

"He kicked me
without great
conviction

THE CALIFORNIA TECH

and I kept quiet."

From "The Wall"
Jean-Paul Sartre

VOLUME 85

PASADENA, CALIFORNIA / FRIDAY, APRIL 20, 1984

NUMBER 25

Hepatitis Vaccine Possible

Caltech News Bureau

A low-cost vaccine to combat one of the world's major diseases, hepatitis B, may result from the discovery that a minor viral protein produces a powerful immune reaction to the disease in humans. The protein already offers a novel method of diagnosing the disease.

Researchers at the New York Blood Center and Caltech have reported discovery and synthesis of the protein in an article in the April 27 issue of *Science*. The scientists are Dr. A. Robert Neurath and Nathan Strick of the Blood Center's Lindsley F. Kimball Research Institute and Dr. Stephen B. H. Kent of Caltech's Division of Biology. Their paper is entitled "Location and Chemical Synthesis of a Pre-S Gene Coded Immunodominant Epitope of Hepatitis B Virus."

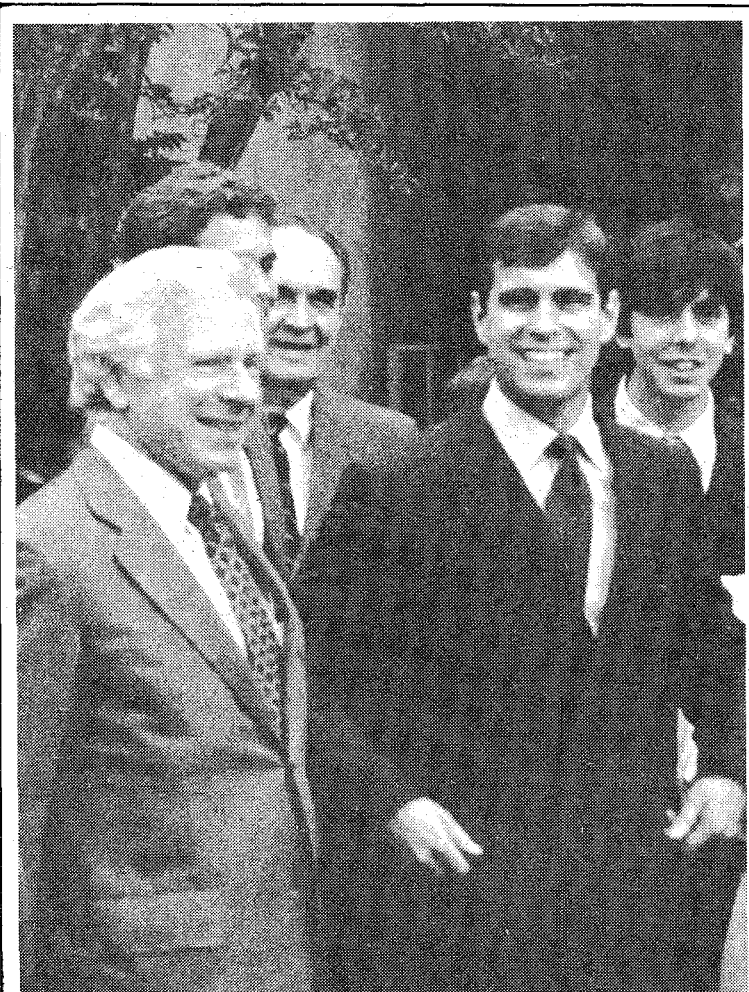
The scientists concentrated their studies on two nearly identical proteins, code-named P33 and P36, that help make up the surface coat of the hepatitis virus. Until now, P33 and P36 have been largely ignored by researchers because they make up only a small percentage of the protein coat.

However, when the researchers used protein analysis techniques to isolate the hepatitis B coat proteins, they found that P33 and P36 reacted especially strongly with hepatitis B antibodies found in humans after infection. Other tests revealed that only a small portion of P33 and P36—a segment 55-amino acids long not found in the major coat proteins—was responsible for the reaction, so the researchers chose this portion to analyze further.

The amino acid structure of P33 and P36 was known from previous work, enabling the researchers to build and test various parts of the 55-unit segment using protein synthesis techniques. When a synthetic protein—called a peptide—representing the first 26 amino acids of the 55-unit segment was injected into rabbits, it induced an extremely strong immune response, producing high levels of antibodies in the animals.

These antibodies were isolated and added to blood samples from human hepatitis B carriers, and they reacted strongly to the hepatitis virus in the victim's blood.

"These antibodies were unusually effective in recognizing the intact virus and virus-related particles," said Drs. Neurath and Kent. "No precedent exists for such high levels of virus-recognizing antibodies to a synthetic peptide analog of a hepatitis B virus protein." This powerful reaction means that the peptide provides the basis for an improved
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Royal Visit: Prince Andrew of U.K. visited JPL and Caltech yesterday. He visited the Space Simulator at JPL and the Seismology Lab on campus. Above, he chats with President Goldberger on the Athenaeum lawn.
Photo by Min Su Yun

Six More Units Computing Required for Class of '88

By Ken Whang

Beginning with this fall's freshman class, Caltech students will be required to take 6 units of computing courses for graduation. The institute computing requirement proposed by the Curriculum Committee was approved 9-4 by the Faculty Board on Monday.

The requirement will be stated in the 1984-1985 catalog as follows: "All student must complete satisfactorily 6 units of coursework in computing. The units must be chosen from CS10 (9 units), E 1a (3 units), E 1b (3 units), AMa 98c (3 units), Ma 4a (6 units), Ma 4b (6 units), CS 112 (9 units), Ph 20 (3 units), Ph 21 (3 units), Ph 22 (3 units), Ph 76 (6 units)."

CS 10 will no longer count towards the freshman laboratory requirement.

The requirement is designed to ensure that all students get some hands-on exposure to computing before they graduate. In the past, some students have avoided any interaction with computers while at Caltech.

According to John List, chairman of the Curriculum Committee, computing skills are "as necessary as calculus, or English literacy" for students who will be professionals in technical fields in the 21st century.

The requirement will also free instructors of other subjects to assign problems requiring some computing, since they may assume that their students can write simpler programs.

