

Watson Lectures

One Big Family

by Greg Simay

Aristotle once remarked "there is no genius without madness." Lecturing before a large Beckman audience last Monday evening, Institute psychologist Nancy Beakel throughly vindicated the Greek sage. We're still not certain what makes Caltech tick, but at least we'll think twice before using it to set our watches.

Nancy explained that some psychologists blame a child's mental illness not only on his parents and his siblings, but also on his more distant relations and even society itself. Curiously enough, she then noted, "Caltech can be treated as a community of fond relations." Before analyzing the Caltech family, however, Nancy talked about families in general, healthy and unhealthy.

Healthy families enjoy well-defined leadership and honest, open communication. Father is usually the task leader, setting family goals; and mother is usually the social-emotional leader, soothing hurt egos and similar wounds. In recent times, however, each parent is beginning to share his/her traditional role with the other. Healthy families can also successfully adapt to any changes they meet, like moving to an unfamiliar locale. Children of these families are consequently likely to become mature healthy adults.

Unhealthy families are battlefields. Leadership is divided, communication is confused, and change is resisted. Daughters are especially likely to become mentally disturbed in families where Mother and Father are continually fighting each other and trying to poison the child against each other. If Mother should succeed in wresting all the leadership from a resentful Father, then her son becomes the likely target for mental illness.

Many disturbed families must have a disturbed member, usually their "target child." As soon as therapy begins to improve the target child, another family mem-

ber begins to imitate the child's former disturbed behavior. "Therefore," Dr. Beakel explains, "When Mom and Dad say to us, 'Please Doc, something is wrong with Johnny. He's driving us all crazy. You fix him!'," we realize he is actually the family member crying loudest for help. So we assess the entire family. I have not yet been asked to intervene in the Caltech family.

Trying to understand Caltech after her thumbnail sketch of the family is rather like trying to work physics problems after reading *Feynman, Vol. I*: the explanations are lucid enough, but how do you handle the weird cases? Nevertheless the audience was willing to join Nancy in making a brave stab at fathoming the Caltech family . . .

Uncle B&G

"Children" in the Caltech family are the undergraduate and graduate students; "parents" are faculty, administrators and staff (B&G a parent?!). Thus, Nancy herself is a "parent" and, like any parent, always anxious to

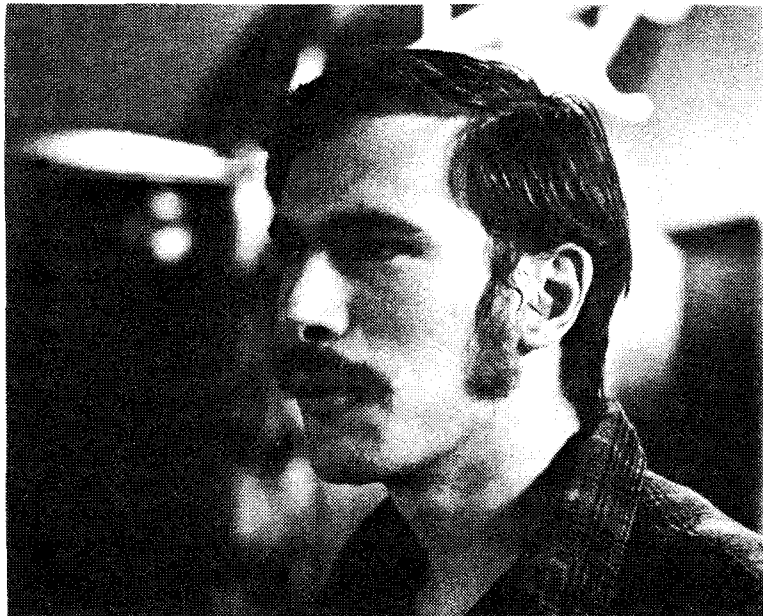
Continued on Page Three

Fowler Takes Number Two

William A. Fowler, Institute Professor of Physics here at Tech, has taken office as vice president of the American Physical Society.

Fowler, who received his PhD from Caltech in 1936, is involved in research on nuclear forces and reaction rates, nuclear spectroscopy, the structure of light nuclei, thermonuclear sources of stellar energy, the synthesis of chemical elements in stars and supernovae, and the study of general relativistic effects in quasar and pulsar models.

Fowler was twice a Guggenheim Fellow at the University of Cambridge, England, and has served on many governmental agencies dealing with scientific activities, including those of the



HAIL TO THE CHIEF! ASCIT President-elect Jim Backus won by a narrow margin in Yesterday's elections.

Backus Beats Beatty

The results of Thursday's ASCIT elections are in. Jim Backus of Dabney has been elected by five votes over the determined efforts of Richard Beatty.

In other action Thursday, Eric Kaler was elected ASCIT Secretary, and Chen Sun was elected ASCIT Treasurer. Proposition

1-75 passed by an overwhelming majority.

Only one ASCIT office remains to be filled: that of Director for Social Activities. Three candidates have been nominated so far; the election will take place soon.

PRESIDENT

Backus172
Beatty167
Other49

SECRETARY

Anderson118
Kaler202
Other46

TREASURER

Sun195
Whitcomb116
Other50

PROPOSITION 1-75

YES305
NO37

National Science Board, National Science Foundation, National Aeronautics and Space Administration, Office of Naval Research, and Atomic Energy Commission.

He has received many honors for his work and is a member of numerous organizations, including the National Academy of Sciences and the American Academy of Arts and Sciences, and is a fellow of the Royal Astronomical Society.

Campus Classic Concert

by Marc Donner

In the continuing tradition of excellence in fine music the Dabney Lounge Chamber Music Concert Series will present an outstanding program of J.S. Bach, C.P.E. Bach, Scarlatti, Telemann and Quantz this Sunday evening, March 9, in Dabney Hall Lounge at 8:00 p.m. Bach compositions to be performed include a trio Sonata in G Major and an aria ("Sheep May Safely Graze).

