

# brain waves

## In This Issue

Dear Friends	Page 1
Under the Microscope	Pages 2-3
In Memory of...	Page 3
A Golden Celebration	Page 4
Women's Council Luncheon: Food for Thought	Back Cover

## Campus Life



*Top (left to right):  
James Damron and Patrick  
& Lorill Haynes; Center:  
George & Demetra Avgeris;  
Bottom (left to right):  
Drs. Towle, Dobyys and Hecox*



*Surgery Brain Research Pavilion*

It is official! The Brain Research Foundation has joined the university life. On February 1st, the Foundation set up shop at The University of Chicago.

This is like coming home. The Brain Research Foundation's new offices are located in the William E. Fay, Jr. and Margaret Hoover Fay Surgery Brain Research Pavilion at 5812 South Ellis Avenue. In 1977, after several years of planning and fundraising, the Brain Research

Foundation was proud to have donated \$3,500,000 for the construction of this building which would accommodate members of the recently formed, Brain Research Institute.

Since its dedication, this building has become home to many bright and talented doctors whose research has continued to produce groundbreaking discoveries that benefit humankind. Now the building also includes the foundation behind the discoveries.

On March 27th, we showcased our new space to our board, BRI members and friends of the foundation. Attendees of the open house were given a tour of the renovated offices and enjoyed some delicious food and stimulating conversation. If you were unable join us that evening, we hope you will stop by soon.

# dear friends



## Brain Research Foundation Board of Trustees

William E. Fay, Jr.  
Chairman Emeritus

John D. Mabie  
Honorary Vice-Chairman

John M. McDonough  
Chairman

Robert J. Winter, Jr.  
Vice-Chairman

Thomas A. Reynolds III  
President

Mary H. Smart  
Vice-President/Secretary

David H. Fishburn  
Treasurer

Richard G. Fessler, M.D., Ph.D.  
Ex-Officio

Patricia B. Koldyke  
Ex-Officio

Mary J. Beattie  
Orville C. Beattie

Alger B. