

BNL Lecture: Electronic Structure Since Dirac

One of the greatest mathematical minds of the twentieth century belonged to Paul Dirac. In 1926, while a 24-year-old graduate student at Cambridge University, he devised a new form of quantum mechanics — the laws that govern the motion of atomic particles. Then, in 1928, he discovered



James W. Davenport

the famous Dirac equation, which unites the ideas of quantum mechanics with Einstein's theory of relativity.

Dirac's revolutionary approach not only made it possible for him to describe the electron mathematically and conclude that it spins on its axis, but also led him to suggest the existence of the electron's antiparticle, the positron.

After figuring out quantum mechanics and the Dirac equation, the theoretical physicist, who shared the 1933 Nobel Prize in Physics, observed, "The underlying physical laws necessary for the mathematical theory of a large part of physics and the whole of chemistry are thus completely known, and the difficulty is only that the exact application of those laws leads to equations much too complicated to be soluble."

Now that we have supercomputers with powers undreamed of by Dirac, are we any closer to solving mathematically the riddles of chemistry, biology or life itself? That's what Physicist James W. Davenport, of the Physics Department, will explore in the 252nd Brookhaven Lecture. His talk on "Electronic Structure Since Dirac" will begin at 4 p.m. on Wednesday, May 24, in Berkner Hall. Myron Strongin, Associate Chairman of the Physics Department, will introduce the lecturer.

Davenport will begin by juxtaposing the philosophies expounded within two recent books. *A Brief History of Time*, by Stephen Hawking, is essentially a modern statement of Dirac's belief that, if you understand the basic laws, you understand everything. On the other side stands Freeman Dyson's *Infinite in All Directions*. Dyson argues that this is analogous to saying that you understand the zoology of the jungle floor if you know the location of the Earth's mountain peaks.

For example, as Davenport will discuss, the recently discovered high-temperature superconductors are not understood theoretically and yet are probably much simpler than most organic models.

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AGS Users Review High-Intensity Route

With 1.5×10^{13} protons per pulse, the AGS is the world's most intense high energy proton accelerator — and so it provides an alternate to the very high energy avenue for particle physicists in their search for new phenomena, especially through precision measurements and searches for rare processes. As such, the AGS has been dubbed the "high-intensity route to new physics."

For a review of the progress along that route, about 100 of the 600 researchers who use the AGS annually made a beeline for the Annual Meeting of the AGS Users Group at BNL, May 11-12.

There, they heard about progress on AGS experiments running the gamut from studies of heavy ions and high-temperature superconductors, to searches for rare kaon decays and radiative hyperon decays.

Attendees also learned that their chosen accelerator would be the accelerator of choice of many other researchers. As Laurence Trueman, BNL's Associate Director for High Energy and Nuclear Physics reported, a third meeting of the AGS Program Committee has been scheduled for this June because of the large number of experimental proposals to utilize the AGS' high intensity beam.

To try to accommodate this demand, Trueman mentioned that BNL has asked for more AGS running time, making the case that, for a 6 percent



Associate Physicist John Haggerty, Physics Department, reports results from the AGS rare kaon decay experiment E787 to the 1989 Annual Meeting of the AGS Users Group, May 11-12.

increase in the AGS budget, beam time can be increased by 50 percent, from 20 to 30 weeks.

The Associate Director also related that two national reviews have recognized the importance of the AGS' high intensity capability.

The Nuclear Science Advisory Committee's subcommittee on the future building of an accelerator with higher intensity than the AGS touted the AGS as the most intense kaon facility in the world, and urged the speedy completion of the Booster — which is on schedule to be completed

in March 1991; an increase in AGS beam time; and support for the construction of the Stretcher ring.

The High Energy Physics Advisory Panel's subpanel on particle physics' next decade endorsed BNL's "high-intensity route," advocated timely completion of the Booster and supported the Lab's request for additional funds to increase AGS running time. The subpanel also recognized that the AGS' high-intensity endeavors will be complementary to the high-energy work to be done in the era of the proposed Superconducting Super Collider.