A cantata by Telemann, two sonatas by Scarlatti and a trio sonata by Quantz along with a sonata by C.P.E. Bach round out what promises to be an excellent evening of classical music.

The artists this weekend should be equal to the music they will perform. We have soprano Maurita Thornburg for the vocal parts, with Allan Vogel on the oboe, Buell Neidlinger at string bass and Patricia Welsh playing the harpsichord. Jill

Shires, who in January charmed the Dabney audience in the third program of this series, will return as a guest artist, with her beautiful flute artistry.

Remember that these GNJO-YABCG concerts are free admission and are certainly worth much more than that.

Most of you don't know the name of Fannie Taylor, but you

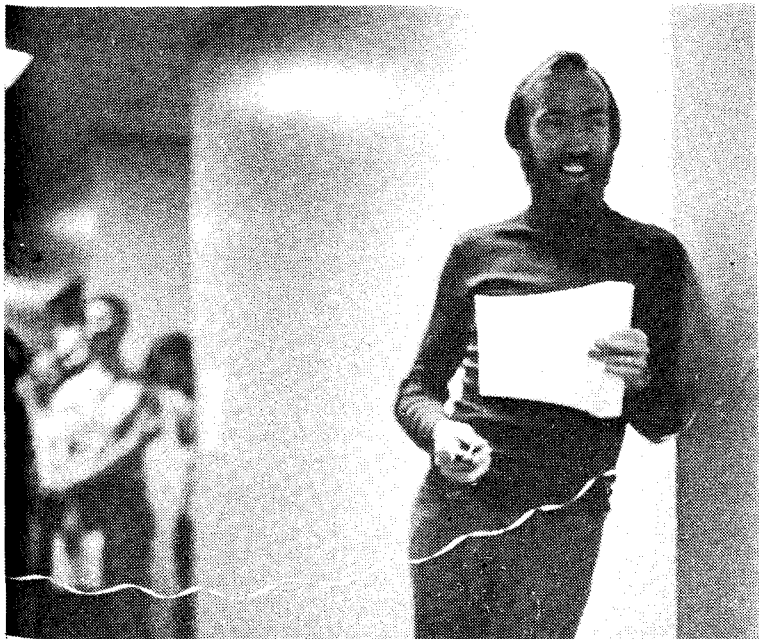
Hockey Pucks Foes Goes All The Way

We did it, goddammit. We won. We won the whole thing. Twelve wins no losses gave Caltech the Southern California Hockey title. The Caltech Hockey Team defeated both Cal State Northridge and UCLA on Sunday and Tuesday respectively to clinch the title. "This is the area we call imagination. It is called the twilight zone." said Coach Doc Warden who was barely able to comprehend the accomplishment. Coach Warden believes the team was infested by an extraterrestrial fungus which derived its nourishment from the frustration of its opponents. But it is not so. We won without the help of outsiders. (Although they offered, to be sure.)

An extraordinary number of Caltech fans witnessed this achievement. "Never before" said one Caltech fan, "in the course of human events has so much been owed by so many to so few." Another fan remarked "Who cares?" A third remarked "This brand looks deeper and richer, but it tastes worse."

We beat CSUN 7-1, and UCLA 3-2, and this was sufficient. Having become Southern State Champs, the team is eligible to play for the entire Southwest championship against Denver, Stanford and Arizona. These games will take place in Boulder Colorado between March 20th-28th. If we win this we will be eligible to compete in the North American Collegiate playoffs in April.

On this Sunday night at 11:00 p.m. however, we will have to play a perfunctory game against Occidental at the West Covina ice arena. Be there or get



KIP THORNE prepares to cut the ceremonial ribbon at the dedication of the new Bridge Rapid Transit Alley. Photo by B. Bus

News Briefs

Shmuckputz Wants Out

Anyone interested in becoming the 1975-76 IHC Secretary should let his house president know. Interviews will be early third term.

Damn The Photons!

There will probably be a fleet-action Alien Space game in the Page House Dining Room, this Saturday night at 7:30 p.m.,

should. She is the Director of Program Information at the National Endowment for the Arts and she is speaking next Wednesday at 8:00 p.m. in Ramo Auditorium on subsidization of the fine arts. The controversy over whether or not to subsidize has been lively and the Feds have decided to help with money and the N.E.A.

Permafrosh Correction

Last week's front page photo caption mentioned interested frosh talking to Carver Mead.

Continued on Page Three

Dr. Brown Talks Tech

by Alan Silverstein

The Caltech Y asked President Brown to speak at a noon discussion in its lounge last week, promising him a chance to interact informally with the student body. Dr. Brown demonstrated that the administration is responsive to the students by accepting their invitation, despite his busy schedule. The result was a successful, friendly and informative hour of social intercourse between a person high in the administration and a large audience of Techers. We could use more of the like.

First Dr. Brown made a short statement about present and future problems facing Caltech and what he and the rest of the administration does "on the third floor of Millikan." After this he opened the floor to questions, which were numerous. I felt that his answers were generally thorough and satisfying. What follows is a potpourri of facts on many subjects presented by Dr. Brown during the discussion.

Caltech will be here in ten to twenty years—but what subjects will it teach and research? What should be done to maintain its acknowledged excellence in the sciences? The answers to these questions are not easy to settle on. Ethics and finances must weigh heavily in the determination of policy, but conflicts often arise between the two, and between short and long term interests. One approach to finding solutions is to look back from the probable future and ask, "what should have been done now?" However, even in the short term there is often disagreement between the faculty, staff, and/or students. Dr. Brown pointed out that "the Institute is its faculty and depends on the research output of that faculty... you'd be surprised how much of my time is spent worrying about what is right, even in these short term situations."

Inflation has been a major problem. "Gifts to the Institute seem to depend more on the stock market than anything else." Utilities will cost about two million this year, compared to \$800,000 two years ago.

