



BROOKHAVEN BULLETIN

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Semester Students To Arrive Monday

The eighth consecutive class of black undergraduate students will arrive at Brookhaven on Monday, February 7, for a semester of research and study. The new class consists of five seniors and five juniors from six colleges and universities in Louisiana, Mississippi, Tennessee, and Texas. Since the first class arrived at the Laboratory in September of 1968, 52 students, exclusive of the incoming group, have completed the Brookhaven Semester Program.

During the first week, students will tour various departments and facilities of the Lab, attend orientation sessions, and be assigned to research advisors. On Monday, February 14, they begin their formal classes in the morning and research assignments in the afternoon. Until the end of the term late in May, the students participate directly in research as a team member alongside the scientists while continuing a minimum of formal class instruction.

The Brookhaven Semester Program has a number of distinct advantages, among them the provision for the students to receive full credit the same as they would were they on campus, and an opportunity for Brookhaven scientists to directly contribute to the educational process at each of the member schools.

In order to bring the Brookhaven Semester to a reality, an historic "first" was accomplished by the participating universities and colleges with the formation of the Regional Cooperative Association in Science and Mathematics (RCASM). The original members include Miles College, Tuskegee Institute, and Talladega College in Alabama; Grambling College in Louisiana; Tougaloo College in Mississippi; Langston University in Oklahoma; Prairie View A&M College, Texas College, and Jarvis Christian College in Texas; and Knoxville College in Tennessee. Fisk University in Tennessee and Alcorn A&M University in Mississippi have since joined. All of these schools have a minimum of a four-year curriculum leading to a bachelor degree in the arts, science or education, and some also offer master degrees. Dr. Amos P. Kennedy, Professor in the Chemistry Department at Grambling College, is the overall coordinator for RCASM and the Brookhaven Semester Program. At Brookhaven the coordinator is LeGrand Newman.

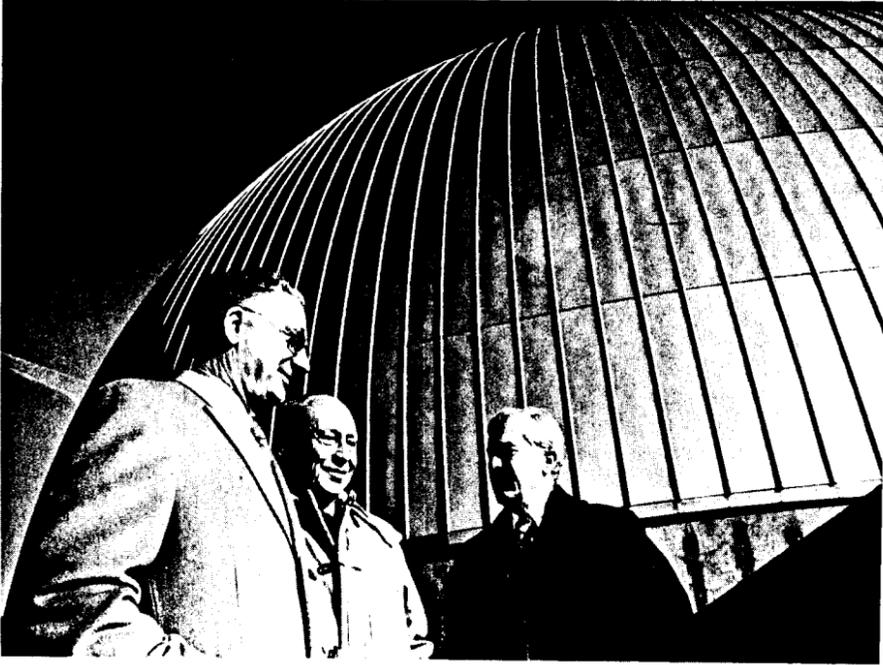
In a reverse interaction, selected BNL scientists visit the member schools in RCASM to give lectures, conduct seminars, and provide general counsel in science and mathematics to both faculty and students. Upon their return to their schools the students address the faculty and their fellow students on their experience at Brookhaven. At least one joint seminar (The Brookhaven Seminar) is held at one of the member schools, at which time all of the participants are expected to present their material. The Brookhaven Seminar is rotated among the different member institutions and is held near the close of each semester.

The Division of Nuclear Education and Training of the U.S. Atomic Energy Commission is funding the 1971-72 academic year under a grant of \$48,840. As part of this, each student will receive \$60.00 per week to pay for food and other incidental expenses. While at Brookhaven National Laboratory, the students will live on-site in dormitories at no cost to them. The previous three years were funded by the National Science Foundation under grants of \$57,000 for 1968-69; \$45,760 for 1969-70; and \$50,985 for 1970-71. All grants are disbursed through Grambling College.

FAS To Meet Friday

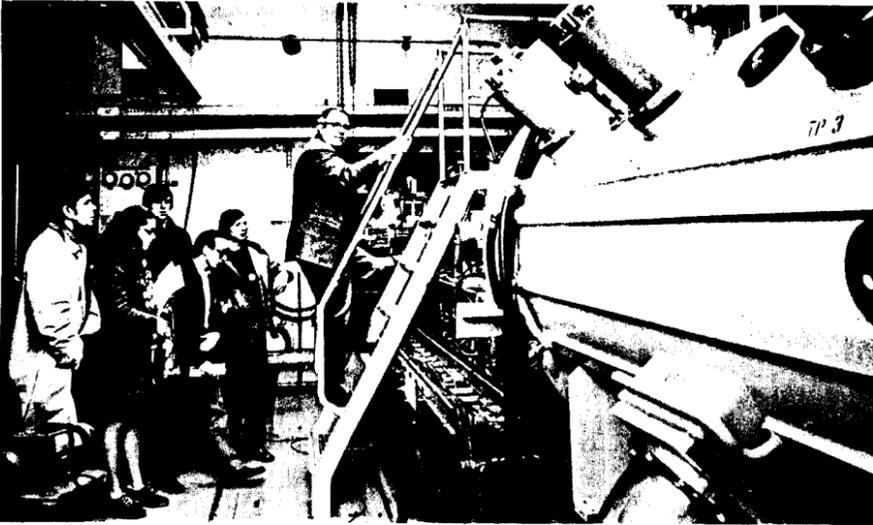
The Brookhaven Chapter of the Federation of American Scientists will meet in Room "A" of the Cafeteria at lunchtime on Friday, February 11th. Martin Rosenblum and Bill Cohen will present proposals for FAS consideration related to national science policy, federal support of science, and the utilization of the national laboratories. All interested BNL'ers are invited to participate in the subsequent discussion.

AEC Official Tours Brookhaven



Last Thursday Kenneth A. Dunbar (left), Manager of the Chicago Operations Office of the AEC came to Brookhaven to view some of the research tools unique to Brookhaven. With Dunbar were Assistant to the Director J.B.H. Kuper, and Brookhaven Area Office Manager Lyman Bryan.

Science Youth Day - 1972



Science Youth Day visitors at the 200-MeV linac follow George Wheeler up a ladder to get a long view of the injector for the Alternating Gradient Synchrotron.



Associate Director R.R. Rau talks to High School students about current physics research during Science Youth Day.

Science Youth Day

More than 75 students and teachers from 10 high schools in Suffolk County came to Brookhaven last Friday for the annual Science Youth Day celebrated in commemoration of the birthday of Thomas Alva Edison. This year the students were treated to a program that focused on high energy physics as practiced at the Alternating Gradient Synchrotron.

Small groups of students stayed with a staff member for a close-up look at one phase of the Lab's research program. Preliminary talks were given by Associate Director R.R. Rau and Accelerator Department Chairman Fred Mills. At the end of the afternoon, a question and answer period was led by Mark Barton, Gerald Bennett, Eric Forsyth and Martin Plotkin. More than twenty other members of the Accelerator Department acted as group guides.