At the AGS Users' Meeting, BNL Director Nicholas Samios (left) announced that Satoshi Ozaki (right) will be returning to the Lab in October to become RHIC Project Head. Now a consultant to BNL, Ozaki had been in the Physics Department for over 20 years when he left the Lab in 1981 to assume the position of Director of KEK, the Japanese high energy physics laboratory, where he also became head of the Tristan Project.

Pros of Antiproton Research

As a great range of experiments can be performed using intense, low energy antiprotons — and as the Alternating Gradient Synchrotron (AGS) is one of the few accelerators in the world capable of producing such a beam — about 50 researchers from the diverse fields of particle and solid state physics, medicine and aerospace came together at BNL on May 10 for a Workshop on Antiproton Technology.

The first form of antimatter to be discovered, in 1932, an antiproton is the antiparticle of the proton. Antiproton beams release highly penetrating radiation when stopped by normal matter, which makes them useful as a scientific probe.

At present, the AGS does not have a dedicated antiproton source, but there is the possibility that one could be commissioned after the Booster comes on line in 1991.

As interesting applied science and technology research would go on at such a source — and could result in the transfer of antiproton storage ring and other technology to industry — BNL's acting Manager for Technology Transfer, Sy Baron, who is Associate Director for Applied Programs, welcomed the researchers' interest in the AGS.

In reviewing antiproton physics and the practical uses of antiproton beams, the workshop attendees considered experiments ranging from particle physics studies of invariance principles and the gravitational force, to solid state research into antiproton interaction with normal matter, to the biomedical application of antiprotons for tissue imaging and therapeutic treatment of cancer.

BNL Women: Progress and Potential

The second person hired to work for BNL was also the Lab's first female employee — and, with the employment of Mariette Kuper in March 1946, the ratio of women to men on the Brookhaven staff reached its first and all-time high of 50 percent.

What is the position of women at Brookhaven today? What is their future at the Lab of tomorrow? Those questions were asked of BNL's Personnel Division as the most recent initiative of Brookhaven Women in Science (BWIS).

And they will be answered at the next BWIS dinner meeting by Virginia H. Brown, Manager of Compensation and Projects, Personnel Division. A BWIS member, Brown will talk about "BNL Women: A Human Resources Perspective — Progress and Potential," on Wednesday, May 24, in Room A, Berkner Hall.

All Brookhaven women and men are invited to attend. Refreshments, wine or soda, will be served at 5:15

p.m. before Brown's talk, which will begin at 5:30 p.m.

After reviewing retrospective statistics of BNL's employment of women, Brown will present the figures on the Lab's employment of women today — the numbers of women and their distribution among the staff — and discuss the progress BNL has made in employing more women in more fields over the years.

Brown will also compare BNL's distribution of women to the availability of female employees in various occupational groups. Finally, she will talk about what can be done to increase both the recruitment and retention of women throughout the Lab — and she will look for input on these issues from the audience.

After the talk, Brown hopes her presentation can be used as the focus of a conversation with the audience on initiatives the Lab is undertaking and whatever other steps can be taken to increase the number of qualified



Virginia H. Brown

women who come to work at Brookhaven and the length of their stay.

(Continued on page 2)

Three Aspects of Art

As various as the inspirations of different artists are the aspects of art they can express. You can view "Three Aspects of Art" next week, at an exhibition in Berkner Hall on Monday, May 22, through Wednesday, May 24.

The show will feature Elinor Kahana, Siyu Liu and Brenda Watson, whose combined talent and contrasting styles unite into an unusually lively and interesting art show.

Kahana, now an American citizen, came from Canada to live in Stony Brook in 1965, when her father Sidney Kahana joined the BNL physics staff. She majored in art at the State University of New York at Stony Brook, taking a year in Paris for language studies and a firsthand look at European art.