People cost money; one goal has been to hold down the number of people it takes to run the Institute. The original plan was to give the administration two floors of Millikan when they moved from Throop a few years ago. However, the decision was made to take only one because "if you squeeze people into a small enough space, they are not so anxious to add to their own numbers."

We were not hurt by cuts in Department of Defense spending as badly as MIT was because only 10% of our support comes from the federal government. JPL gets almost all its money from the government, but not from the DOD. However, "I would not rule out a cut in NASA funding."

How many students should Caltech admit? The number of graduate students is limited by research grants obtained. In 1968 there were 770 grads; now the figure is closer to 720. The undergraduate student body size, however, is a more complicated matter and depends more on personal preferences. "I myself would like to see the present size of 800 go up to, say, 1000." Most of the faculty disagree because that would increase their teaching load without a corresponding addition to the size of the faculty here. Dr. Brown stated that the number of students to be admitted to the undergraduate program also depends on the pool of available applicants and the standards used in their selection. To raise the number now would imply a lowering of the standards, he said. But he predicts an increase in the numbers of transfer students accepted at the junior level, especially into the Engineering and Applied Science option. He added that if the faculty does decide to admit more undergraduates without lowering standards, a recruitment program might be necessary.

In any case, additional student housing is neither required at this time nor being planned. Thinking that admissions are limited by the available housing would be as false as the Physics department maintaining, as they did back

before tracks were introduced, that admissions must be bounded by the size of 201 Bridge. To Dr. Brown, the real limit is the size and quality of the pool of applicants.

He expects that the number of women at Caltech, both faculty and student, will rise slowly and naturally as they make their way into the sciences. It is important, though, that they are judged for hiring, tenure, or admission by exactly the same standards used for men, and without bias or quotas.

The Institute has no plans to build apartments near campus, but it is "not averse to buying them" and perhaps even designating them for student use. This has already been done a few times.

On the purpose and style of education at Caltech: "The faculty inevitably tries to replicate itself—that's what they do best."

The job market for college graduates is getting harder. However, Dr. Brown does not expect that Techers will be affected as badly as some graduates, though they will feel some pressures from society. More Techers will be taking non-academic jobs in the next 10-20 years, perhaps even non-professional occupations. The past average of 80% of all Caltech undergraduates going straight on to grad school has already dropped to 60%. This may reflect a number who are planning to take time off first and return to grad school in a few years. President Brown feels that some shift in the figures may be healthy, but would not like to see too much. There is, he thinks, a definite need for well-trained Techers to eventually enter academic life so they may train others.

The Institute should also respond to the pressures of society and perhaps give birth to a medical program or a new option in Applied Biology. However, a big Caltech medical campus external to Tech and JPL "would not be right."

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"FRANKLY SPEAKING"

by Phil Frank



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FORUM

Beckman Internships Are Here

The Institute is very happy to be able to announce the resumption of the Arnold O. Beckman internship program for the summer of 1975. This internship, supported by friends of Dr. Beckman, pays a stipend of \$100 per week for a period of up to 12 weeks plus travel expenses and is intended to give the selected Intern the opportunity to spend the summer working in the office of the politician of his choice, local, state or national,

and seeing the process of government from the inside. Applications for the 1975 internship must be in the office of the Director of Student Relations, room 210 Dabney, not later than April 1 and the application should include a brief statement—one or two pages—of the way the applicant proposes to spend the summer and of the benefits he or she expects to derive from the internship.

—Lyman Bonner

Starry, Starry, Night

Cosmic Light Orchestra

by Alan Silverstein

"Other than appearance, the thing that outwardly most distinguishes man from other creatures is his *technology*... and now nothing could be more important than its use in art to rekindle wonder and delight in the midst of our darkest anxieties." Thus reads a portion of the current advertisement for the Laserium Cosmic Laser Light Concert at Griffith Observatory, a show that calls itself "an experience." It is. Try to imagine: seemingly three-dimensional figures, designs, patterns, lattices, and shapes of many colors, changing quickly and flexibly or slowly and majestically, but always in step with music selected for its rhythm or beauty, projected across the range of vision overhead against a backdrop of slowly moving stars. Words don't do it justice; nor does memory. The Laserium is astounding, magnificent, unbelievable. Extremists have called it a religious experience, but almost no one who sees it will deny that it is, at the least, amazing.

Griffity has been hosting the presentation by Laser Images, Inc. in its planetarium for more than a year now, so it isn't "new" in that sense of the word, but it still plays several times a week to full houses of about 600. I saw the show recently and was so impressed that I feel it deserves praise in these pages. Using only a single one-watt krypton gas laser, what must be

a large amount of electrically-controlled optical gear, and a quality sound system, one human operator ("laserist") creates a unique form of multisensual entertainment so moving it's overwhelming.

About ten different musical selections are played during a performance, lasts a little more than an hour. Each has its own types of visual effects, which I thought were well matched to the music, and each is preceded by a short, prosaic description of what will be presented next. The themes ranged from "Primordial Atom" to "Expanding Universe." Allowing for artistic license, that was what we saw and heard.

I'm sure some people who haven't seen the show are curious just what you can do with a

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**NEXT TERM: Beyond the
Valley of the Dolls**

Laserium

Continued from Page Two

laser. A lot, let me assure you. You can take a pure white laser, such as the one used, and filter it to produce a rainbow of colors. Then you can diffract and diffuse it in a variety of ways to produce endless soft shapes. Or, you can reflect it and refract it under precise control to get sharp patterns, or sweep the multicolored beams quickly enough to leave traces in the eye. Thus we saw ever-changing, always-moving smears, streaks, blobs, spirals, circles, shapes and even who-knows-what-to-callems. You would be surprised at what can be done, and how thrilling the effects can be when controlled synchronously with sound.