Jerry Levine (right) shows a group of high school students around the experimental area of the AGS.

Where Are You Little Tachyon?

A popular ditty of several decades ago went like this:

*"I saw a man upon the stair
I looked again - he wasn't there
He wasn't there again today
Oh, how I wish he'd go away!"*

The tachyon is like "the little man upon the stair" to a pair of Brookhaven experimental bubble chamber physicists.

And the tachyon?

The tachyon, like a quark, a ghost, a flying saucer, or Howard Hughes, is something that a lot of people would like to believe in but never have seen.

In 1962 some physicists discussed particles that could travel faster than light, a concept that allowed them to get around the speed-of-light limit proposed by Einstein's theory of relativity. This tachyon theory caused a small stir for a short while, and then was ignored for several years until 1967 when several theoretical physicists became interested again and published papers on the subject.

Early in 1970, Jerome Danburg and George Kalbfleisch of the Brookhaven Physics Department became fascinated with tachyons, and decided to see if they could investigate further experimentally. They had no idea of where to look for the ephemeral particle, or what the particle would look like if they found it.



George Kalbfleisch and Jerry Danburg

They reasoned, however, that perhaps the particle did exist, and had been passed by in bubble chamber pictures that had been taken in a search for known particles.

The search was started through 500,000 existing pictures taken in the 31" bubble chamber. In their search they discarded all known particle tracks, and all known events that might have happened accidentally. They looked for very small events that might have been too insignificant of mention in the past.

Over the course of several months, they finally winnowed the mass of pictures down to a few hundred that were carefully scanned and analyzed, always under conditions that would have been right for the theoretical tachyon.

Their search was fruitless.

But at the same time, a picture of what the tachyon *was not* was emerging. The limits of the search had been narrowed, and the particle itself began to have more character.

During the summer of 1971, when the AGS was shut down, a new search was started. This time, 5,500 pictures were taken in the 30" chamber, but with a new twist.

There was no incoming beam.

It is fine to have no incoming beam if you want to look at cosmic rays, but hardly useful when you are searching for events of the nature of the formation of a particle. Danburg and Kalbfleisch reasoned that with no incoming beam the only particles moving in the chamber would not be cosmic rays,

(Continued on page 2)

Morse Named President Of Physical Society

Dr. Philip M. Morse, Professor Emeritus of Physics at the Massachusetts Institute of Technology, took office on Monday as President of The American Physical Society at the conclusion of the Annual Business Meeting of the scientific organization in the San Francisco Hilton Hotel. He succeeds Dr. Robert Serber of Columbia University who served as President during 1971.

Dr. Morse served as Director of the MIT Computation Center from 1955 to 1967 and was Director of the MIT Operations Research Center from 1953 to 1969.



First Laboratory Director Philip Morse, and present Director, Maurice Goldhaber.

He was the first Director of Brookhaven National Laboratory, from 1947 to 1949. He is a pioneer in the field of operations research in the United States, having received the Presidential Medal for Merit for his services in World War II. He served as the first president of the Operations Research Society. Operations research is the application of scientific and mathematical principles to problems of operations in industry, health services, transportation, police and fire management, and other areas in the public and private sectors.

Dr. Joseph E. Mayer, who was voted Vice President Elect last year (1971), assumes the vice presidency at this meeting (1972), and automatically becomes APS President in January, 1973.

Dr. Wolfgang K.H. Panofsky, Physics Professor at the Stanford Linear Accelerator Center, Stanford University, was voted Vice President Elect and will automatically assume the APS Presidency at the 1974 Annual Meeting.



Dr. Philip Morse, first director of Brookhaven gave a physics colloquium on "Operations Research for Physicists" on Tuesday, January 25.

Met. Chapter Of ANS To Meet On Tuesday

William O. Daub, who was appointed to the Atomic Energy Commission last year by President Nixon, will be the speaker at the next meeting of the New York Metropolitan Chapter of the American Nuclear Society. Commissioner Daub's topic will be "Quality - The Name of the Game in Nuclear Power."