Now pursuing a master's degree in art, Kahana first concentrated on ceramics, experimenting with the raku firing technique. A small selection of this work will be in the show. She now specializes in landscapes primarily painted directly from nature. Some of them incorporate figures, such as the picture entitled *Seduction: Tribute to Watteau's Nymph and Satyr*, shown here in the accompanying photo. In the future, she plans to explore a more abstract style.

Liu Siyu, or Lucy Liu in the English version of her name, left China last

year to come to Brookhaven where her husband Bo Yu had joined the Instrumentation Division. Liu studied Chinese art for four years at Jinghua Art School in Beijing, where she was also attending Tsinghua University for her degree in architecture.

Liu paints flowers, landscapes, people — anything arousing her inspiration of the moment. Her finished paintings, such as the *Smiling and Talking daffodils* shown here, are often worked up from preliminary sketches and studies, which she keeps for reference. Next year, Liu plans to finish her M.A. in architecture in this country, but she will continue to paint.

Brenda Watson was born and grew up in Topley, a 200-inhabitant village in northern British Columbia, Canada, then moved to study at an art college in the Okanagan Valley. She finished her degree in art at the University of British Columbia.

Watson's main interest has been in sculpture, inspired by feminist and political ideas — but this work is too heavy to move from Canada. Since she came to Brookhaven about six months ago, when her husband Gilles Couture joined the Physics Department for two years, she has been sketching and painting, both in oils and acrylics. The example of her work shown here, *Red Tree with Shadow*, is



The three artists: (from left) Elinor Kahana, Lucy Liu and Brenda Watson, with examples of their work.

one of the seven pieces she will display in next week's show.

Sponsored by the BERA Art Committee and presented jointly with the Hospitality Committee, the show will open on Monday, May 22, from 12:30

to 2 p.m., with homemade desserts offered. The show will also be open on Monday from 5 to 7 p.m., and Tuesday and Wednesday, May 23 and 24, from 11:30 a.m. to 1:30 p.m.

— Liz Seubert

Talking About Ticks and Lyme Disease

It usually begins with a bull's-eye rash and flu-like symptoms. If left untreated, it can reappear weeks or months later as neurological and cardiological problems. If still not cured, it will finally manifest itself as a type of arthritis.

It is Lyme disease — and it begins with the bite of a tick.

A Bit of History

The disease was named in 1976 after the town of Lyme, Connecticut, in which Polly Murray, a resident, alerted public health officials of the local epidemic after she came down with the disease, along with her children and many neighbors.

Last year 5,000 cases of the disease were reported in the U.S., bringing the total to 13,000. But, as it is believed that Lyme disease is both underdiagnosed and underreported, the actual total could be four times as great.

The greatest incidence of Lyme disease in New York State occurs in Suffolk County. In the U.S., New York ranks number one in reported cases —

half of which originate in the victims' own backyards.

Ticks Are the Culprits

In the Eastern U.S., *Ixodes dammini* was first identified in 1977 as the tick that carries the Lyme-disease bacteria. As white-tailed deer are the primary hosts of this adult tick, *I. dammini* is commonly known as the deer tick.

However, it is believed that deer ticks acquire the Lyme-disease bacteria as larvae from the white-footed mouse and that deer ticks transmit the bacteria to humans when the ticks reach the nymph stage over the spring and summer.

Human victims often do not know that they have been bitten, as nymph deer ticks are the size of the period at the end of this sentence. Though they are the cause of Lyme disease in deer, horses, dogs and cats, adult deer ticks, which feed from fall to spring, are large enough to be detected and removed, so are not thought to be responsible for many human cases.

Prevention & Action

As Suffolk County is a Lyme-disease

Down on the Farm

Round up the kids! Call a friend! Come on down to the annual grand opening of the Suffolk County Farm and Education Center, on Sunday, May 21, from 11 a.m. to 3 p.m.

Children will enjoy the animals, hayrides, games, pony rides and much more.