Laserium isn't perfect—do we ever do anything that is? The music was carefully chosen to appeal to a wide range of tastes, so you won't like all of it by any means, and you'll wish there were some other selections used instead. However, you're equally likely to enjoy most of it a lot, and you're sure to be really turned on by at least one of the light-sound sensations. Bright projections of course ruined the effect of the stars as a backdrop occasionally. (I recall with amusement the oohing and aahing of the Angelenos before the show even started, as they saw "the stars" down to seventh magnitude—how many of them for the first time in their lives?) However, most of the images are more colorful than brilliant, and they stay high overhead so as to avoid shadows. Sitting with your head craned back for an hour in

a crowded auditorium (smoking absolutely forbidden, fortunately) does detract from enjoying the performance, but such is the nature of planetariums. I'd suggest finding a seat towards the outside of the circle, halfway between the speakers, if possible.

That brings up the question of logistics. It's good to buy your ticket early, at least a half hour (if not an hour) before the show. Then you can wander around to see the interesting exhibits inside, or stand in line to get into the planetarium proper, as you prefer. Reservation and group discounts don't exist. Griffith Planetarium is about 30 minutes west of us on a hill north of and overlooking Hollywood (as well as most of the rest of the LA basin). If it's a clear night, exit through the door opposite where you came in for a terrific view (it may even compare with the show). How to get there: check a good map. I'm not sure myself. Where to call for more information: 664-1191 gives you a recorded message on showtimes; 664-1181 usually gets a real live human being. Cost: a measly \$2 a head (bodies free). And, a note: Griffith Observatory and the park surrounding is a nice place to go in general. The Planetarium houses a small, but interesting, and free museum with working exhibits, and it puts on other shows, concurrently with the Laserium.

News Briefs

Continued from Page One

One of these "frosh" was actually Hardy Martel, Secretary of the Board of Trustees and EE Professor. You've got to watch these frosh!

Peekies

You have two hours. Deposit completed blue books in a paper bag, swing over head, and scream like a chicken.



Family

Continued from Page One

show home movies to her guests. Unlike many home movies, though, Nancy's slides were thoroughly entertaining—"Children" and "parents" alike pursued their zany activities amid the joyful chatter of switched-on Bach. Dirty Dave sits astride the Fleming Cannon, in case the original bore should prove defective. Like the victim of mutant fungus in the old sci-fi flicks, a graduate student becomes more and more entangled in wires and computer tape. Researchers grimace behind huge lenses, then remove them, and we see no difference. Professors scowl, weep and laugh at their charges, often all at once. Harry Gray and his Igor teach Chem 1 in leopard's suits, males chase shapely coeds in birthday suits. Undergrads study and collapse amid their electronic debris, their Feynman's a gaping red wound on their chests. Frosh and sophs struggle against each other in their Mudeo contests, barbaric rituals performed in waist-high mud.

After eight minutes of this visual salute to her demented "offspring", Nancy asks "Is Caltech a happy family?"

In The Fine Print

"The Caltech community is seen as a highly prestigious group of the intellectual elite—it says so right here in the catalogue. But it's no help in getting a date." Because of their intelligence, Techers were often shunned by peers and flattered by elders.

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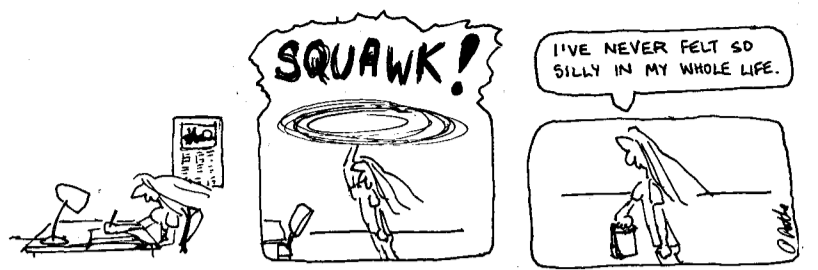
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Hence, they began to think of themselves as "apart from human," beings who couldn't quite share in the joys and problems of the human race. At the same time, their social isolation led them to rely more and more on their intellect for their security and self-esteem: "Don't do anything dumb. Avoid human error."

Professors reinforce their attitude through their high expectations. "We have too many fathers (goal setters) and not enough mothers (comforters). We ought to have our own WIN buttons. Students are expected to be the elite in scientific research."

Of course, this exclusive reliance on the intellect causes problems. Students accustomed to easy success suddenly find themselves struggling with courses and seemingly outclassed by many of their peers. And students who wish to leave the world of science and engineering are made to feel like pariahs, people who couldn't hack the real disciplines. "Thou shalt not let they thoughts stray to the arts and the humanities."

Nancy hopes better communication between students and faculty will relieve some of these student pressures. Theoretically, there are no communication barriers but several practical barriers exist. Students who feel intimidated by the Caltech environment may be too afraid to approach their professors. Professors, on the other hand, may feel threatened by students who may be advancing beyond their level. But the real problem is that "we don't teach professors how to teach." Thus, a professor could be unwittingly confusing or boring his students, no doubt increasing the anxieties of those who feel compelled to under-

stand everything the first time. Dr. Beakel admitted she was herself guilty of boring her class when she taught one of her psychology courses. She had "forgotten that this same course had bored me to tears when I was a grad student."

Stand Up and Be Candid

Nancy urges students to be candid with professors rather than retreat into silence. "It's like the boy who, because he is angry at his parents, always forgets to take out the garbage. I'd like to know what I do to you in class that you forget to take out the garbage."

Yet the Caltech family is a very cohesive and intimate one. The Honor System works remarkably well and few restrictions plague the student. This cohesiveness is bad only if the student uses it as a shelter against the outside world.

"We're a family with a lot of strengths, but we don't live up to our own potential. We allow ourselves to be too weighted by our own image," summarized Nancy. But she can't resist a sly dig, "Maybe we wouldn't be so comfortable if they (the students) didn't do our little chores for us—like doing our research."

