



Sidney Fiarman, Henry Peters and Michael Degen

It's Design D for SSC

On Tuesday, September 17, Lab Director Nicholas Samios received a phone call from Maury Tigner, Director of the SSC Central Design Group, the organization responsible for the conceptual design of a projected Superconducting Super Collider (SSC). It was good news for Brookhaven. Design D, the BNL/LBL/Fermilab high-field magnet, had been selected to be the focus of future magnet R&D for the SSC. The next immediate step is the construction of six prototype full-length magnets of 16.6 meters each.

On learning the news, Paul Reardon, associate director for High Energy Facilities, said: "This latest significant achievement by BNL further demonstrates its capabilities in the area of superconducting magnetic systems, and builds on a successful development of the final magnets proposed for CBA. It also lends further credibility to our proposed design for the relativistic heavy ion collider. Collaboration with Fermilab and LBL emphasizes the national character of the SSC effort and

uses the best experience of all three laboratories."

The SSC Magnet Selection Advisory Committee, chaired by Frank Sciulli of Columbia University, submitted its report to Tigner on September 9 recommending that Design D be chosen. Tigner accepted its recommendation and after discussion with and concurrence by DOE, informed Samios of the decision.

For the long magnets now under design, Design D is a collaborative effort. Brookhaven is responsible for the magnet system, i.e., the cold-mass; Fermilab for the cryostat in which the magnet cold-mass is mounted; and LBL for superconducting wire development. The magnet design uses a niobium-titanium superconductor in a two-layer coil, held in place with a stainless steel collar and a cold iron yoke. In July, the first 4.5-meter demonstration magnet built to this design was successfully tested. Since then, three additional magnets of the same length have all achieved or surpassed their specified performance.

Seals That Safeguard

The International Atomic Energy Agency (IAEA) does not want its 200 safeguard inspectors to sign off and seal containers of nuclear material only for the material to be delivered to clandestine weapons producers. To detect any diversion of nuclear material from peaceful use, the IAEA relies on, among other things, seals that reveal tampering. One such seal, which the IAEA is now testing in France and Germany, is a recently patented invention of Associate Physicist Sidney Fiarman and Technical Associate Michael Degen of the Technical Support Organization of BNL's Department of Nuclear Energy, and Senior Designer Henry Peters now of the Reactor Division.

The seal is comprised of a shrinkable tube having either dots, triangles or other markings over which is fitted

another shrinkable tube that is transparent and on which a grid is printed. Heating the tubes causes them to shrink to fit the item being sealed and causes a random and unique relationship between the first and second set of markings. Since the seal can be identified when applied and verified later, it cannot be removed without detection.

In designing this seal, Fiarman, Degen and Peters solved the problem of how to seal the valves at the ends of very large cylinders of uranium hexafluoride (UF_6) in such a way that the seal is inexpensive and can be easily checked for tampering in the field. UF_6 is produced at uranium enrichment facilities, and it contains about three to four percent uranium-235. Later in the fuel cycle, UF_6 is converted to uranium oxide and used

in light water reactors to produce energy.

The seal can also be used to seal bottles, like those containing uranium or plutonium nitrate. "Possibly, this seal has commercial applications — to be used over padlocks, for example," says Fiarman.

Thousands of UF_6 cylinders are checked periodically by IAEA inspectors. "One cylinder contains enough U-235 to make approximately one weapon, should the material be diverted," says Fiarman. Since it would have to be further enriched at a clandestine facility before it could be used in a bomb, UF_6 is not the most intensively safeguarded material. However, it is more attractive for diversion than natural uranium, which comes out of the ground containing only 0.7% U-235.

The seals on UF_6 cylinder valves used at present, which Senior Nuclear Engineer Cesar Sastre designed by modifying a commercially available seal, are made up of two metal caps containing the knotted ends of a wire that is threaded through a plastic bag placed over the cylinder valve. These seals are numbered and have unique identification marks inside the caps, which are documented when the seals are issued for use. When inspectors

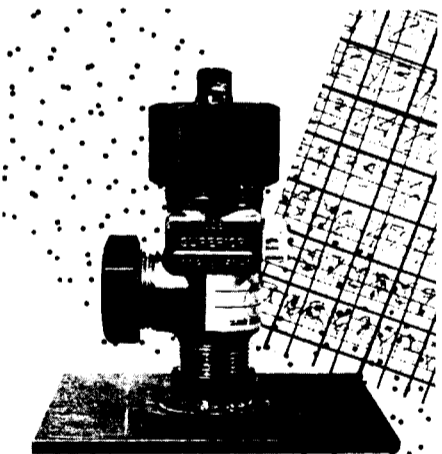
remove the double cap seals, they visually inspect the parts for tampering. They then deliver the seal to IAEA headquarters for inspection under the microscope since verification in the field is not practical.