The farm is run by Suffolk County and the Cornell Cooperative Extension. For more information, call 282-1506.

Look! A Limerick!

From Medical, Instrumentation
To Physics and Administration
Chemistry, CCD

DAS, DNE —

BNL shows diversification.

— Morris Strongson

Computing & Communications

Note to Employees:

Attendance at lectures, meetings and other special programs held during normal working hours is subject to supervisory concurrence.

More Tick Talk

The Arthritis Foundation is sponsoring a series of free educational talks on Lyme Disease across Long Island. Each talk covers diagnosis, treatment and prevention, and will be given by a rheumatologist, a physician specializing in arthritis.

Cold Spring Harbor High School
Wednesday, May 31, 7:30 p.m.

Glen Cove City Hall
Monday, May 22, 7 p.m.

Patchogue-Medford Library
Wednesday, May 31, 7:30 p.m.

Southampton High School
Wednesday, May 24, 7:30 p.m.

The Cornell Cooperative Extension at the Suffolk County Farm and Education Center, Yaphank Avenue, Yaphank, will present a program on Lyme Disease, on Tuesday, June 6, at 7 p.m.

Due to limited space, a maximum of 25 persons may participate. To register or obtain more information, call 282-1506.

BNL Women

(cont'd)

After a brief stint at the Lab from 1959-61, Brown returned to BNL in 1977 and has been continuously employed in Personnel ever since. Responsible for managing Brookhaven's compensation program since 1981, she also oversees the development of computerized human-resources systems, and she directs special personnel projects, including a task force on recruitment and retention.

In addition, Brown serves as a part-time lecturer at the Harriman Graduate School of Policy and Management, State University of New York at Stony Brook.

After the talk, at 6:30 p.m., all those who would like to continue the discussion are invited to accompany the speaker to a local restaurant. For reservations, call Stephanie Lamontagne, Ext. 7141, by Monday, May 22.

BNL Lecture

(Cont'd)

Davenport will also talk about one of the fundamental features of quantum mechanics — the shell structure of atoms, in which electrons orbit about a central nucleus. He will describe the photoemission spectroscopy experiments done at BNL's National Synchrotron Light Source (NSLS), which make the NSLS probably the best device available for examining shell structure.

The results of these experiments can mostly be calculated with an accuracy of 0.1 electron volt for single atoms, molecules of less than 50 atoms and simple solids. It is perhaps remarkable that physicists have found no disagreements with the theory put forth by Dirac over 60 years ago.

It is more difficult to calculate crystal structure. However, work in Davenport's Solid State Theory Group has recently demonstrated that it is possible to predict the crystal structures of elements. They have shown theoretically, for the first time, that gold, the most malleable of all metals, is cubic and that osmium, which has a density twice that of lead, is hexagonal.

As computers increase in sophistication, Davenport sees problems with the interpretation of the results. He will explain why he says, "We should always remember that our goal is not to calculate but to understand. I believe there will be more and more examples where we can predict the outcome of an experiment but will not be able to give a simple graphic picture of what is going on. That is a

challenge for theorists."

James Davenport received his Ph.D. in physics from the University of Pennsylvania in 1976, where he was the co-winner of the Sigma Xi Prize for the Best Thesis in Natural Science. His dissertation was titled "Theory of Photoemission From Molecules in the Gas Phase and on Solid Surfaces."

After a year as a postdoctoral fellow at the University of Pennsylvania, Davenport spent a year as a postdoctoral research associate at the Institute of Theoretical Physics, Chalmers University of Technology, Göteborg, Sweden.

Upon his return to the U.S. in 1978, Davenport joined the staff of the Solid State Theory Group in the Physics Department as an assistant physicist. He was named Associate Physicist in 1981 and Physicist in 1983. In 1986, he became group leader. He is currently chairman of the Lab's Computer Policy Committee, as well as chairman of the steering committee charged with setting up ESnet — a Department of Energy-wide computer network for scientific research.

