal incriminating evidence from a company under indictment. Just how the government intends to get this evidence admitted in a court of law is glossed over, but never mind. The great part is his government contact, an assistant prosecutor played by ex-football great Bubba Smith. *Nobody* backtalks or intimidates this prosecutor.

The plot involves intrigue, thefts, and yet another crooked company, which quite accidentally steals the evidence from Quint (Tommy Lee Jones). In his efforts to recover the evidence, he en-

counters car-thief *extraordinaire* Linda Hamilton, and her evil boss, Robert Vaughn.

John Carpenter is credited with co-writing the script, and it shows his touch in several ways. Much of the film is shot on locations in Los Angeles, including a building still under construction. The visual appearance is very sharp, and the moments of suspense and violence were very believable. The fantasy element is the car itself, a prototype called *Black Moon*, a super-speed, Kevlar-bodied, hydrogen-burning machine that is the *fastest* thing this side of Bonneville. (KITT, eat your heart out!)

*Black Moon Rising* is well-acted, well-directed, and well-written for what it is, not the film of the year, but an enjoyable adventure film. There is a little blood and violence, but not excessive amounts. There is sex, but not graphic or gratuitous (in fact, one scene points out rather humorously why sex and violence don't mix). If you want an evening of entertainment watching thieves and counter-thieves, pretty girls, tough guys and hot cars, *Black Moon Rising* is a good one.

## Life's little Necessities

**Albert Einstein: the Practical Bohemian:** Ed Metzger's one-man show follows Einstein from his early years in Europe to his time in America. Ramo Auditorium. Friday & Saturday, Jan. 31 & Feb. 1, 8:00 pm. \$15. Students with ID \$7.50. \$5 student rush.

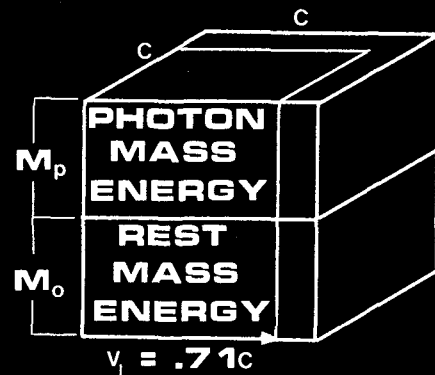
**I Hear America Singing:** Keith & Rusty McNeil present a program of American folk songs. Beckman Auditorium. Sunday, Feb. 2, 3:30 pm. \$12-\$10-\$8.

**When in Doubt, Flip a Coin!:** Yaser S. Abu-Mostafa gives a Watson lecture on randomness. Beckman Auditorium. Wednesday, Feb. 5, 8:00 pm. FREE!!!

**TODAY'S PHYSICS PROBLEM: A REST MASS  $M_0$  IS GIVEN A VELOCITY  $v = .866c$  RELATIVE TO THE STATIONARY REFERENCE FRAME S. WHAT IS ITS RELATIVISTIC MASS AT THIS VELOCITY?**

**SOLUTION: FOLLOW THE 7 STEPS OUTLINED BELOW:**

**TOTAL ENERGY CUBE  $2Mc^2$**



(1)  $M = M_p = M_0$

(2)  $2Mv_1^2 = M_p c^2$

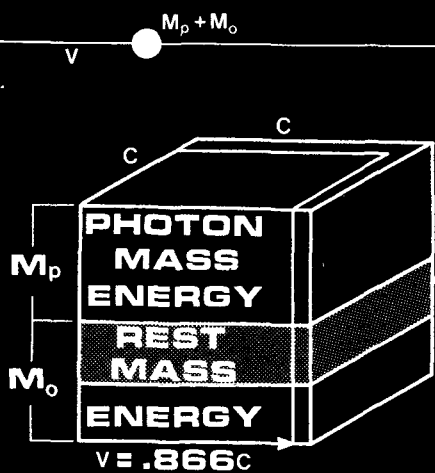
(3)  $v_1 = \sqrt{\frac{M_p c^2}{2M}} = .71c$