Fiarman had the initial idea to use shrink tubing for a seal that could be verified in the field. "Shrink tubing is a plastic bag open at both ends," explains Fiarman. "When you heat it using a heatgun, hair drier or propane torch, it shrinks in a random, unique way — you can't shrink two of them the same way. It depends upon how the heat is applied, what the temperature is — too many variables that are not reproducible."

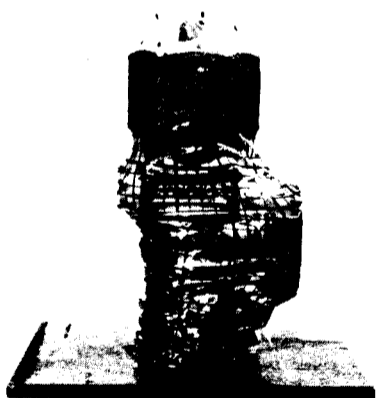
Degen and Peters thought to use two shrink tubes with different patterns, one on top of the other. Originally, they used a numbered grid shrink-tube over one with dots. Researchers at Sandia National Laboratory suggested using triangles instead of dots, and that is now the preferred design for the top tubing because the angular orientation of the triangles with respect to the grid can be noted.

IAEA inspectors involved in field testing of the shrink tubing seal take pictures or make sketches of the orientation of the triangles or dots within

(Continued on page 2)



The valve to be sealed, (background, left) the underlayer of shrink tubing marked with dots and the overlayer of shrink tubing labeled with a numbered grid.



The valve covered with both layers of tubing that has been shrunk to fit. Note the random relationship between the two patterned layers produces a seal with a unique signature.

First Lab Director Dies at 82

Philip McCord Morse, the Laboratory's first Director, died at Emerson Hospital in Concord, Mass., on September 5. He was 82 years old.

Morse was Director from 1946-1948 and it was his job to organize the transformation of an army camp into a national laboratory. An important part of that job was finding the proper staff and equipment. The fledgling lab grew rapidly in both directions and after two years, feeling that BNL was firmly established, Morse returned to MIT, from which he had taken a leave of absence.

On learning of Morse's death, Laboratory Director Nicholas P. Samios said that "Morse had the difficult, yet exciting, task of starting a new institution. This early endeavor clearly proved fruitful."

A physicist, Morse's interests

ranged from underwater acoustics to astrophysics. He made pioneering and seminal contributions to the science and practice of operations research, the use of computers in research and the civilian uses of nuclear energy.

Philip Morse joined the MIT faculty in 1931 and was named professor of physics emeritus in 1969. He headed the Operations Research Center at MIT from 1956 to 1969 and the MIT Computation Center from 1957-67.

From 1940 to 1945, he directed research on sound control and underwater sound for the National Defense Research Council and the U.S. Navy. In 1942, he organized and directed a civilian task force to evaluate the U.S. antisubmarine program. For his distinguished contributions to the war effort, Morse was awarded the Presidential Medal for Merit.

He was a fellow of the National Academy of Sciences, the National Academy of Engineering, the American Academy of Arts and Sciences, the Acoustical Society of America and the Operations Research Society of America. In 1975, he was named chairman of the Governing Board of the American Institute of Physics and chairman of the Panel on Public Affairs of the American Physical Society.

Morse and his wife, the former Annabelle Hopkins, lived in Winchester, Mass. She died in February. Surviving are a son, C. Philip Morse of Raleigh, N.C., a daughter, Annabella M. Fowler of Antrim, N.H., a sister, Betty Brown of Raleigh, N.C., and a brother, Allen Morse of LaJolla, Calif.

A scholarship fund in Morse's name is to be established at MIT.



Philip Morse

The Black Experience



Franklin Knight

Franklin W. Knight, professor of Latin American and Caribbean History at The Johns Hopkins University, will speak on "The Black Experience in the Americas: An Historical Overview," at 7 p.m. on Tuesday, September 24, in Berkner Hall. The lecture is sponsored by the Afro-American Culture Club.