Davenport is a member of the American Physical Society (APS) and the New York Academy of Sciences. From 1983-88, he was a board member of the Physical Electronics Conference, an annual topical conference of the APS.

After the lecture, those attending are invited to join the speaker for discussion and hors d'oeuvres. In addition, anyone interested in joining the lecturer for dinner at a restaurant off site should call Myron Strongin, Ext. 3763.

Equipment Demos

Codonics will demonstrate the Seikosha VP3500 video printer, on Tuesday, May 23, from 10 a.m. to 3 p.m., in Berkner Hall.

The Seikosha VP3500 is designed to provide grey-scale hard copy for high-resolution image-processing systems. The unit operates off an analog video signal, which eliminates the need to address software compatibility for a specific output device.

August Waeldin will display their scientific and industrial products on Wednesday, May 24, from 10 a.m. to 3 p.m., in Berkner Hall. Their product line includes quality inspection and biological microscopes, CCTV systems, image analysis and apparatus for testing and inspection.

On Thursday, May 25, Hewlett-Packard will exhibit their "Solutions for the 90's" product fair at Berkner Hall, from 10 a.m. to 3 p.m.

Exhibits will feature such Hewlett-Packard products and solutions as real time systems, engineering workstations, personal computer solutions, ME-CAD and EE-CAD systems, HP networking products, 2D/3D graphic workstations, data communications, telecommunications and logic development/digital design.

Radio Club

The BERA Amateur Radio Club will meet in Berkner Hall, Room D, on Thursday, May 25, at noon.

The agenda will include the schedule for conversion of the UHF repeater, necessary changes to update the constitution and by-laws, and budgets for the year's activities.

All licensed radio amateurs who are BERA members are invited to attend. Those who are interested in becoming licensed amateur radio operators are also welcome.

For more information contact Andy Feldman, Ext. 3264, or Bob Bacharach, Ext. 7790.

Cafeteria Menu

Monday, May 22	
Soup: Chicken corn chowder	(cup) .75 (bowl) .95
Stuffed flank steak w/veg.	3.25
Florentine chicken w/pot. or veg.	3.10
Lite-line: Salad plate	2.25
Hot deli: Picnic Italianos	2.85
Tuesday, May 23	
Soup: Cottage cheese	(cup) .75 (bowl) .95
Mussels marinara	3.10
Chicken cacciatore	3.10
Lite-line: Broiled chicken w/pot. or veg.	3.10
Hot deli: Sloppy Joes	2.85
Wednesday, May 24	
Soup: Chicken okra gumbo	(cup) .75 (bowl) .95
Franks & baked beans casserole	3.10
Baked ziti w/ garlic bread	3.10
Lite-line: Vegetable medley	2.25
Hot deli: Turkey melt croissant	2.85
Thursday, May 25	
Soup: Mushroom bisque	(cup) .75 (bowl) .95
Ham en croûte	3.10
Turkey w/stuffing	3.10
Lite-line: Ratatouille	2.75
Hot deli: Fish burger	2.85
Friday, May 26	
Soup: Tuna	(cup) .75 (bowl) .95
Corned beef & cabbage	3.10
Seafood à la king	3.50
Lite-line: Broiled whitefish	3.10
Hot deli: Open roast beef sandwich	2.85

Volleyball Champs



In League I, Upfagrabs grabbed top place: (front, from left) Barry Karlin, Sandy Lane, Rong Li, Ali Lopez; (back, from left) Walt Reams, Bill Kropp and Jean Spears. Not pictured: Jay Adams.



High Volley'em vollied 'em high enough to take top honors in League III: (front, from left) Kim Holschuh, Jim Boomer, Eileen Kosloski, Tom Langdon, Debbie Langdon; (back, from left) Jean Jordan Sweet, Donna Vestal, Dave Bingham, Joe DeVoe and Terri Strelecki. Not pictured: Rich Boeke and Dave Peter.