(4) **ACTIVATED REST MASS ENERGY**  
 $M_0 v_1^2 = M_0 (.71c)^2 = .5M_0 c^2$

(5)  $2Mv^2 = 1.5M_p c^2$

(6)  $v = \sqrt{\frac{1.5M_p c^2}{2M}} = .866c$

(7)  $M_{TOTAL} = \frac{M_0}{\sqrt{1 - \frac{(.866c)^2}{c^2}}} = 2M_0$



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SPORTS

# Beaver Skaters Fall at Home

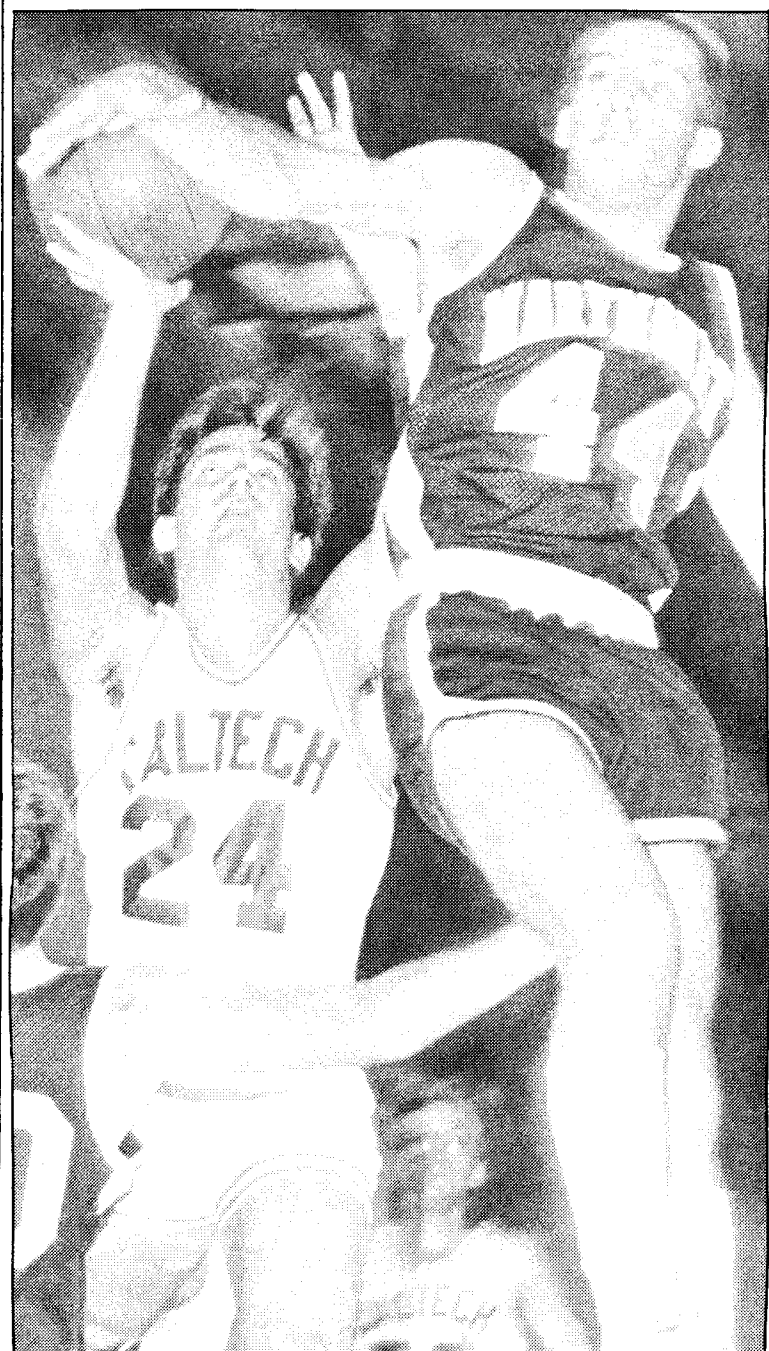
by Marty Zimmerman  
 Tuesday night Caltech played Cal State Northridge at home. Northridge jumped out to a quick lead in the first period, but Caltech battled back. Captain George Yates scored a goal assisted by Martin Brouillette. Later, Phil Askenazy knocked in a puck lying in front of the net. At the end of the first period Northridge led 4-2. In the

second period almost all the action took place at mid-ice and Northridge scored the only goal of the period.