Knight will cover the history of Africans and their descendants in the

Americas and the contributions they have made to the development of the Americas. He will explain why the Black experience was not a common experience and why it is absurd to think that all people of African descent are similar, any more than all Europeans or all Asians are similar. Yet, says Knight, Africans share some aspects of a generalized American Creole culture which is inescapable. He maintains that it is important for all of American society to be aware of Black history.

Knight joined the Johns Hopkins faculty in 1973 and has taught a range of graduate and undergraduate courses dealing with various aspects of the economic and social problems of modern Latin America. His analyses of Latin American problems have been aired on National Public Radio, The Voice of America, the BBC and many radio and TV stations in the United States. He also has numerous publications to his credit. Before coming to Johns Hopkins, Knight taught for five years at SUNY at Stony Brook. He obtained his Ph.D. from the University of Wisconsin in 1969.

Murder, She Says

Crime Historian and dramatist E.J. Wagner will blend science and suspense in "Murder in the Laboratory," a program of baffling and bizarre criminal cases from the world of forensic medicine, on Saturday, October 5, at 8 p.m. in Berkner Hall.

Culled from actual casebooks, the crimes that Wagner will recount are landmark cases of the Victorian era, which influenced current methods of crime detection. The eerie chronicles of the Westport body snatchers, the notorious "murder at Harvard" case of 1850, and the curious predilection for arsenic displayed by many Victorian gentlewomen will be part of this chilling narrative. In her research, Wagner has had the cooperation of the Suffolk County Medical Examiner's Office. This presentation is not

for the faint of heart and is intended for adults and mature teenagers.

E.J. Wagner, who has a degree in dramatic arts, has been specializing in tales of suspense for over 20 years. The New York Times describes her as "a compendium of what is lethal and why." She performs regularly at the Museum of Long Island Natural Sciences, SUNY at Stony Brook and has presented her work at numerous other centers on Long Island, as well as on radio and international TV. She served as consultant on Renaissance poisoning for the Arts and Entertainment Network presentation of the BBC's "The Borgias."

This event is sponsored by Brookhaven Women in Science to benefit the Chasman Scholarship Fund. Money from the fund will be awarded to Long Island women who are resuming their education in scientific or technical fields. Renate Chasman (1932-1977) was a theoretical accelerator physicist whose work influenced the design of the electron storage rings at the National Synchrotron Light Source.

Tickets are \$5, and are available at the BERA Sales Office and from the ticket sellers listed below:

	Bldg.	Ext.
Mary Phillips	426	3282
Vicki McLane	197D	2902
Penny Baggett	902B	5154
Harriet Martin	477A	3487
	911C	4853
Gail Williams	460	3338
Sharon Spark	515	4111
Florence O'Brien	490	2837
Bonnie Weslowski	555A	4301
Rae Greenberg	510A	3743
Eena-Mai Franz	703	7103
Ellen Gannon	535	4216
Pat Aud	120	7560



E.J. Wagner

Engineers - Take Note

The Laboratory is considering offering the Professional Engineers License Review Course, on site, in conjunction with Suffolk County Community College. Whether or not the program is offered will depend on the number of employees interested in attending. If it is offered, the course would begin in December and would prepare engineers for Part A of the examination "Fundamentals of Engineering." Contact Pat Knisely at Ext. 7631 if you would be interested in taking this course.

Arrivals & Departures

Arrivals

Bhupinder Bawa Central Shops
 John H. Featherly Physics
 Avraham Gover NSLS
 Kurt A. Wiesenfeld Physics

Departures

This list includes all employees who have terminated from the Laboratory, including retirees:
 Paula A. Broesler Plant Eng.
 Christine Hudak Personnel
 Dorothy C. Luther Plant Eng.
 Daniel W. McPherson Chemistry
 Hugh S. Rhodus Plant Eng.

Speaking Out

Reporter: Anita Cohen Photographer: Peter Horton

On Friday the 13th, when we conducted this "Speaking Out," New York's two teams were riding high. The previous afternoon, the Mets had beaten their rivals, the St. Louis Cardinals, to lead the National League's Eastern Division by a half game. The same night, the Yankees had come within 1½ games of first place in the American League East, by taking the first game in a four-game series from the division-leading Toronto Blue Jays. With all this, we wondered whether BNL'ers were excited about the possibility of New York's teams meeting in a "subway series," and who they'd root for. Whether our question was a jinx, we'll never know, but since then, both teams have had trouble winning. Still, even though things are not as fortuitous as they seemed a week ago, baseball fans know, "It ain't over till it's over."