John Seinfeld, Executive Officer for Chemical Engineering, considers the requirement to be "a very good thing." The chemical engineering faculty are currently trying to "integrate computing into our courses where appropriate," and the requirement should help to equip their students with the fundamentals necessary for more advanced work.

Seinfeld believes that even in the chemical engineering curriculum, which has the most rigid requirements of any option, there is enough flexibility that the new 6-unit requirement should not pose a problem.

List noted that, as in all institute requirements, exceptions may be made in some cases. Those who already have an exceptional background in computing may be allowed to substitute another course for those listed under the computing requirement.

Geoffrey Fox, Dean of Educational Computing, thinks the requirement is a good first step, but is really too modest. As it stands now, the computing requirement exposes the students to simple computing problems, but "doesn't insure that they be able to use the computer fluently in their work."

He added that new courses will be available to satisfy the requirement, and that eventually they may comprise "half the courses in the catalog."

Berg Gets Biophysics Prize

Caltech News Bureau

Howard Berg, Caltech professor of biology who made the remarkable discovery that as long as one billion years ago nature invented the wheel, has been named co-recipient of the 1984 American Physical Society Biological Physics Prize for outstanding achievement in biological physics research.

In selecting Berg, the award committee cited him for his "elucidation of complex bacteriological phenomena, in particular chemotaxis [motion toward or away from chemicals] and bacterial locomotion, through simple but penetrating physical theories and brilliant experiments." The prize also includes an honorarium.

Originally trained as a chemist and physicist, Dr. Berg received his bachelor's degree from Caltech in 1956, his MA in 1960 and PhD in 1964, both from Harvard. He was a Fulbright Fellow from 1956 to 1957 and served on the faculties of both Harvard and the University of Colorado before coming to Caltech in 1979.

A ranking authority in the field of bacterial behavior, particularly locomotion, Dr. Berg startled the scientific community in the mid-1970s with the extraordinary news that the wheel had not been created by advanced humans at the dawn of civilization, but by the bacteria, near the beginning of life on earth.

His discovery was that some bacteria do not, as was long thought, move by whipping

their tail-like flagella back and forth, but by revolving them like a propeller. This propeller is attached to the cell's body by a proton-powered rotary motor that drives the cell forward about 20 body widths per second—the equivalent of a human being moving about 30 miles per hour.

Dr. Berg conducts some of his investigations with a tracking microscope, an instrument he invented to observe the behavior and movement of a single small cell over an extended period of time.

Much of his research on bacterial locomotion focuses on

Escherichia coli, a common intestinal bacterium that assists digestion and is widely used in work on recombinant DNA. The tracking microscope has revealed that *E. coli* are rudimentary hedonists who move vigorously toward chemical attractants that provoke their interest.

Dr. Berg's current studies are bringing to light many additional complexities in the behavior of organisms on the lowest rungs of the evolutionary ladder.

Recently, he has been observing an unusual bacteria called
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ARCO Gives Geology \$500K

Caltech News Bureau

Atlantic Richfield Foundation has awarded Caltech \$500,000 for new scientific instruments in the Division of Geological and Planetary Sciences, Caltech President Marvin L. Goldberger has announced.

"We are extremely grateful to the Atlantic Richfield Foundation for this generous grant," said Dr. Goldberger. "The instruments it allows Caltech to purchase will help maintain the remarkable pace of advances in geochemical analysis for which our Division of Geological and Planetary Sciences has been so renowned."

The grant will be used to help purchase two new analytical devices for the divi-

sion—an automated electron microprobe and a Fourier transform infrared analyzer.

The electron microprobe is a device that provides a precise chemical analysis of a selected tiny volume (less than one cubic micron) on the polished surface of a mineral or rock. It measures the x-rays excited by an electron beam that can be focused to a point and scanned across the surface. The instrument produces compositional maps that are used to study mineral growth, as well as precise analyses of mineral grains too small to remove from the rock for analysis.

Caltech's electron microprobe facility, established in 1963, was among the first in

the nation. Using that facility, Caltech Professor of Geology Arden Albee and his colleagues devised analytical methods for automated EMP analysis that are now used worldwide for analyzing complicated minerals.

The Fourier transform infrared analyzer measures the spectrum of infrared radiation passed through a sample to determine the amount of water or other forms of hydrogen it contains.

These instruments are used by geologists to analyze both terrestrial and lunar rock samples, as well as meteorites, for clues to the origin of geological features on earth, and the origin and evolution of the solar system.

The Inside World

Blacker: There will be no entry for Blacker House this week. — *The Communist Party*

Dabney: No entry.

Fleming: Last weekend was the surprisingly successful Fleming-Page Outdoor Olympiad. The Seniors jumped out to an early lead by winning volleyball, and clinched the championship hours later by winning football. With apparently no motivation for the raft race (using the likes of J. Sahr and S. Stevens) the Seniors left Kup behind and cruised into last place in the rafting competition. By setting a new world record, the Juniors captured second overall as they won the raft race comfortably. The final results were:

	Volleyball	Football	Rafting	Total
1. Seniors	1st	1st	4th	9 pts.
2. Juniors	2nd	4th	1st	8 pts.
3. Freshmen	3rd	2nd	3rd	7 pts.
4. Sophomores	4th	3rd	2nd	6 pts.
5. Sean Eddy				

In interhouse basketball, Fleming dropped into a tie for 1st after a couple of games with cochamps Page and Blacker.

This coming weekend is a surprise party... and it's such a surprise that nobody knows where it's going to be. Keep your eyes and ears open.

This Sunday pain shall be inflicted upon the scumballs. — *Al Fansome*

Page: Frosh dusted the Sophs 26-7 last week. Sorry Robby!

The Olympiad with Fleming this week was a great success. The seniors got lucky and came in first, followed by the Juniors, Frosh, then Sophs. Oh, well!

Warren is severe!

Thanks Lloyd, for a great party.

Look forward to egg coloring sometime this week. Bring your own eggs!

P.S. Ditch day is *not* tomorrow! (I think!) — *C.C.*

Lloyd: The party was a blast. The Source played well into the night.