The Set Ups set themselves up as League II champions: (front, from left) Sue Monteleone, Gwyn Williams, Ali Lopez, Carmen Falkenbach, Jim Guppy; (back, from left) Bill Horak, Jean Springston, Lorrie Krebs and Mike Sagurton. Not pictured: Jack Lazarz.



In the Open League, Phoenix rose to first place: (front, from left) Don Litcher, Rich Davis, Dennis Weygand; (back, from left) Bob Casey, John Millener and John Usher. Not pictured: Markus Buescher and Sandi Litcher.

— Photos in this issue by Roger Stoutenburgh.

Note to Diners

The Cafeteria will be closed on Saturday, May 20, due to the Science Fair. On that day, snack bar service will be available from 9 a.m. to 2 p.m. at the Brookhaven Center.

Also, the Tap Room at the Brookhaven Center will be closed on Thursday, May 25.

Archery Club

There will be a meeting of the BERA Archery Club on Thursday, May 25, at noon in the gazebo by the BERA ball fields. In the event of rain, the meeting will be held at the Recreation Building in the apartment area. Topics to be discussed are maintenance and cleanup of the range and the 1989 budget. All members are urged to come. Anyone interested in joining is also welcome.

Arrivals & Departures

Arrivals

Nereida E. Gonzalez Medical
Richard T. Howard Accel. Dev.
William J. McGrath Biology
Oswaldo Soto Plant Eng.
Helio Takai Physics

Departures

This list includes all employees who have terminated from the Laboratory, including retirees:

Mohsen Khatib-Rahbar DNE
Barry M. Magee Sfgds. & Sec.
Clare B. Sheppard Physics

Swim Club

Three BNL Swim Team records and four out of four personal records were set by Wlodek Guryn at the U.S. Masters Swimming National Short Course Championships, on May 5-7, 1989.

Guryn was BNL's only representative among the nearly 1,800 swimmers at this international competition, held at the Mission Bay Aquatic Center, Boca Raton, Florida.

The four events in which Guryn swam and set his personal records were: the 50-yard breaststroke, 33.16, for a 19th place among men 35-39; the 200-yard breaststroke, 2:43.63, 19th among men 35-39; the 100-yard individual medley, 1:05.88, 36th among men 35-39; and the 400-yard individual medley, 5:37.77, 29th among men 35-39.

Guryn bettered the BNL team records and the BNL age-group records for men 35-39 in the 200-yard breaststroke by over one second and in the 100-yard individual medley by nearly one second. In addition, he now holds the team record and the record for his age group in the 400-yard individual medley.

Seats Left on Bus

As the Bulletin went to press, there were still a few seats left on the BERA bus going to Trump's Castle in Atlantic City tomorrow. If you're interested, see Louisa Barone at the BERA Sales Office in Berkner Hall before 2 p.m. today, or call her on Ext. 3347.

AACC Elections

The Afro-American Culture Club (AACC) will hold elections for Vice President and Recording Secretary on Wednesday and Thursday, May 24 and 25. AACC members may vote from 11:30 a.m. to 1:30 p.m. in the lobby of Berkner Hall.

The candidates are:

Vice President	Recording Secretary
Leon Lawrence	Pauline Dixon
Ralph Wilson	Celeste Samuels

Cooking Exchange

Favorite foods of summer will be featured at the last International Cooking Exchange meeting for this season. For a per person fee of \$2 to pay for the ingredients, all BERA members and their families can come to the meeting and sample the dishes prepared, on Wednesday, May 24, at 12:30 p.m. in the Recreation Building. Babysitting will be provided at 50¢ per child.

IBEW Meeting

Local 2230, IBEW, will hold its regular monthly meeting on Monday, May 22, at 6 p.m., in the Knights of Columbus Hall, Railroad Avenue, Patchogue. There will also be an afternoon meeting at 2 p.m. for shift workers in the Union office at 31 Oak Street, Patchogue. On the agenda will be regular business, committee reports and the presidents report.

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