Jose Medina (Plant Eng.) — I was at the Mets game yesterday. It was a phenomenal game — they won 7-6. I think a subway series is a pretty good possibility. I'd probably root for the Mets because I'm a National Leaguer, an old N.Y. Giants Fan.



Kay Conklin (Medical) — I like the Mets. I always have. I think the Yankees are doing well, and they're making their boss very happy. And as long as they keep going the way they are, there's a good chance there will be a subway series.



John Boccio (DNE) — New York has waited too long for a subway series and I'm eager for one between the Mets and the Yankees — even though I'm still an old Brooklyn Dodgers fan, and I still don't like the Yankees!



Maria Apelskog (TID) — I think it's great that we have the two best teams in the country. Whichever team wins is great, but I'm a Yankee fan. I usually follow the games — while I'm at the bowling alley!



Anthony Fresco (DNE) — It reminds me of when I was a child growing up in Brooklyn, in the 1950s. It was a time of the Dodgers and the Yankees. And I was one of the few Yankee fans on my block. So I think it's good that there's a chance for another New York subway series. It's almost as exciting as when the Yankees used to play the Dodgers.



Joe Scott (Reactor) — I watch baseball all the time. I'm even rooting for the Yankees this year, just so we can have a subway series. Normally, I'd want them to lose but, this year, just to see the Mets beat them, I'd like to see the Yankees win their division.



Bea Pyatt (Medical) — I think it's going to do a lot for New York, money-wise, if they both go into the Series. I don't have a preference for either team, but my husband likes the Mets.



Hsing Cheng (DAS) — I think it's very interesting to watch two New York teams against each other. I think I would root for the Yankees because they have a strong offense, a good batting average. I think that, for winning, that's more important than defense.



Joseph Mead (Plant Eng.) — I'm interested in baseball. I happen to be from the West Indies and I like cricket. You don't have cricket, so I fell in love with baseball, and my favorite team is the Mets. Win or lose, I'm with them all the way, and I hope they have a chance to be in the World Series.



Meyer Steinberg — I'd like to see a subway series. I'm a Yankee fan. I think baseball — to watch it — is boring. I can't sit through a baseball game; neither can I watch it on television. The only time I follow baseball is during the World Series.



Seals

(Continued)

several of the numbered grid squares. Though the shrink tubing and the markings can be manufactured by others, the seal's pattern cannot be reproduced because of the random way the tubing shrinks.

"The seal does not safeguard the cylinder, just the valve," Fiarman underlines. To indicate if the valve itself has been removed from the cylinder, a "tip indicator" is included under the seal. It is much like a child's toy: a steel ball sits inside a plastic cup that is inside a larger plastic container. If the container is tipped, the ball will fall out of the cup. If a sealed valve is unscrewed, the steel ball would fall out of the cup, and even if the valve were screwed back on, it would be impossible to get the ball back in the cup because the entire cylinder can't be picked up and shaken until

the ball falls back into the cup.

The shrink wrap has been tested on 200 cylinders over the last two years. "The only problem found with them is that water gets between the cylinder valve and the seal because these cylinders are kept outside," says Fiarman. So the seals were modified to allow the water to drain. The seals may soon go into routine use by the IAEA. — Marsha Belford

Coming Up

Mathematician Herbert Robbins will give the first Brookhaven Lecture of the season on October 2, at 4:30 p.m., in Berkner Hall. He will talk about "Predicting Your Future from Someone Else's Past."

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A Catcher's Lament

When off my mitt it sadly goes,
 To land quite neatly on my nose,
 And red my poor probiscus glows,
 I'll give my all to softball.
 Tho' foul tips bounce right
 on my head,
 Tho' bat and ball refuse to wed,
 I'll practice til I'm near to dead,
 I live and die for softball.
 When heavy runners knock me flat,
 When balls keep whizzing past
 my bat,
 Thru welling panic I'll stand pat,
 To best this beast called softball.
 Thru ankle sprains and gritty teeth,
 When knees cry out for some relief,
 I'll crouch secure in my belief,
 Someday I'll conquer softball.
 A thrown bat brings me to my knees,
 The pitcher begs me, "Catch this,
 please,"
 Oh no, it's coming straight to me,
 Suspense is king in softball.
 Tho' I know I'll never be called great,
 Would it be too much to ask of fate,
 To let my feet run past homeplate
 Just once, to score for softball?
 But after all is said and done,
 To be a Foul Up's been great fun,
 I'm richer for the friends I've won,
 And I owe it all to Softball!