Easter egg hunt Sunday noon at Corona and brunch at three at the house.

Sheets have gone up. Counterstacks are in progress. The seniors are wimps. — *Rod*

Ricketts: No entry.

Ruddock: Well, Laserium was last weekend - we had a good turnout. Sam fell asleep, but we all know he's too uncultured to appreciate Pink Floyd.

Meanwhile, many of us were in Sacramento attending the Model UN. No, really, we *did* go to meetings. Honest. The Subcommittee as Hot Tub Usage had frequent sessions. I would like to thank Aaron Roodman for the good job he did keeping everything cool. Thanks, Donkey. I would also like to thank Gleen for keeping an unnamed Embo in the van while we were driving at 40 mph.

Anyway, this weekend we're having a "Which Way to the Beach?" party Saturday night in Spalding Penthouse. Appropriate attire is of course required. It promises to be a great party, so everyone come out and have a good time!

Alley 5 beat Alley 2 in Millikan Elevator Racing.

As the Lizard King would say, take it as it comes. — *Hos*



Undergraduates Dean Elzinga as Claudio and Andrea Bland as Hero, the daughter of the Governor of Messina practice the pavanne for the dance sequences in *Much Ado About Nothing* by William Shakespeare, to be presented by TACIT (Theater Arts at the California Institute of Technology) on April 27, 28, 29 and May 4, 5, and 6. Tickets for Caltech students are \$2.50 and are currently on sale in the Caltech Ticket Office, 332 South Wilson.

Tech-Oxy-Claremont; Ath Formal

By-Dan Schwartz

Plans are moving right along for our giant Caltech-Oxy-Claremont blowout next Saturday. If you'd like to help out, talk to a Social Team member in your house after we have the ESC meeting this Monday.

Make sure to sign up for the Ath Formal *now*. The sign-ups come down next week. By the way, we'll be having Filet-in-Chemise, an entree with Filet Mignon wrapped in a soft crepe. The cost will be \$19 per person. If you have a group of 3, 4, 5, or 6 couples that would like to sit together, drop me a note or stop by 134 Page. Such tables may also choose an alternate to the house wine

from the Ath wine list.

Questions or comments? Call the Social Hotline, x6274.

THE CALIFORNIA TECH

Volume 85 Number 25
Friday, April 20, 1984

Published weekly except during examination and vacation periods by the Associated Students of the California Institute of Technology, Inc. The opinions expressed herein are strictly those of the authors and do not necessarily reflect those of the editors.

Letters and announcements are welcome. Included with all contributions should be the author's name and phone number and the intended date of publication. The editors reserve the right to abridge letters, so please keep them concise.

Turn in copy to the *Tech* office mailbox, room 107 Winnett. The deadline for copy is Wednesday evening at 8:00 pm. Late copy may not be printed unless previous arrangements have been made with the editors.

Editors in Chief Ken Hahn
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The offices of the *California Tech* are located in
Winnett Center on the Caltech campus.

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Business Manager: Room 107 356-6154

Production: Room 115 356-6153

The *California Tech*, 107-51
Caltech, Pasadena, CA 91125

Printed by News-Type Service, Glendale,
California.

Subscriptions should be directed to the attention
of the circulation manager.

\$6.00 per year (three terms)

\$100.00 per life ISSN 0008-1582

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The Caltech Y Fly-by

Friday... April 20

Noon concert—Toni Malone, Gospel Music on Good Friday.

Sign Up today or Monday for "Sentenced to Life"—a play about unwanted people. Presented at Sierra Madre Congregational Church on Wednesday evening. Transportation will be provided.

Monday... April 23

Sign Up for the Philharmonic Friday night, April 27, at 8:30. Last of the season!

Wednesday... April 25

Noon Update—"Chemistry in Electromagnetic Bottles," Jack Beauchamp, Winnett Clubroom 1. Bring a lunch and a friend.

Thursday... April 26

Sports Day. You, too, can help organize Sports Day. 10 a.m. at the MOSH's office.

Friday... April 27

Noon concert—Another surprise from our own Suzy Blue!!

Don't forget, Sports Day is May 4!

Lost something? Come look in our lost and found. For more information on any program, call the Caltech Y office at 356-6163, or just drop in.

Cinematech

STANLEY KUBRICK'S

The Killing

7:30

LUIS BUNUEL'S

Land Without Bread

9:00

In Cold Blood

9:35

Saturday Evening in Baxter Lecture Hall
Students, \$1 All Others, \$2



Doubleheader: Last Saturday night was a party night for Caltech with Blacker's I-Publicans in the Blacker-Ricketts party (above) and The Source sponsored by Lloyd at Winnett Student Center (below).
Photos by Min Su Yun



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Notes

Appointed Offices Filled

Following are the new holders of ASCIT appointed offices:
Totem Editor Chwe; **Big T Editor** A. Ghosh, G. Crawford; **Little T Editor** Sahnaw; **Big T Business Manager** Peterson; **Little T Business Manager** Peterson; **California Tech Business Managers** Adams, Peterson; **ASCIT Executive Committee** Gainey, A. Ghosh, Goldstein, Mapes, Premont, J. Watanabe, F. Wong; **Social Activities Committee** G. Gibbs, L. Henderson; **President's Staff** Asthana, G. Crawford, Curtin, A. Ghosh, Mihos, Murch, Roodman, Sauter; **Elections Chairman** Evans; **Educational Policies Committee** Choy, Pitt, Takemoto; **Communications Director** Lodge; **Student Darkroom Chairman** Mapes; **Publications Darkroom Chairman** Yun.

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For the Entire Month Of April

A Free Root Beer Float to All Freshmen and Sophomores

Faculty, Grad Students, Attend!
Mondays and Tuesdays are Beer Days. Half price on beer.

B. C.: On Lake Avenue
1/2 Block North of California

The Body Shop

Reduce Fat Intake

The aim is to reduce total fat intake to 30 percent of daily calories, more or less equally divided between saturated, monounsaturated, and polyunsaturated fats. In addition, cholesterol intake should not exceed 300 milligrams a day, averaged out over the course of a week.