The meeting will be held at the New York Academy of Science, 2 East 63rd Street (between 5th and Madison Avenues), in Manhattan, on Tuesday, February 8. The luncheon meeting will begin at 12:30 p.m. at \$6.00 per person. A cash bar will open at noon.

Eleven Year Old Korean Girl To Present Concert



Mee-Hee Oh practices on the grand piano in Berkner Hall.



Dr. Yang H. Oh, Medical, shows daughter Mee-Hee and son Sammy medical laboratory equipment.

What promises to be a sparkling evening at the piano has been added to the concert series at Brookhaven National Laboratory. On February 9, Miss Mee-Hee Oh, 11-year-old from Seoul, Korea, will present a program of music drawn from the compositions of Bach, Mozart, Beethoven, Schubert, Debussy, Chopin, and Harrison.

The recital will be held in Berkner Hall starting at 8:00 p.m., Wednesday, February 9. Admission is free and the public is invited. Refreshments will be served following the concert.

Miss Oh is currently a sixth grade student at the William Floyd Middle School in Mastic Beach, Long Island. Born in Seoul, Korea in 1960, she came to the United States in 1966. In 1969 the family moved from Boston to Shirley on Long Island when Miss Oh's father accepted a position on the research staff of the Medical Department.

Miss Oh's formal piano training began in 1968 in Boston where she studied under Miss Ruth Shapiro. After moving to Long Island, Miss Oh continued her training under Miss Volya Cossack of New York City, who is Chairman of the New York Orchestral Society, serves as an adjudicator of the National Guild of Piano Teachers, conducts pedagogy classes for piano teachers, and has herself trained many concert and recording artists.

In the past year, Miss Oh has given recitals at Miss Cossack's studio and at the Musicians Club in New York, and won an award and high commendation from the judges for her audition before the National Guild of Piano Teachers.

The evening's program is as follows:

- I. Invention in C Minor (No. 2); A Minor (No. 13).....Bach
- II. Fantasy in D Minor K397.....Mozart
- III. Sonata in G Minor Op. 49 No. 1; Andante, Allegro.....Beethoven
- IV. 3 Waltzes in A Flat Major from Op 9; Scherzo in B Flat Major.....Schubert
- V. Arabesque in E Major No. 1.....Debussy
- VI. 2 Waltzes - D Flat Major Op. 64 No. 1; A Flat Major Op. 64 No. 3.....Chopin
- VII. Little Suite for Piano (Pasorale-Quadrille).....Lou Harrison

Tachyons

(continued)

residual radiation, or other tracks that would be easy to classify.

So, the search was on again.

The 5,500 pictures were synthesized, analyzed and scrutinized. This time the scientists were looking for a spontaneous movement on the part of a proton. They theorized that a proton would gain energy with the release of a tachyon, and as the tachyon was emitted, the proton would move sort of like a mexican jumping bean. The formation of the tachyon would not change the proton in any way except to cause it to gain energy. There would be no splitting or disintegration of the particle.

But, at the end of the search, the results were still the same - no tachyons, but a lot was added to the picture of what a tachyon is not.

Still other searches were made of data on the heat given off by the earth. If the tachyon did indeed occur naturally, there would be a slight warming trend that would be observable. Again, no evidence of a tachyon was found.

Yesterday, in San Francisco, Danburg and Kalbfleisch reported to a meeting of the American Physical Society that ordinary matter, at least, does not emit radiation which travels faster than light. They do not rule out, however, that such radiation could exist.

The two scientists were careful to say that their search and that of others to date have used only a few of the ways that tachyons might be found.

Einstein, after formulating his theory of Special Relativity, noted in 1905 that it is impossible for ordinary matter to move at the speed of light. The only thing that can move at the speed of light is light itself.