— L.D. Cuthbert

Cooking Exchange

On Wednesday, September 25, members of the International Cooking Exchange will demonstrate a variety of vegetable recipes.

Exchange meetings are held in the Recreation Building on the second and fourth Wednesdays of each month from 12:30 to 2:30 p.m. Membership is open to employees and their immediate family members. A \$1.25 donation entitles those present to a copy of the day's recipes, samples of the prepared dishes and coffee and tea. Babysitting is provided at 50¢ for each child.

For more details call committee members Susan Sears, 744-7831; Sara Morse, 286-1712; or Rosy Antillon, 282-3222.



League IV, MOLE-ESTERS: Back row (from left) — Clarence Wilkins, Valerie Miller, Angela Boccio, Jim Desmond. Front row — Janet Firriolo, Diana Toledo, Pat Carr, Dave Comstock. Missing from photo — Dave Alexoff, Tom Carr, Melanie Covitz, Denise Monteleone, Rich Ferrieri, Payton King, Connie Koehler.

Softball

Final Standings

League I		
	Won	Lost
Blue Jays	9	3
Ravens	7	5
Cool 'N Gang	6	6
Moles	6	6
Phoubars	6	6
Scram	4	8
Six Pax	4	8

In playoff games for first and second halves:

Cool 'N Gang 11 - Ravens 5
 Cool 'N Gang 8 - Blue Jays 2
 Cool 'N Gang Playoff Winners

League II

Dirty Sox *	12	3
Titans *	11	4
Magnuts	10	4
AMD	9	5
Lights Out	7	7
Faze II	6	8
Medical	3	11
Random Errors	0	14

*Dirty Sox defeated the Titans in a playoff game to break the tie for first place.

League III

Survivors	10	2
Farm Team	9	3
TNT	6	6
No Names	4	8
Nads	1	11

League IV

Mole-Esters	12	3
Septembers	10	5
Who Cares	9	6
Kidz-R-Us	6	9
Turkeys	6	9
Farm Busters	2	13

League V

Foul-Ups	12	3
Mudville Sluggers	11	4
No Feedback	7	8
Space Kadets*	7	7
Simply Awesome	6	9
Underalls*	1	13

* Rained out game not played as it had no bearing on standings.

Islanders Pre-Season Tickets

Tickets for the NY Islanders pre-season home games are now on sale at the BERA Sales Office in Berkner Hall. The eight tickets for each of four games (schedule below) are being sold to employees at a special reduced cost of two for \$30, a savings of \$12.

Schedule:

Saturday, September 28	Buffalo
Tuesday, October 1	Boston
Thursday, October 3	Philadelphia
Saturday, October 5	NY Rangers

Opening sale date for regular season tickets will be announced in the Bulletin on October 4. Schedules will be available for pickup at the BERA Sales Office one week prior to sale date.

(Continued on page 4)

Softball Champions



League I, BLUE JAYS: Back row (from left) — Lou Nieves, Jim Amendola, Nick Pisco, George Oldham, Jerry Shepherd, Bob Medina, Larry Musso. Front row — Kevin Cosgrove, Frank Palmeri, Walt Chornoma, Dennis Hall, Dave Hansen. Missing from photo — Juan Alvarez, Wally Shaffer.



League II, DIRTY SOX: Back row (from left) — Dennis Carlson, Dennis Nordstrom, Ed Gill, Rich DiFranco, Ernie Schmitt, Jim Vaughn, Peter Lane, Sol Pearlstein. Front row — Ken Rogers, Peter Ratzke, Lou Cannizzo, Kevin Wyman, Rick Wilke. Missing from photo — Dave Dougherty, Don Meany, Terry Whitledge.



League III, SURVIVORS: From left — Ruth Faine, Leroy James, Jackie Larrie, Bob Brown, Sharon Smith, Jim Garrison, Ken Sutter. Missing from photo — Vernon Faine, Kay Hunt, Henrietta James, Sydell Lamb, Scott Ryan, Doreen Spiers, Ed Taylor, Rosemary Taylor.



League V, FOUL-UPS: Back row (from left) — Gary Smith, Bonnie Biittner, Walter Kane, Michelle Rabatin, Jay Leonard, Linda Cuthbert, Rich Casella, Sue Pepper, Larry Hoff. Front row — Kimberly Holschuh, Mike Colon, Angela Bernholz, Eric Bernholz, Joan Slavinsky, Ricky Backofen. Missing from photo — Jerry Gaeta, Michelle Riccardio, Alan Schmidtchen.

—photos by Horton