Caltech doesn't create the problems Techers have brought with them, but it does force Techers to confront them. But this is not enough. Caltech must help its "children" to help resolve these problems, not amplify them. All the zany behavior in the world won't restore a shattered self-esteem or calm a deep-rooted anxiety. As Dr. Beakel pointed out, Caltech is a parent, whether it wants the role or not. Caltech will continue to be a parent as long as its students desire to grow emotionally as well as intellectually during their stay here.

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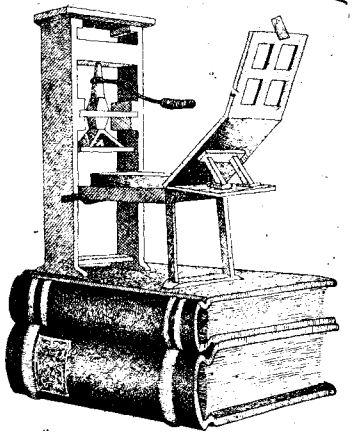
scholarship. These grants of at least \$500 to worthy college students are administered by the Sacramento Bodies of the Ancient and Accepted Scottish Rite

of Freemasonry, Post Office Box 19497, Sacramento, CA 95819.

Eligibility requirements: 1) Enrollment at any accredited college or university; 2) Any academic major is acceptable but preference will be given to students majoring in Eugenics or similar studies such as Genetics

and the Biological or Life Sciences; 3) Grants are limited to students who are members or senior members of the Order of DeMolay or who are the sons or daughters of a member of a constituent Masonic Lodge of the Grand Lodge of Free and Ac-

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BOOKS

Forerunner Foray, by Andre Norton, Ace Books, \$1.50.

Forerunner Foray is the first Andre Norton book I've read recently (which means written recently by Ms Norton, sort of) that I actually enjoyed. It delves into the world of applied psionics and its possibilities, as well as questioning just how much of reality is determined by the mind. Like many Norton books, this one deals with the life of a young outcast, this one an orphan brought up by a Thieves Guild member for use in pulling off major crimes. The setting is the far future, but all this means is that there are lots of "futuristic" things running around. Most of the book deals with the heroine's efforts to unravel the mysteries of an artifact of the ancient 'Forerunners' of modern civilization, one which literally drags her mind back into its own past and the lives of previous owners of the gemstone.

One of the most entertaining features of this book is the use of a truly alien character, a vaguely bird-shaped telepath named Harath, whose thought processes are strange enough to be legitimately alien. Ms Norton's aliens are sometimes people in animal costumes, but for once she succeeds.

This book vaguely ties in to several others in a loose series involving the world of Korwar and its people, the dregs of several centuries of interstellar wars and migrations. This is definitely the best of that series. Ziantha, the heroine, is reasonably well developed as she feels herself torn between her loyalties to the feline alien who raised her and her own comprehensions of the way things really are after

Continued on Page Eight

LOS ANGELES

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The Tech About Town

On page four of this rag you may notice a huge ad for the coming Civic Light Opera Season. Warning; see last week's column and avoid this turkey at all costs. Get loaded and stare at a broken tube.

There's quite a bit on campus coming up—it would seem that things are coming to life again. Tonight, of course, is *Two Gentlemen of Verona* by the NSC. If *Macbeth* left a bad taste, fix it up tonight. If it's not sold out, \$1 rush tickets will be available at noon. Saturday and Sunday will see more Armchair Adventures, *Australia & the Pacific*, respectively, and Sunday will also see the latest free Dabney Lounge Concert, which should have an article of its own elsewhere. I'm told the flutist, Jill Shires, is ravishing to both eye and ear, which alone should make it all worthwhile. Wednesday, Ramo will host a lecture by Fannie Taylor, the spokesperson for the National Endowment for the Arts. She will speak on a central topic in the performing arts, the question of the subsidization of the arts.

A few things came to my notice this week, so let me just reel them off. I'll remind you of the Ice House in order to tell you to read the review in this issue about it (Ed. Note: It isn't there this week. See last week or next week). Some of you will remember ASCIT's productions of Gilbert & Sullivan's *H.M.S. Pinafore* and *Pirates of Penzance*, and may even have foolishly regretted the lack of G&S in the past two years. Regardless of such trivia, take heart. On March 22, the Oasadena Symphony will present a concert version of *Trial by Jury*, G&S's first work in collaboration. The program will also include Mozart's "Overture to the Marriage of Figaro" and Debussy's "Three Nocturnes," and tickets will be \$6, \$4, and \$2.50.

We're into the final two weeks of the run of *Something's Afoot*, the much-acclaimed mystery-spoof musical playing at the Huntington Hartford. Tickets range in price from \$8.50 to \$3.50. Now what's three and a

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half double cheeseburgers with heavy chili worth? However, if your taste does run more to Mark Twain than Agatha Christie, God save you, wait. On April 12 (just think, 3rd TERM) Hal Holbrook will bring his one-man show, "Mark Twain Tonight," to Bridges Auditorium at the Claremont Colleges. It turns out that April 12 is National Take a Pitzie Out Night.

As a fresh note, the Ojai Festival will return with director Michael Tilson Thomas on May 30, and it will feature the world premier on June 1 of Wuorinen's new work, "Reliquary for Stravinsky." This commissioned piece is exactly what its title suggests—a work composed around the written fragments of an orchestral piece left unfinished by Stravinsky's death. This year's Festival promises to continue the fine tradition of many years.

—Chris Harcourt

Far Out

Cygnus X-1: A Thorne in Universe

How do you go about proving the idea that invisible objects such as black holes exist in the universe? It is a painstaking task of constantly testing theory against observations and using these observations to repair the theory.

After four years of this approach, there are indications of agreement between theory and observations, report Dr. Kip Thorne, Physics professor at Caltech, and Dr. Richard H. Price, assistant professor of physics at the University of Utah. This improves chances of the discovery of black holes.