For about the last ten years, however, there has been a lively interest among physicists about things which would *always* travel faster than light. Such entities have been given the name "tachyons," from the Greek word for "fast." Einstein's theory does not forbid the existence of tachyons; it only shows that ordinary mass cannot be accelerated to the speed of light. However, tachyons would not have the same kind of mass that familiar objects do, therefore there

is no reason why they cannot be made, or "born," with velocities already exceeding that of light. This is apparently what radio astronomers might have observed when they recently reported the observation of two quasars in space that appear to be exploding at several times the speed of light. To date, no such speed has been reported on earth, even using the highest energy accelerators currently available.

Understanding tachyons presents great challenges. Theoretical physicists have encountered severe difficulties trying to describe many of the expected properties of tachyons (if they in fact exist). One of the worst problems is the fact that to some observers, tachyons could appear to have *negative* energies, something that never happens with ordinary matter. It is easy to imagine having a negative balance in an overdrawn bank account, but talking about negative energy is something like talking about a person who is minus six feet tall. Another difficulty is the fact that if one could control tachyons, it would become possible to communicate with one's own past! This would entail a number of perplexing results. In fact the two difficulties just named are related, and there are a number of others as well.

Still, strange things have happened before in physics, and in the last five years or so a few physicists have looked for evidence of tachyons, which are assumed to be tiny particles like the other building-blocks of matter.

Danburg and Kalbfleisch pointed out that the rate at which tachyons could be emitted is limited. If, for example, the particles making up the Earth were picking up energy at the expense of tachyons, our planet would get warmer. So the heat flow (relatively well-known) coming out of the Earth also puts stringent limits on the number of tachyons that are being radiated by matter.

Theatre Group Meeting

The next meeting of the Theatre Group will be on Tuesday, February 15, in the Recreation Hall. The agenda and program will be announced in next week's Bulletin. All those interested are invited to attend.

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CARL R. THIEN, Editor
CLAIRE LAMBERTI, Editorial Assistant

40 Brookhaven Ave. Upton, N.Y. 11973
Telephone 516 924-6262 Ext. 7238

NORBERT J. DERNBACH
Public Relations Officer

10% Cash Option At Retirement Approved For TIAA-CREF Plans

Starting July 1, 1972, employees retiring from the Laboratory at age 55 or older will have the option of drawing up to 10% of their TIAA and CREF accumulations in a lump sum cash payment. This new benefit, called a "Retirement Transition Benefit," had been sought by the Laboratory for some time and is now being offered to all institutions participating in the TIAA-CREF retirement system at the option of each institution.

The lump sum option will be offered to Laboratory employees meeting the minimum age requirement at the time they select their annuity option. Each such employee may withdraw any amount up to a maximum of 10% from each of his contracts. Percentages may not be combined so that a withdrawal from any one contract exceeds 10%. For example, one may not draw 5% from TIAA and 15% from CREF.

Further information or answers to any questions about the option may be obtained from Personnel Services, Extension 2106.

Weekend Use of Gymnasium

The gymnasium and locker room facilities are available on request Saturdays, Sundays, and Holidays during the hours 9 a.m. to 9 p.m. On these days the gymnasium will be reserved for tennis between 9 a.m. and 12 noon.

Employees wishing to use the gymnasium and/or locker rooms will be issued a key for the gymnasium at Police Headquarters upon presentation of their Laboratory I.D. card.

Cooking Exchange

French cooking at its best will be featured at the next Cooking Exchange session. The date is Thursday, February 10, 3 to 5 p.m. in the Recreation Building in the apartment area. There is a charge of 75¢ per session for each person attending to cover the cost of recipes and for the babysitters.

If you need additional information, please call Terri Pittenger at 286-9471.

BNL Mountaineering Club

A snow shoeing trip sometime in February is being planned by R. Bergoffen for one of the following areas: Adirondack, Green or White Mountains. For further information and details concerning this trip, club members or interested persons should contact Bob at Ext. 2487 or 7525.

Jazz At The Center

The Isotope Stompers, a jazz group formed from staff members and friends of Brookhaven National Laboratory, play for your cocktail hour enjoyment each Monday evening at the Brookhaven Center. The music starts at 5:30 and continues till 8 p.m. The bar at the Center opens at 5 p.m.