The third period was rough. Northridge scored three more goals, but nine penalties were called. In the entire game 17 penalties were assessed, about half of them against Caltech. This hurt

Caltech since our power plays did not work while Northridge did an excellent job of converting power plays into goals. Still, the game was more even than the 8-2 final score would indicate. Next week we play Northridge again (Tuesday at 9:30 pm, Pasadena Ice Center) and the match should prove to be a good one. So come out and watch!

# Caltech Crunch - Century Neared



Laid up - A crazed Marymount cager makes an effort to intercept Caltech's Ed Zanelli on his way to the hoop. The Beavers easily handed their opponents a 99-79 defeat.

photo by Rod Van Meter

The Caltech basketball team improved their record to 10-7 with a 99-79 win over Marymount College. They were led by Brett Bush with 24 points and 16 rebounds, followed by Ed Zanelli with 20 points, Jim Helgren with 19, and Brian Porter with 18.

It was a very fast paced game with both teams pressing and fast breaking, as the high score indicates. The first period was close with Tech leading 49-41 at the break, but the Beavers opened the second half strongly to go ahead 72-45, and the game was all but over from there.

Although the Beavers on the whole put up a poor defensive effort, Jim "The Enforcer" Helgren is credited with sidelining three of

the Marymount players, forcing them to finish the game with only four men.

Other highlights included first points of the year for Jed Lengyel, a perfect two for two from the line, and Tom Bewley, a consummate one for one from the field. Bill Gustafson improved his P/F ratio to one half for the year, and Helgren *gusjohnsoned* two Marymount players (one of them twice).

The next game for the Beavers is tomorrow night at 7:30 against the Redlands J.V. Also, don't forget to watch Tech in action on National T.V. at halftime of the Syracuse - St. Johns game tomorrow morning.

## WEEKLY SPORTS CALENDAR

Day	Date	Time	Sport	Opponent	Location
Sat.	2-1	10:00 am	Swimming (M/W)	Claremont-Harvey Mudd	Claremont
Sat.	2-1	1:00 pm	Baseball	Alumni	Caltech
Sat.	2-1	1:00 pm	Fencing	Cal State Fullerton & UCSD	Caltech
Sat.	2-1	1:00 pm	Men's Tennis	JPL	Caltech
Sat.	2-1	1:00 pm	Women's Tennis	Claremont-Mudd-Scripps	Claremont
Sat.	2-1	7:30 pm	Basketball	Redlands JV	Caltech
Sun.	2-2	1:00 pm	Women's Soccer	DeFeet	LaSalle High
Tue.	2-4	3:00 pm	Baseball	Christ College	Christ College
Tue.	2-4	3:00 pm	Men's Tennis	Christ College	Caltech
Tue.	2-4	9:30 pm	Ice Hockey Club	Cal State Northridge	Pasadena Ice Center
Wed.	2-5	3:00 pm	Women's Tennis	Pomona-Pitzer	Caltech
Wed.	2-5	4:30 pm	Wrestling	Pomona-Pitzer	Caltech
Wed.	2-5	7:00 pm	Basketball	Pomona-Pitzer JV	Pomona-Pitzer
Sat.	2-8	All Day	Wrestling	Biola Invitational	Biola
Sat.	2-8	10:00 am	Swimming (M/W)	U.C. Riverside	Caltech
Sat.	2-8	11:00 am	Women's Tennis	Middlebury College	Caltech
Sat.	2-8	12 noon	Baseball	Christ College	Caltech (2)
Sat.	2-8	1:00 pm	Fencing	UCLA & San Diego State U.	Caltech
Sat.	2-8	2:00 pm	Men's Tennis	Faculty	Caltech
Sat.	2-8	6:00 pm	Basketball	Claremont-Mudd JV	Claremont
Sun.	2-9	3:00 pm	Women's Soccer	Valkyries	Caltech