In the current "Astrophysical Journal Letters," the scientists discuss agreements between theory and observations. They also suggest further observations of the most likely candidate for a black hole, the strong x-ray source in Cygnus X-1, a double object 7,500 light years from earth. Cygnus X-1 consists of a bright star and an unseen x-ray source about one tenth as far from the star as the earth is from the sun. The star and object are gravitationally linked and orbit

around a common center every 5.6 days. The dark object is one of the strongest emitters of x-rays in the sky. According to theory, black holes with companion stars are strong x-ray emitters. Thorne estimates the dark object is eight times more massive than the sun.

Astronomers have become fascinated with the idea that black holes exist and that the universe has many of them. A black hole is believed to be the remains of a large star that collapsed inward with tremendous velocity, after exhausting its nuclear fuel, and became very small (in this case an estimated 50 kilometers in diameter). Such material would become so condensed that its gravity would be too strong to allow light to radiate and would suck in all matter that came near it. Hence the name black hole.

Spectroscopic observations of Cygnus X-1 show that glowing gas is continually being pulled off the visible star toward the optically invisible object. That object, presumably the black hole, is 'visible' in x-rays. The physics of the disk of gas feeding

into this hole is inferred from this information.

Since 1971, when speculation began that Cygnus X-1 may contain a black hole, astronomers Drs. Martin Rees and James Pringle of the Institute of Astronomy, Cambridge England, and Profs Rashid Sunyaev and Nikolai Shakura of the Institute of Applied Mathematics, Moscow, Russia, have developed a theory describing what a black hole should look like when linked gravitationally to a visible star. Dr. Thorne and a Caltech graduate student, Don N. Page, have altered this theory to conform to general relativity, and have compared it with the observations of Cygnus X-1. Rough comparisons have been made before but not detailed ones, Dr. Thorne said, because the data and theory are both poor.

"The data are poor because the x-ray signals from Cygnus X-1 fluctuate wildly, as theory said they would," Dr. Thorne reports. "But because they fluctuate we need much more data before we know what's going on. Great changes occur in x-ray signals within fractions of a second. There aren't enough data to figure it out properly."

Theory strongly suggests, and observations agree, that the disk from which the x-rays are emitted has two regions: an inner one, 100 kilometers wide and 5 to 15 kilometers thick that is translucent to x-rays, and an outer part 1,000 kilometers wide and only a few kilometers thick that is very opaque to x-rays. This means the inner region is much "hotter", emitting much higher energy x-rays than the outer one.

In March, 1971, Cygnus X-1 suffered a cataclysm of some kind. The pattern of x-ray

Continued on Page Eight

Black Holes?



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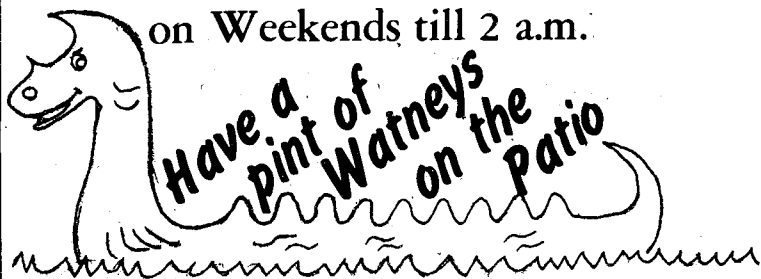
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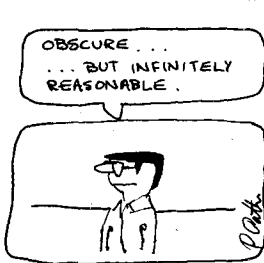
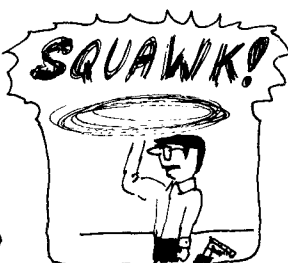
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Brown

Continued from Page Two

A few controversial questions were raised near the end of the hour. The faculty determines graduation requirements, including the PE requirement, and it is their privilege to establish

the rules as they see fit. Funding for the PE department follows proportionately with the requirements established, as with any department.

Dr. Brown acknowledged that the Health Center is a deep problem mainly because of the small size of the student body and rising costs. But should decisions concerning the Center, and similar matters, be thrown to the students? He said the answer is, no. Essentially, questions of policy should be left to those persons in the faculty and administration qualified to and with the responsibility for answering them. Likewise, the same people have mediated the issue of a board contract between those for (mostly parents and prospective students) and against (mostly the people on it now). He pointed out, though, that most students are glad to have the contract even though they may not be satisfied with the food they're getting.

The noon discussion ran out of time before subject matter. Similar sessions with other leaders of the Institute might prove equally fruitful.

Sgt. York?

Seriously though, this is quite a reasonable volume, and the author claims to be working on a second edition, with additions and corrections. In the meantime, any of you who failed to answer the trivia questions correctly had better go look them up. In the words of Michelangelo, "Trifles make perfection and perfection is no trifle."

"The March of Trivia" rides again!

-Nick Smith

Kundalini Anyone?

There is a class starting in Kundalini Yoga—the yoga of awareness—at the Foothill Free Clinic, 48 N. Raymond, Wednesday evenings from 5:45 to 7. For information, call 578-0299.

$$Ee^{+E/kT}$$

How Many Bricks in Olive Walk?

The Trivia Encyclopedia, by Fred L. Worth, Brooke House, \$3.95.