A common way to recognize the dietary fats and to distinguish between the 3 fats is: saturated fats are solid to semi-solid at room temperature (meats, dairy products, and some vegetable products), monounsaturated fats are liquid at room temperature, become thick when refrigerated (avocados, peanuts, olives and most nuts), and polyunsaturated fats are liquid at room temperature and when refrigerated (plant sources).

We have been exposed to and overwhelmed with nutritional information attacking fats. Fats have been linked to many health problems including obesity, cancer and atherosclerosis. Nevertheless, fats are essential in the diet to maintain good health. Fat is important for energy storage

and release, protection of vital organs, insulation and as a carrier and solvent for four vitamins (A, D, E, K).

Fats are also responsible for depressing 'hunger pangs' associated with dieting. Fats in the diet stimulate the release of a hormone which produces the feeling of satiety after eating. This is essential for the reduction of food intake when dealing with a weight control or weight reduction program.

We have made significant changes in the past years in how much fat and cholesterol we eat. We now eat much less saturated fats, less cholesterol, and more polyunsaturated fats than a century ago. We are moving in the right direction but we are hardly home free. Fats and cholesterol are still far too prominent in our diets and implicated in several diseases that are taking many lives.

Following these recommendations would help to decrease your intake of dietary fat and cholesterol in your diet:

Choose lean cuts of meat: *Beef*—flank, round, tenderloin, sirloin tip steak, extra lean ground beef. *Pork*—center cut ham, boiled

sliced ham, loin chop and pork tenderloin. *Veal*—all cuts except breasts. *Lamb*—leg of lamb, leg chop, lamb steak, sirloin chop. *Poultry*—small chickens, turkey and cornish game hen; small birds are leaner than large ones, white meat is lower in cholesterol than dark meat. *Fish*—most are low in fats.

Avoid well-marbled cuts. Remove skin and fat pads before cooking. Broil or roast meats, poultry and fish. Cut intake of red meats.

Switch to low-fat or skim milk and milk products. Become aware of what is truly low in fat. Buttermilk is low-cal, low-fat and low cholesterol. Yogurt should be 99% fat-free to be considered low-fat. Ice milk and soft serve contain less than half the fat of ice cream; sherbet is even lower. Avoid cream substitutions, usually made with saturated fat and sugars. Be careful with all cheeses, even the part-skim milk ones, imitations are deceiving.

Limit egg yolks to 2-4 a week, including those in prepared and processed foods. For every 2 eggs, discard 1 yolk. You can eat as many egg whites as you want, an excellent source of low-cal protein.

When you are using fats and oils, use vegetable oils rather than animal fats or solid vegetable shortening. The total fat and calorie content are the same but the saturated fat content is much lower and there is now cholesterol in pure vegetable fats.

Watch out for the goodies—eat them in moderation!

Protein for Hep B

from page 1

diagnostic test for hepatitis B, they said, and may more effectively identify the infective form of the disease.

"The animal antibodies reacted with the intact virus and related particles to such an extent that we have been able to use them to detect virus in human blood serum at a dilution of one millionfold," said the scientists.

Of even greater importance, they said, would be the production of the peptide for use as a cheap, effective vaccine for hepatitis B. Such a vaccine would produce a powerful protective immune response in treated humans, enabling them to resist the disease.

Drs. Neurath and Kent have already begun animal tests of the protein as a vaccine in collaboration with other scientists, experiments which should take about six months. However, they caution that until the results of these tests are in, the potential of the peptide as a vaccine remains in doubt.

Although a vaccine for hepatitis B does exist, it is scarce and expensive—costing about \$100 per person in the United States—because it is derived from the blood of human hepatitis carriers. A synthetic vaccine based on the small protein, however, could be manufactured in enormous quantities at extremely low costs—enough to enable mass immunizations, even in Third World countries.

Also, traditional vaccines may have a short shelf-life, and may offer some risk of causing the disease themselves. Both these problems could be avoided with the use of a synthetic

vaccine consisting only of a chemically synthesized viral protein segment, which cannot be infective.

Hepatitis B is one of the world's major health problems. There are about 600,000 carriers of the disease in this country, and some 200,000,000 worldwide. The disease is a major cause of premature adult death in Asia and Africa and is linked to liver cancer, an extremely deadly malignancy. Because of this link, wide use of a synthetic hepatitis B vaccine would also eradicate human liver cancers associated with the disease.

Many academic and industrial research laboratories working toward the production of an effective, safe, low-cost hepatitis B virus vaccine.

Hepatitis B is not the only viral disease that may be attacked using such synthetic protein vaccines, said the researchers.

"The chemical synthesis of small peptides derived from viral proteins—pioneered by Richard Lerner of the Scripps Clinic and others—is an exciting new technology for the manufacture of vaccines," said Drs. Neurath and Kent. "These synthetic peptides have in a limited number of cases proved to be highly effective in inducing an immune response that will recognize an intact virus, and in a few cases to neutralize the infectivity of a virus. This means it might be possible to create synthetic peptides for a number of infectious viral diseases."

The scientists' research was supported by the National Heart, Lung, and Blood Institute, the New York Blood Center, and by Caltech.

Berg's Prize

from page 1

Cytophaga that appears to glide over surfaces by a means strongly resembling tractor treads, and a fungus, *Phycomyces*, which uses a chemical radar system to detect barriers.

The author of numerous studies on bacterial motion and behavior, Dr. Berg also serves on the editorial board of the journals *Cell Motility* and *Modern Cell Biology*. He is a member of the American Physical Society, Biophysical Society, American Society for Microbiology, American Society for Biological Chemists, American Association for the Advancement of Science, and the New York Academy of Science.