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## SPORTS RESULTS

Basketball	Caltech 99	Marymount 79
	LaVerne J.V. 61	Caltech 59
Wrestling	Caltech 18	LaVerne 18



## WHAT GOES ON

## ASCIT Election Results

There will be a run-off election today, January 31, for the office of ASCIT President, between Clea Bures and Chris Schofield. David Bruning was re-elected ASCIT Treasurer.

## Party, Party, Party

All those interested in Model United Nations, particularly those who wish to attend the regionals on Feb. 15 should attend a meeting next Tuesday night at 7 pm in the Y Lounge.

## CLASSIFIED

## HELP WANTED—

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**"PAY LESS TAX LEGALLY,"** J.K. Lasser, Arthur Young—tax time is here again. All tax guidebooks 40% OFF at the CALTECH BOOKSTORE, and tax deductible too!

**RATES:** \$2.50 for first 30 words; 10¢ for each additional word. Payment must accompany ad.

## CCF Retreat

"Growing in Christ's Love" will be the theme of this year's Caltech Christian Fellowship retreat. The retreat will be held at Capra ranch, Jan. 31-Feb. 2. Cost is \$25. For information call Kevin Wilson, 578-9696 or John McGill, x6079.

## Free Money for Seniors

This is it, seniors—time to turn in your senior photo to the *Big T* office (first floor, Winnett). Photos are due no later than Feb. 7. They should be black and white (any size), preferably on glossy paper. Please include your name, option, and hometown. Call us at x6154 if you need a photographer.

## GM Scholarship

Three sophomores will be selected to be General Motors Scholars: two electrical engineers and one mechanical engineer. Tuition, fees and a \$200 stipend will be paid on behalf of each scholar, *without regard for financial need.* Pick up the applications at the Financial Aid Office, Room 10, Parsons-Gates. Application deadline: February 17, 1986.

## Cal Grant Applicants

All freshman students who have completed a Cal Grant Supplement (or who will) *must* complete the "Additional Report Request Form." Failure to do so will result in automatic denial of the Cal Grant. Please stop by the Financial Aid Office as soon as possible to pick up this form. Cal Grant deadline: February 11, 1986.

## Water Polo

Anyone interested in playing water polo on Wednesdays is encouraged to call David Bruning at 578-9971 (115 Page). This is a recreational group from 7:30-9:00 p.m.. All levels of ability welcome.

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## Osborne Klub

The monthly meeting of OKOK (Osborne Komputer Owners Klub) will be held Tuesday, February 11, in Winnett Lounge. This meeting is open to all micro users, which include owners of Osborne, KayPro and other CP/M or PC/MS-DOS computers. A 1-hour "hands-on" tutorial begins at 6:30 pm, upstairs in Clubroom 1. This month's hands-on topic will be "New Public Domain Software—What's In It and How to Use It." The general meeting begins at 8:00 in the downstairs lounge. This month's program is: "1985 Tax Returns, State & Federal," using SuperCalc. Everyone is welcome to attend. Bring your computer and participate actively, or just listen.

## Romance Language

Come see *Romance Language*, a new comedy by Peter Parnell, with Huck Finn, Emily Dickinson, General Custer, and many more... The Y has tickets for tomorrow night, Saturday Feb. 1 at 8 pm at the Mark Taper Forum. Tickets are \$6 each. Y car leaves at 7:15 pm.