Arrivals & Departures

Arrivals

Andreas Bamberger Physics
Peter D. Esser Medical
Frederick W. Martin Applied Math
James H. Scharenguivel Physics
Elliot J. Schiller Chemistry
Walter A. Sevan Applied Science

Departures

Shirley C. Brown Staff Svcs.
Bruce K. Dietrich Chemistry
John L. Dobesh Mech. Engrg.
Lucia Esannason Physics



Edwin Taylor



Pat Towey



Jerry Weiss



Charles Flood



George Oldham



John May

BERA Election Candidates Picked

The following is the slate of candidates selected by the 1972 BERA Nominating Committee.

- George Oldham (Rigger) Plant Engineering and Planning
- Jerome Weiss (Chemist) Applied Science
- Edwin Taylor (Technician III) Applied Mathematics
- Charles Flood (Associate Health Physicist) Health Physics & Safety
- Patricia Towey (Executive Secretary) Physics
- John May (Design Engineer III) Accelerator

The BERA Trustees whose terms expire on March 1, 1972 are: Charles Meinhold, George Oldham and Jerome Weiss.

Ballots for the election will be mailed to all employees on February 10.

Camera Club

The BNL Camera Club will meet on Tuesday, February 8, at 8:00 p.m. in the Recreation Building. In preparation for the spring exhibit in Berkner Hall, we will have a showing of the work of all interested contributors. Bring slides, black and white or color prints, and even unfinished work you may be interested in finishing within the next few months. Everybody is welcome.

Slo-Break Basketball

by Jack Brennan

The AEC won the first half by beating the Knacks 57-29 and AMD 45-23. Bob Casey, with 32 points total for both games, led the AEC attack. Jim Hooper, Dennis Nordstrum and Tim Henry had one double figure game for AEC. Ed Gill of the Knacks scored 16 points. The Dirty Dozen grabbed second place with a 48-23 win over Medical and a close 33-32 over the Tandems. Tom Jesaitis with 13 and Pete Stillman with 10 led the Dozen attack in the Medical game.

In the Tandem game, the Dozen trio of Herm Haller, Jesaitis and Stillman had 29 of the club's 33 points. The Tandems beat Personnel to capture third place 38-23. Burleigh James scored 11 for the Tandems. The Knacks won fourth place, beating Biology 41-29. Bob Janson of the Knacks with 14 and Nick Combatti of Biology were the games high scorers.

Personnel looked strong beating Medical 49-26. Dick Ellis of Personnel was the high scorer with 20 points. Bob Eisner of Personnel had 14. AMD beat Biology 43-32 as Les Lawrence with 15 and Joe Abata of Biology with 13 were the games high scorers. Stan Samuelsen had 14 points for AMD.

Final First Half Standings

	W	L
AEC	7	0
Dirty Dozen	6	1
Tandems	5	2
Knacks	4	3
AMD	3	4
Personnel	2	5
Biology	1	6
Medical	0	7

Volleyball News

Odelli Ozer

The Boomerangs continued to terrorize the Mixed League last week. "Quarterbacked" by Charlie Cowan and helped along by the good play of Bill Kropp, the Ellises and the Kinseys they won 3 out of 4 games, their only loss coming again in a close game with the Gotcha's. The Active Sites on the other hand seem to be having the best time of all in spite of not too many successes on the court. The Jets and the Spikers have been having trouble holding their ground while reshaping their teams.

The Men's League started the second half of the season with the introduction of a new "handicap system" in order to improve the balance between the teams. In the only game played a two point handicap did not prevent the Atom Spikers from trouncing the Particle Detectors 3-0.