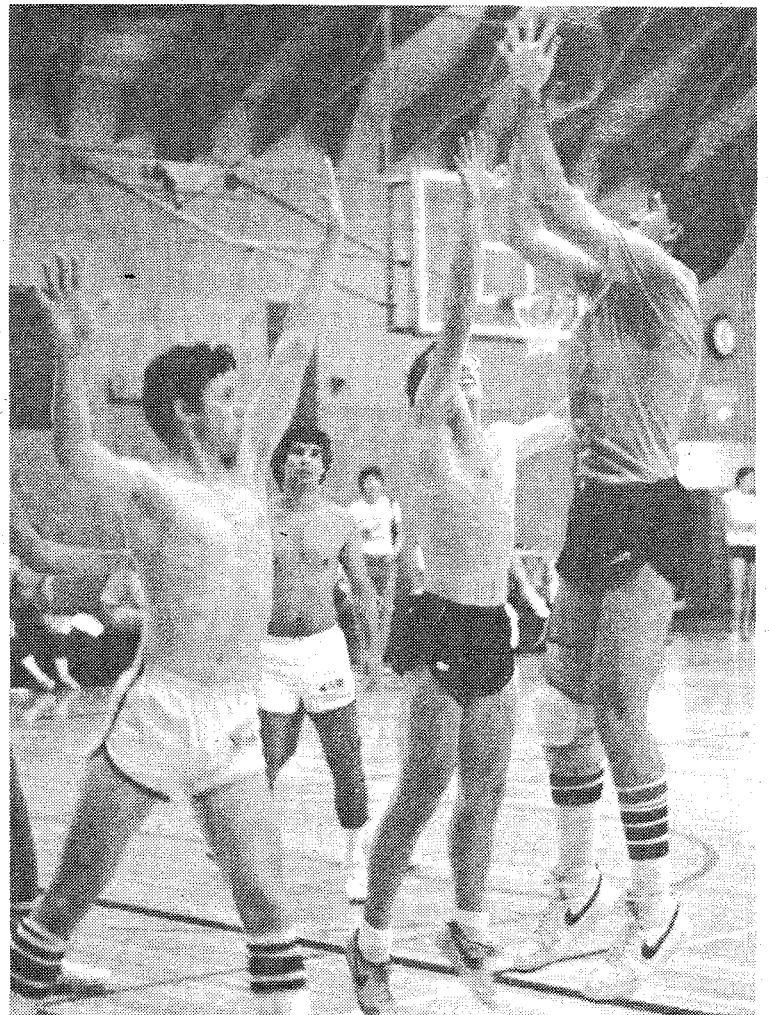
In 1978-79, he was the recipient of a Science Faculty Professional Development Award, from the National Science Foundation. His work with bacteria was featured in a 1977 episode of the BBC series *Horizons*, and repeated in 1980 on a NOVA program entitled "Living Machines."

The Outside World

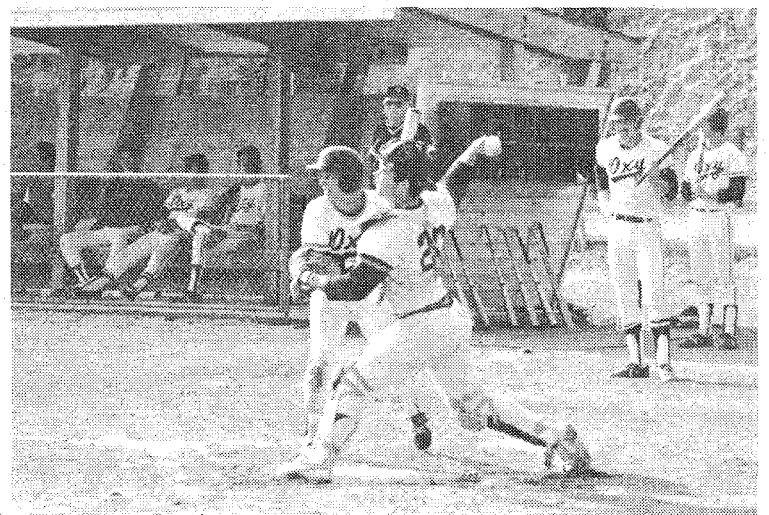
A Libyan Embassy gunman killed a police officer and wounded 10 people with machine gun fire on Monday in London. The shooting took place during an anti-Qaddafi demonstration in front of the Libyan Embassy. British police immediately surrounded the embassy but could not enter by force without violating the diplomatic immunity protection given to the embassy and its personnel. In retaliation, Libyan troops and demonstrators in Tripoli surrounded the British Embassy, but ceased their siege one day later. The British government is seeking a diplomatic solution to the standoff with Libya.

The United States and other NATO members offered a new troop-reducing plan to the Warsaw Pact on Wednesday. The troop reduction plan would cover combat and support forces, and would cut each sides' forces to 900,000 men, of which up to 700,000 can be ground personnel. There are disagreements between the Warsaw Pact and NATO over how many men each side actually has deployed, and such differences must first be resolved.

John DeLorean's trial opened Thursday on charges of drug trafficking. He is accused of trying to raise money for his company, DeLorean Motor Company, in a \$24 million cocaine deal. Federal agents have a videotape of him dealing cocaine, but defense attorneys say that he was entrapped by the government.



Dr. K, the "team," is giving a shooting lesson in a recent interhouse basketball game between Lloyd and Page.



Pat Harrison gives a cannonball treatment to an Oxy-player who was attempting to steal second base.

Photo by Min Su Yun

Sports Day Nears

by Stewart A. Peebles

Sports Day is coming! Remember last year when you got to go and take your frustrations out on your professors and TA's by beating them in softball or in soccer? Well, you will have that same opportunity this year on Friday, May 4. That's the date of the second annual Caltech Sports Day. The format will be similar to last year's. The sports to be contested will be basketball, soccer, football, softball, running, tennis, volleyball, swimming, and a triathlon. The events will be held during the afternoon in the gym and on the fields and courts around it. Schedules/

sign-up sheets are posted in the student houses. Sign up for any sports you plan to participate in so that the organizers can prepare the activities more effectively. The format for the sports will be arranged so anyone can come by at any time during the scheduled period and get a chance to play. There will be a dinner on the Olive Walk at 5:30, after the events have been completed. There will be a band at the dinner, as well as contests and door prizes. It's a good chance to meet and get to know members at the Caltech community that you don't get to see often, so sign up and plan to participate.

Drought Hits Beavers

by Doug Oute

Now is the time of the season that all Beaver baseball veterans have come to know as "the drought." The drought usually hits each year when the Beavers begin their league season, and lasts until the end of the year. Despite their best efforts, the Beavers have once again fallen on hard times.