Who was Mary Anne Nicholls? How about Gutzon Borglum? Does the name Lamont Cranston send a chill up your spine? What was unusual about the battleship U.S.S. Kearsarge? What is Colonel Sanders' first name? These and thousands of other questions no sane person ever considered

Freemasons

Continued from Page Four

cepted Masons of California. Students who meet the above requirements may obtain applications by writing to the above address. Grants will be awarded on a competitive basis and applicants are required to meet with a screening committee. Anyone interested can obtain further information in Room 109, Dabney Hall.

asking are answered in this, an overwhelming (\$3.95, paperback, no less) compendium of trivial facts. *The Trivia Encyclopedia* attempts to cover at least lightly, trivia in all its myriad forms. There is sports trivia, movie trivia, comic book trivia, radio trivia, even Mayor La Trivia (played by Gale Gordon on the *Fibber McGee and Molly* radio show. Remember radio?) and other things ranging from the letter A (Scarlet) to "Zwolfte Stunde, Die" (a remake of *Nosferatu* which in turn was an unauthorized version of *Dracula*, if that helps).

This volume is an essential one for the true trivia buff, if for no other purpose than to overwhelm the enemy in a trivia fight. The sheer mass of data in the volume boggles the mind. There is, however, one fly (Vincent Price) in

the ointment. The mass of data seems to have overwhelmed both the 'author' and his editor. In some places there are errors that ought to have been spotted immediately by any true triviast. In addition, the cataloging of the material seems to have driven both of them mad. There is no other explanation for the bizarre orderings and lumpings, such as grouping Sherlock Holmes, James Bond and Doc Savage rather blithely under the heading, 'Detectives'. In order to figure out just where to find anything, one must read the entire volume, 300 pages of reasonably dense copy. However, if one is dedicated to the pursuit of trivialities, this is no hardship. After all, how else would one find out that if you subtract six from the altitude in feet of Disneyland you get the number of Germans captured by

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The Fred Logs

Fred Fights Fiendishes

by Fred

A bright morning sun found us once again surveying the snowy hilltop where lay the ruined castle. The scene looked peaceful in the still air but there were ominous signs on the ground. Where we had walked around yesterday our footprints were still visible but in places they had been trampled by a new set of prints. An indeterminate, but large, number of creatures with clawed feet had inspected our tracks during the night and followed them for a ways down

the hill before returning to a tunnel on the east side. They appeared to be orc tracks.

Not wishing to run into such a formidable force we chose the tunnel furthest to the west and got ready to make our entrance. Once again Gimli the local dwarf and Legolas, Sterling's elven partner, would lead. They were followed by their companions George and Sterling. Then Father John and myself, the only magician in the group, with Lloyd and Hugh following last as the rearguard. Scattered through the

column were two pack mules and four local fighting men whom we had hired to come with us as added protection.

The passage ahead of us sloped gently running long and straight into the earth. Torchlight sparkled off icicles hanging from the ceiling as we moved slowly down it. The men ahead of me seemed to blend into the walls in their grey chainmail and behind me the only thing clearly visible was the golden scarf on the crest of Lloyd's helmet. I pulled my black cloak closer around my shoulders.

We had traveled quite a distance when Gimli spotted a trapdoor in the floor ahead of him. It opened grudgingly to reveal another corridor just beneath us running perpendicular to ours. The tunnel before us still ran straight and featureless into the distance so we decided to try our luck with the new one. Securing a rope we lowered Gimli down to the lower floor. He called up that the new corridor appeared to turn at both ends after about twenty feet. This sounded more interesting so we lowered down Legolas and he was quickly followed by George. We were about to fix the rope to Sterling when I heard a snorting sound and then a shriek from Gimli.

Like a nightmare out of ancient legend, something that could only have been a minotaur, half man-half bull, appeared at the left corner and then charged

them. Legolas drew his sword and stepped forward to meet it and without waiting for the rope Sterling jumped down behind him. The minotaur scraped Legolas with its horns as he wheeled to take a blow at it. George put an arrow into its shoulder but my sleep spell from above failed miserably. Enraged by its wound the beast pressed harder trying to gore them with its huge horns. Gimli and Sterling barred its path but were forced back at every blow.

Seeing their chance Lloyd and Hugh descended through the trapdoor behind it and attacked suddenly. As it whirled to meet them another arrow struck it and then a rain of sword blows. Hugh parried aside its final thrust as it collapsed to the floor.

The Naming

While the rest of us descended the rope one of Lloyd's men led the mules back to the surface (there being no way of bringing them down) and we quickly reassembled. But not quickly enough. Lloyd and Sterling were still examining the minotaur when a trio of gargoyles, drawn by the sound of fighting appeared around the corner facing Hugh and I. As Hugh drew his sword I shouted over my shoulder to Lloyd, "Golden Boy, get your ass up here," (thus coining in an instant the name he was to go by forever afterwards) and in an instant he was past me and into the fight. Gargoyles are strong and crafty fighters and we could hardly expect to take them too easily. But luck was shining on us. Hugh and "Golden Boy" managed to get through their guard while their return blows glanced off our shields. More blood flowed, none of it ours,

and the gargoyles lay dead.

We quickly followed the passage they had come down and discovered a secret door in the end wall that opened into their lair. Inside was a fourth gargoyle but this one we managed to surprise and it was overwhelmed by three of our swordsmen before it could take a blow. The room was cluttered with trash and stale food but alas, no treasure.

Sadly we retraced our steps and then started in the other direction. The corridor now twisted through a confusing series of turns, switchbacks, and doors and finally ended in a blank wall. On the right side of the last section were two doors, and Gimli and George went to work at opening the far one. Everyone was in this one section of corridor except for Hugh and I who were standing around the last switchback watching our rear.