The standings on January 27 were as follows:

Mixed League	W	L
Gotcha's	6	0
Boomerangs	5	2
Jets	3	3
Spikers	2	3
Trolls	1	2
Active Sites	0	7

Men's League	W	L
Atom Spikers	3	0
Set Ups	3	0
Chemistry	0	0
Cool Tools	0	0
Spikers	0	0
AEC	0	3
Particle Detector	0	3

Soccer

Ken Batchelor

On Friday 21st January the strong DAS Medical and Chemistry team increased their lead at the top of the Inter-Departmental League with a victory over AGS and a win by forfeit from Physics who were unable to raise enough players for a team.

In the one game played there was plenty of action around both goals and though the DAS team deserved the win the AGS team never gave up and were in the game with a chance right up to the final whistle. The real difference between the teams was in finishing power with the strong DAS front line of Meyers, Farrell and Sutherland creating many scoring opportunities which resulted in a hat trick for Meyers in their 5 goals to 2 victory.

DAS, Med., & Chem. 5 vs AGS 2
(Meyers 3, Sutherland 2) (Batchelor, McCafferty)

League Standings:

	Goals					Pts.
	W	D	L	F	A	
DAS, Medical & Chemistry	40	1	1	40	22	21
AGS	4	1	7	15	40	9
Physics	3	0	9	31	24	6

Leading Goal Scorers: Farrell 11, Meyers 10, Sutherland 9, Nielsen 8, Batchelor 8, Strayer 8, Cox 7.

Bowling News

Grace Fales

Congratulations to J. Cain with a 623 scratch, 713 gross series and Gene Fales with a 700 gross series, earning their Club Awards. Other merits go to: L. Jacobson 238 last week, 237 this week, G. Walker 223, J. Scesny 221/266/671, J. Bunt 202, and W. Kollmer 214. The Sandbaggers are taking a quick lead in first place with 19 wins and only 2 losses in points.

Pink League

The Hopefuls continue to hold first place by 1 point, with the Fiscal Assets and Spares in close pursuit. "Honorable mention" to Doris Pion this week with a smashing 152. Other highs: Renie Rosati 161, Pat Oster 166, Ellie Murgatroyd 169/476, Marie Brenner 175, and Helen Caisey 198/506.

Black and Blue League

Joe Mayeski of the Spare Ribbers dreamt he rolled two 200 games - and would you believe he did just that. He had a 212/206/545. Two gals who didn't dream (they just bowled) were Helen Caisey with a 170/184/481 and Kit D'Ambrosio 170/452.

Red League

Highs for the week were J. Berech 204, R. Adams 203, W. Kristiansen 200, and R. Larsen 210.

Cafeteria Menu

Week Ending February 10, 1972

Friday, February 4	
Clam & Celery Bisque	
Cod Crisps w/Chips	.90
Roast Leg of Lamb w/Mint Jelly & 1 Veg.	.95
Broiled Halibut w/Carlton Butter & 1 Veg.	.95
Monday, February 7	
Tomato Soup	
Roast Fresh Ham & 1 Veg.	.90
Chicken Patties w/Giblet Gravy, Currant Jelly & 1 Veg.	.90
Western Omelet & French Fries	.80
Tuesday, February 8	
Vegetable Soup	
Grilled Ham, Sausage & Pineapple & 1 Veg.	.90
Creamed Chicken & Mushrooms on Noodles	.90
Sauerbraten w/Potato Pancakes	.90
Wednesday, February 9	
Yankee Bean Soup	
Baked Beef Loaf w/Gravy & 1 Veg.	.85
Shrimp Chow Mein on Boiled Rice w/Crisp Noodles	.90
Polish Keilbasy w/Mashed Potatoes & Sauerkraut	.80
Thursday, February 10	
Beef Barley Broth	
Beef Hash w/Brown Gravy & 1 Veg.	.80
Baked Lasagna w/Meat Sauce & 1 Veg.	.90
Broiled Chicken Livers w/Bacon Strips & 1 Veg.	.85

Perfect Attendance - 1971



Some well deserved thanks were given by Bob Brown (center) to members of the Technical Photography and Graphic Arts Division who had perfect attendance during 1971. They are (left to right) Dorothy Berg, Leo J. Casey, Frank Welch, and Bob Walton.