The Beavers went into their series against Pomona Pitzer two weeks ago with the sweet taste of victory still lingering in their memory. Three games later, the Beavers emerged, and

the annual drought was on. The Beavers dropped all three games, losing 10-0 and 16-4.

It's hard to win a baseball game when you don't score any runs, and the Beavers didn't in the first game. They collected only six hits, two of which were by Pat Harrison. In the second game, the Beavers had only eight hits, but did a better job of putting them together. Pat Harrison, Michael Keating, and Jim Hamrick each had two hits for the Beavers. Unfortunately, Occidental managed to collect quite a few hits of their own to keep the game out of reach.

On Tuesday, the Beavers traveled to Oxy to do battle

once again. Caltech suffered from a lack of effective pitching and offense, and was unable to prevent disaster, losing 19-2. Pat Harrison once again provided a bright spot for the Beavers, collecting two hits in four trips to the plate. Ed Casey doubled down left field line to collect the Beavers' only extra base hit.

The next home game is on Tuesday at Caltech against Claremont Mudd. The Beavers are within reach of a number of Caltech baseball records, which I will elaborate on in next week's "Assault on Baseball History" article, so come on out and watch a little bit of history in the making

Weekly Sports Calendar

Sat.	4-21	11:00 am	Track	UCSD & Westmont	Caltech
Sat.	4-21	11:00 am	Women's Tennis	JPL	Caltech
Sat.	4-21	12 noon	Baseball	Claremont-Mudd	Clare-Mudd
Sat.	4-21	1:30 pm	Men's Tennis	Faculty	Caltech
Mon.	4-23	1:00 pm	Golf	Redlands	CIT—Annandale
Tue.	4-24	3:00 pm	Baseball	Claremont-Mudd	Caltech
Tue.	4-24	3:00 pm	Men's Tennis	Azusa Pacific	Azusa-Pacific
Fri.	4-24	All Day	Men's Tennis	SCIAC Tournament	Redlands
Fri.	4-27	All Day	Women's Tennis	SCIAC Tournament	Claremont
Fri.	4-27	2:00 pm	Track	SCIAC Prelims	Occidental
Sat.	4-28	All Day	Men's Tennis	SCIAC Tournament	Redlands
Sat.	4-28	All Day	Women's Tennis	SCIAC Tournament	Claremont
Sat.	4-28	11:00 am	Track	SCIAC Championships	Occidental
Sat.	4-28	12 noon	Baseball (2)	Whittier	Caltech
Sun.	4-29	3:00 pm	Women's Soccer	Shakers	La Salle High

Three Tie for First in Basketball

by Ath Man at Large

Barring any major upsets, this year's Interhouse Basketball Season will end with a three-way tie for first place among Fleming, Blacker, and Page. Each of the three had a 1-1 record against the other two.

Blacker blew out Page, behind Se Jung Shin's 20 points and Steve Hawes' 17, 55-37. Fleming beat Blacker 64-44 in a game that was close for three quarters. Ed Zanelli led Fleming with 25 points, while Stewart Peebles (16) and Brian Brunn (13) also contributed strongly. Page came back to beat Fleming 53-45, pushed on by 14 points from Bob Holden, 13 from Tom Heer, and 12 from Fred Ferrante. Ed Zanelli carried Fleming with 25 points,

keeping Fleming in the game after Stewart Peebles fouled out.

The scoring stars of the season have been Chris Kyriakakis, who scored 31 in Lloyd's victory over Ruddock and 36 in a losing effort against Page, and Se Jung Shin, who netted 31 in Blacker's triumph over Ruddock and 38 against Lloyd.

Jeff Lester and a resurgent Scott Gordon have made Dabney competitive, scoring together about 40 points a game in recent efforts. Despite their endeavors, the Darbs appear to be headed for a winless season.

Tennis is the next Interhouse sport, and it will start April 27.

Water Polo Women Win

by Skip's Cousin

Toss-up question: "Is there a river in Riverside?"

Badilla, Caltech: "Yes."

Bonus question: "For what two purposes is the river there?"

Hildeman, Caltech: "Eleven months of the year it is used as a skate park and a bus driver training course."

"Correct. That gives Caltech a total of 115 points and the victory in the World Series of College Bowl." (Wild screams in the background.)

Ah, yes. How can one describe Riverside? Pleasantly nestled at the end of the San Gabriel Valley. A city amongst the cow chips, where the sky is a glistening brown and the temperature disgustingly hot. Surely this is a place where water polo thrives. Where the men are men, and the women are rougher than the Amazons, though not as fast. What a beautiful morning April 14th was.

The Caltech women's water polo team had undergone some management reorganization during the preceding week. SCIAC rules, as interpreted by the Athletic Director, forced the retirement of coach Clint Dodd. He was replaced by his assistant, Doc Watkins, with Reed Boogehard acting as goalkeeper coach. This way coach emeritus Dodd could not be blamed for using his far more experienced and skilled

women players to teach a select few men secret plays.

The U.C. Riverside pool rivals only the LaBrea Tar Pits in the number of dead carcasses in one spot. Of course, it is only bugs and not mastodons there, but it took a considerable amount of warm-up time to learn when not to take a breath. Watkins and Private Piccarillo were there to lead the ladies, with Dodd helping out on the finer points.

The game was close from the coin toss. The Beaverettes looked somewhat sluggish, and if not for the excellent play of goalie Charlotte "The Rock" Clark, Caltech would have been well behind after three quarters. As it was, the score was 4-3.

With only one substitute, the fourth quarter did not look to be in Caltech's favor. But Doc's gang came out smoking, getting four goals to Riverside's one, and causing a third ejection on one of the opposition's top players. The Riverettes, though, roughed their way back into a tie at 7-all. With seconds ticking down, Boom-Boom Blamick powered in the winner for the good guys. The victory stood 8-7 without a single raindrop.

Official statistics for the game went as follows: Suzy—4 goals, 2 ejections, and 6 bug bites; Bonnie—3 goals, 1 ejection, and no car problems;

Lynn—1 goal, 2 ejections, and a gorgeous smile; Ute—2 ejections and no Whittier party; and Gloria—1 good game plus a dozen great brownies (even with the ants).