I was startled to hear an unfamiliar voice chanting a magic spell. I turned to see Father John standing with a shocked look on his face and without waiting for him to shake off his surprise dashed around the corner. The rest of the party, all nine of them, were lying on the floor in a magical sleep and a strange figure was disappearing through the nearest door. I leapt forward, drawing my dagger, and he hesitated a moment to take a jab at me with his. My aim was truer and I laid him out with two quick thrusts as Hugh came running up. The magician's death broke the spell he had laid over my companions and they started to waken. I reflected to myself on what might have happened if

Continued on Page Eight

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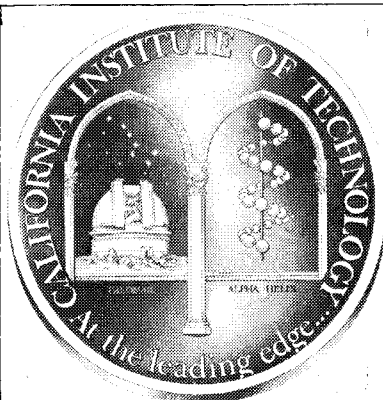
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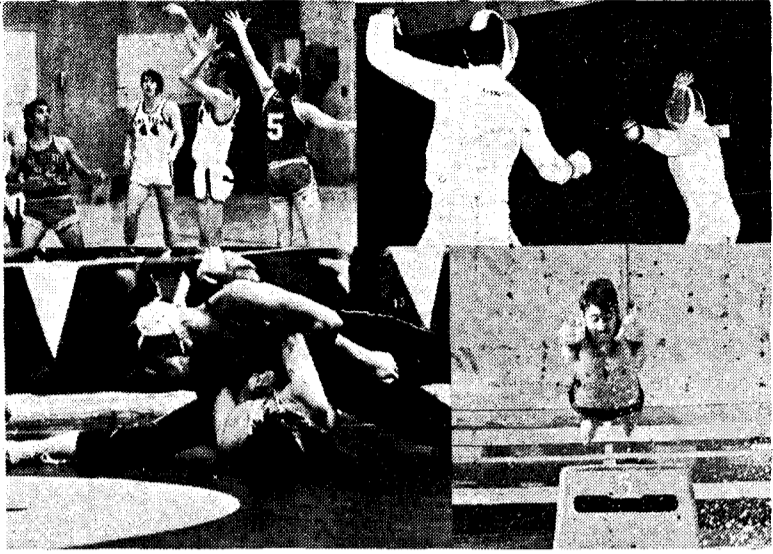
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Page Eight

Friday, March 7, 1975

Duel Lost

Runners Fall at Whittier

by Dave Sivertsen

Tech's track team met with defeat (de feet of de udder team, yuk yuk) on the road last Saturday. In a conference duel with Whittier, Whittier is better known for its smog and a certain alumnus (initials RMN) than for its track team, but they still defeated Tech, 113-22.

Caltech's squad was depleted by various other activities, but still scored. Doug Herbert came through with C.I.T.s only two firsts, in the shot and discus. Land, Hickey, Choo and Wise comprised a 440 relay team that took second. Land and Choo took third in the 100 and 220, respectively, and Wise took third in both the triple jump and long jump.

Distance runners were without

the strength of upperclassmen, but Duane Gray took second in the half. Sivertsen took third in the mile, and second in the 440 hurdles when a runner was disqualified. Lou Testa took third in the three-mile, and the meet

finished when Whittier ran against itself in the final mile relay.

Next Caltech takes on Pomona-Pitzer. The meet will be behind Caltech's gym at 1:30 tomorrow.

Page Tables Dabney

Page defeated Dabney in Discobolus table tennis last Sunday by a score of 4-1.

The only loss for Page was Jacob Na's defeat of David Novikoff in first singles 21-13 and 21-13. Kwan Chow of Page beat Jon Ziegler of Dabney in straight sets in second singles. Third singles saw Joe Fahle (Pa) defeat James Kelly. Page wrapped up a

victory when Ben Chun won two straight over Paul Carpenter.

The final match saw the Page doubles team of Mark Bandhauer and Pui Lam defeat the Dabney team of Wesley Chalfant and Subhash Sharma to end the proceedings.

Harriet Schock
Kinky Friedman

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Fred Logs

Continued from Page Seven

he had gotten away. My own magic could not have lifted the spell then. All nine of them might have slept forever.

The room that Gimli and George were opening proved to be the minotaur's lair. Its only treasure was a box containing a thousand copper pieces. Hugh secretly slipped one into his boot but we could see no point in lugging out the rest and left them behind.

Frustration and a Hog

More wandering. We opened another door and stood face to face with a six-foot tall giant toad. This time Father John thought fastest. Snatching a pouch of belladonna from his belt he tossed it to the toad

which slurped it up and fell over poisoned a moment later.

While the toad was still croaking a giant hog stepped on a pittrap above the other end of the party and almost landed on Sterling and Legolas when it fell through. It was so dazed by the fall that they dispatched it easily.

Another long corridor led us into a bunch of small rooms connected by doors which refused to open without a struggle. One of them proved to be a one way door which slammed shut in the middle of our party. We were feeling so disgusted by this point that we smashed the door to

Cygnus

Continued from Page Five

emissions changed drastically, the intensity of low-energy x-rays diminishing considerably. According to theory, the thick inner region of the disk probably expanded from 100 kilometers to 200 kilometers in width, 'eating up' some of the thinner, outer region.

"We are beginning to get concrete agreements between details of observations and details of theory," Dr. Thorne said. "And those agreements point to what direction we should go to strengthen the theory and to strengthen the observations.

"We are going from the stage in which we were doing gross exploration and the vague idea that Cygnus X-1 might be a black hole to real concrete comparisons between observations and theory.

"I'm about 80 percent convinced that Cygnus X-1 contains a black hole. Future confrontations between observations and theory may strengthen that conviction - or may destroy it."

shards with our weapons, breaking a mace in the process.

We marched on. Branch corridors turned out to be blind leads and the one we were in was starting to slope upwards. A slight bend and we could see daylight ahead. Tired and frustrated we emerged onto the surface, no richer than before but maybe a little wiser.

Foray

Continued from Page Four

her voyages through the gemstone. The downer of the whole book is that one eventually realizes that there is no choice between good and evil to be made, only between power for the Guild members or power for the race of historians and archaeologists who offer Ziantha sanctuary from the law. I guess any ending the main character can walk away from is a good one.

--Nick Smith

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