## Shabbat

There will be a short Friday night service tonight (and every Friday this term) at 6 pm. Afterwards, there is a delicious *free* dinner. To RSVP or for info call x3966. The dinner is held at the Caltech Bayit at 350 S. Wilson.

## Totem Reborn

The *Totem* is being resurrected again this year. If you draw, write, or photograph, I will gladly accept drawings, poems, short stories, prose, and photographs of any kind. Talent is not a prerequisite; just express yourself! I'm trying to publish two *Totems* this year, so please contribute something by Feb. 7. You can mail contributions to Richard Lawson 1-55, or drop them off at my room, 221 Rud-dock. Questions? Call me at x6182.

## Short-Term Jobs

EIP/Southern California is accepting applications until Feb. 3, 1986 for its 1986 program. A national, non-profit organization, EIP/SC offers upperclass undergraduate students and recent graduates on all levels, short-term (3-24 months), salaried positions on environmental projects with private industry, government and non-profit organizations. All majors may apply, particularly persons with a background in chemistry, biology, public health, toxicology, resource management, planning, geology, architecture, water resources, environmental studies and historic preservations. For more information and application materials, call (213) 622-0029.

## Solvang Century

The SCOR Cardiac Cyclists Club will be hosting the Fourth Annual "Solvang Century" bicycle ride on March 8, 1986. The ride will start and finish at Santa Ynez High School and is a moderately tough 100 mile ride through Solvang, Buellton, Lompoc, Santa Maria and Los Olivos. All riders receive a route slip, water bottle, athletic bag, full SAG support with five food and drink stops for their entry fee. The entry fee is \$16 if paid for February 22, 1986. An additional option is the pre-ride pasta dinner to be held at the Lutheran Bethania Church in Solvang on March 7 at 5:30 pm. World Land Speed Record Holder John Howard will be the guest speaker. Dinners are \$7.50 per person. Entry forms are available at the Human Performance Center in Whittier, or will be mailed by calling (213) 945-6366.

## Whale-watching

Come whale-watching with the Caltech Y on Saturday, Feb. 8! We'll be looking for gray whales and may also see porpoises, dolphins, gulls, terns, loons, and more! The cost is \$6, and some transportation is available. Sign up at The Y.

## Soroptomist Fellowship

Soroptomist International of Los Angeles announces the Gertrude Schuckert Award in the amount of \$3,000 for graduate study for women in 1986-87. The field of study is open and competition is open to women who are U.S. citizens and residents of the State of California. Candidates must be enrolled in a graduate degree program in the 1986-87 academic year. For further information, contact the Financial Aid Office, Room 10, Parsons-Gates. Application deadline: Saturday, February 15, 1986.

## Arroyo Singers

The Arroyo Singers, a Pasadena based women's chorus, is now rehearsing Tuesday evenings from 7:30 to 9:30 p.m. and is seeking new members interested in singing classical music.

The choral group, under the directorship of Steven Wight, is in their 25th year of performing in the Pasadena area at various times throughout their September-to-June season.

Rehearsals are held each Tuesday at 2475 Boulder Road, Altadena. For further information, please call 213-256-3355.

## Free Money!

The Student Investment Fund will disburse up to about \$4000 for projects of broad interest to the students. The disbursements should not be used for

- the furtherance of any political cause;
- making up any deficit incurred, or;
- funding scholarships.

Instead they should preferably be used for capital investments and direct material improvements. Please submit proposals to Yosufi Tyedkhan 1-54 Caltech Pasadena, CA 91126 or contact him at 796-3227. Deadline is Feb. 15.

## Tutors Needed

We will be needing tutors and counselors for our Summer Secondary School Science Project which runs from Monday, June 23, 1986 through Thursday, August 7th, 1986.

Those undergraduates who will be working for us must wish to teach and work with motivated high school youth and/or supervise them in the north undergraduate houses for the seven weeks of the program (especially during the evenings).

We are in need of the three tutors in biology, chemistry, physics/trig., and two or three tutors in physics/calculus. Contact Lee F. Browne at x6207 for further information.

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