Cricketers Beat Camarillo

by Brian Warr

A quickly scheduled return match against old our old foes, Camarillo, proved a much closer match than the first.

Caltech, once again invited to bat, lost a couple of early wickets due to the ball not coming on, but were then steered toward a great total by the control and skill of Santosh (31) and Rakesh (28). The key to their partnership of 52 was their ability to find gaps for singles and twos, waiting patiently for bad balls to hit for four.

The middle order also held up well, with Nadeem (9), Sanjay (9) and Rick (10 not out), Caltech at last showing some length in the batting lineup. The score after their allotted 30 overs was 106-7, a highly creditable performance on what was a very slow outfield.

For once it was Caltech's fielding and bowling which showed weaknesses. Runs came freely from both opening bowlers, forcing Caltech early positions, Zeta is Caltech's best onto the defensive. In such

blow. His fine spell of 8-3-9-3 contained and finally dismissed Camarillo's aggressive number one batsman.

But these wickets were not enough. With 40 on the board already, left-handers 5 and 6 came in and quietly raised the score to 84-4 in much the same manner of Santosh earlier. It became clear that the only way for Caltech to win was to try to

blast out the opposition by sheer bace.

Nadeem (4-0-5-2) and Rakesh (4-0-12-2), in his second spell, responded to the task magnificently. At this desperate stage, Caltech at last moved into top gear and captured the last six wickets in the space of just five runs. With this exciting finish, Caltech won by 17.

About Cricket

by Chris Meisl

So what is this cricket game anyway? Cricket is played much like baseball, except that the batsman and bowler (pitcher) are in the center of the field. The batsman tries to protect three wickets (sticks) upon which two bails (small pieces of wood) rest. The bowler and his teammates try to knock the bails off the wickets.

In the process of guarding the wickets, the batsman hits the ball and scores runs by run-

ning from his wicket to the one facing him about 20 yards away. Another bowler at the opposite wicket does the same. If the bails get knocked off one set of wickets while the bowler is outside the crease (a small rectangle around each wicket), that bowler is out, and is replaced by a new player. An over is six bowls and there are 11 players on a team.

Oh yes! . . . the game breaks at four in the afternoon for tea!

TALES OF CAPTAIN X



letter

A Minority View

Uncertainty About Quantum Physics?

Dear Editor:

Previous editors of *The California Tech* have published two letters of mine that questioned the experimental validity of relativity theory. They considered those letters important enough for their readers to see. I hope you still print minority views.

Basic to quantum theory is the idea that particles behave as waves in diffraction and interference phenomena. For instance, in the case where light passes through a pair of slits in a screen, each photon is thought to behave as though it goes through both slits at once and then interferes with itself! Only waves are known to act this way.

In the best double-slit experiments a laser is weakened to emit photons one at a time. Yet, over a few month's time, its photons can still build up an interference pattern on a photographic plate. This means that wavelike interference occurs at the quantum level, i.e. to single photons. At first glance quantum theory looks right, even though most of its early contributors were skeptical of it.

Since electrons also can "behave as waves," modern physicists believe, for historical reasons, that particles *are* waves. But have they kept us from learning otherwise in school, by their replacement of all double slits with diffraction gratings? Well, turning a cliché around, it's awfully hard to see the trees for the forest when you are looking at 10,000 to 100,000 slits per inch. That is no way to separate the particles from the waves! Let me tell you how I did it.

For an incompleated high school project in 1963, I used opaque screen to block various parts of the light in a double-slit interference pattern. This experiment was repeated ten years later to reexamine the dark minimum between two blocked maxima. I then discovered that my "canceled" light never entered the minimum; rather it was all diverted to the adjacent maxima. I checked this finding by tracing the paths of light with a cloud of chalk dust and a small white card.

Everyone agrees that you can see where all the photons windup. Quantum theorists, in particular, have intensity measurements to show that no light is lost during interference. However, they still doubt the existence of my traceable paths (meaning the electromagnetic deflections in flight, which leave gaps like those in Saturn's rings). So, it is hard for me to compete with the textbook notion that light can be recovered beyond its "temporary cancelation" in space. Maybe I should dare those of you who believe whatever you've been taught in

school to recover the photons that you think are cancelled *between two blocked maxima*. This can't be done, because they don't go there. For the same reason, blocking a minimum won't dim the maxima beyond it. So much for the wave theory of light! But then what deflects the photons?

In most experiments with double-slit interference, the distance between the two slits is greater than the "wavelength of the particles" in question. A laser can thus be used to aim single photons alternately at each slit or just at one slit. The two slits are usually spaced far enough apart that nothing, not even Heisenberg's uncertainty principle, keeps us from *choosing* the slits where all our photons go.

Even though each photon is now aimed to go through only one slit, both slits must still be open to it for an interference pattern to form. This means that *field* waves surrounding any given photon are what pass through both slits, interfere with themselves, and deflect the photon after we send it through either slit. In short, particles are separate from waves! Otherwise, anyone who wants to maintain the concept of "wave-particle duality" with "force-carrying particles" will have to find some of the latter passing through both slits to deflect a photon.

There are other historical and experimental reasons for the above result. Newton once postulated the existence of aether (field) waves that seemed to guide his corpuscles of light. De Broglie had the same thought, but he was unable to explain interference with it in terms of wave mechanics. Bonner, on the other hand, supports my own idea that photons are neutral trains of alternately plus and minus charges. Such charges would be spaced half of "their" interference wavelength apart by the surrounding Bonner *field* waves. Pair production and pair annihilation also suggest that photons contain both kinds of charges. Even polarized light might be explained by charge orientation. Don't many other phenomena require light to *electromagnetic* properties?

In its treatment of diffraction as a mere probability, quantum theory pays lip service to the Huygens-Fresnel wave principle. Therefore, before I give this principle a new physical interpretation, I will show that diffraction is predetermined at the quantum level.

Here are two observations of apparently gravitational waves that run counter to the static "space-curvature" model of general relativity: Figure 1 pictures a wave-diffraction pattern that was built up from data on the sun's gravitational

continued on page 7

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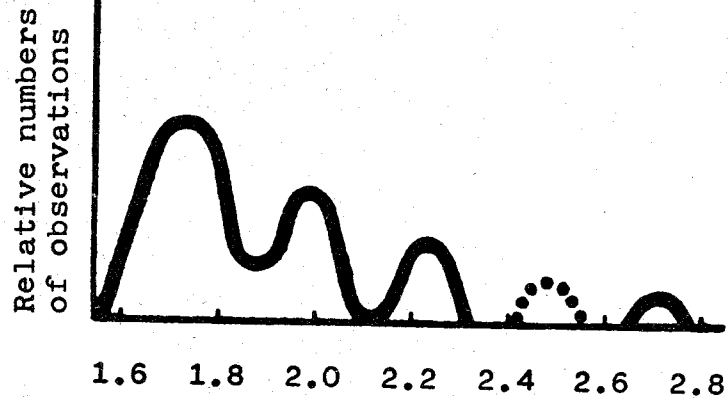
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Quantum Mechanics Improbable?

From page 6
 deflection of starlight. There is a similar, though much smaller, lunar effect called "shadow bands," which occur just before and just after total solar eclipses.
 Until I classified them as diffraction patterns, these observations lacked a sensible explanation. Most astronomers ignored the data collected after 1919 on solar deflections of starlight, the data collected after 1919 on solar deflections of starlight, because many of those values disagree with general relativity. They also guessed that shadow bands oc-

cur when mountains and craters on the Moon's edge reflect the last rays of (or the first rays after) totally eclipsed sunlight. However, such edge reflections can produce only irregular patterns outside the shadow. Do modern astronomers have less respect for observational facts than for mathematical theories? Well, I am unable to convince them that diffraction, like classical gravitation, occurs everywhere. Take your pick: knife edge, ball, Moon, or Sun. They will all cause diffraction.
 Although lunar shadow bands pass by much too quick-

ly for us to examine, the solar deflections of starlight mentioned above easily disprove quantum theory's acausality. Using background stars as faint point sources of light, we can readily tell from photographs that the photons are diffracted as a function of how close each one passes by the Sun. No star image was spread out. But if diffraction is predetermined at the quantum level, what happens to our quantum uncertainties? Of course! There are still plenty of limitations on how accurately we can aim photons in small-scale laboratory experiments.



Maximum deflection, in seconds of arc

Figure 1: Maximum angular displacements of Sun-grazing starlight during the total solar eclipses from 1919 to 1959 fall within a smooth-curve diffraction pattern. This group effect is statistically significant because the experimental error averages less than 10 percent. The dotted line encloses an area where some data are expected but have yet to be recorded. Optical results differ widely from the questionable electronic analysis of "Sun-grazing" radio waves. All non-relativistic data in the latter cases were blamed on the highly ionized solar corona.

BLOOM COUNTY

by Berke Breathed

Shirley Yuri Mambo,
 the Swan
 tr. by Zobi-Wan

Tom Petty:
 Hold DeMille's dream,
 Wear a fur's medjool
 Which a riser blew.
 Dresden king, come to!
 Add to a stair anew:
 Thatch a loft. Mead drew
 Ewe arsenic steam;
 Muffie, latchkey wean—
 Tom Petty:
 Hold DeMille's dream!

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announcements

Staff Meeting

The Tech staff meets 12:15 p.m. on Mondays in Room 127 Baxter. All are encouraged to attend.

Benefit Concert

The Caltech Jam Room presents a benefit concert to raise money. Six Caltech bands will be playing in Dabney Gardens on April 21. The concert will start at 1:00 p.m. and go on until late in the evening. A \$2.00 donation is requested.

Women and Professions

The OWC will sponsor events during Secretaries Awareness Week, honoring Caltech's secretaries. On Tuesday, April 24, Gerda Steele, Program Manager from the Commission on the Status of Women, will speak on the topic of "Changing Professions." The talk will be aimed at women in the secretarial profession and will include an extensive question and answer period. It will be held in Winnett Lounge at noon.

On Wednesday, April 25, Evelyn Johnson of the Nine to Five organization will speak at noon. The talk will be outdoors by the Winnett Center and will be about "Today's Secretary."

Also on Wednesday, a table will be open outside of Winnett with special surprises for support staff members, and information pertaining to the profession of secretary as well as everything you always wanted to know about the OWC. The table will be open from 9:30 a.m. to 3:00 p.m., so come out and see what we have to offer!

We need women to tend the table, so if you could donate an hour or even a half hour of your time between 9:30 and 3:00 on Wednesday, April 25, it would be greatly appreciated. Call Mickey Gray on X4167 to set up a time.

Free Food

You can help update the *little t* restaurant section. If you have been to any local restaurants that weren't reviewed in last year's *little t* - or wish to update a review that did appear - you can win a free dinner.

The Master's Office is offering five prizes of \$20 towards dinner for two at an as-yet unreviewed restaurant. To qualify for one of the prizes, simply send a short review to *little t*, (107-51) containing the following information:

- restaurant name and address (with directions if necessary) and whether it is within walking distance
- approximate price range
- comments on atmosphere, service, and the quality of the food
- an overall rating between one and four stars

Each week, one review will be drawn at random from all of those received, and the reviewer will be given \$20 toward eating at and reviewing a new restaurant (payable when the review is received). Only the first three reviews of any given restaurant will be put into the drawing, and only significant changes to previous reviews will be accepted. The prizes are open to undergrads only, but submissions are welcome from everyone.

Enter as often as you wish, and see next week's *Tech* for the first winner.

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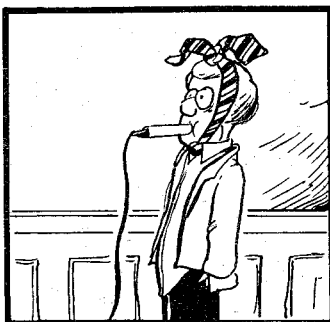
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The California Tech is published weekly except during examination and vacation periods by the Associated Students of the California Institute of Technology, Inc., Winnett Center, Caltech (107-51), Pasadena, California 91125.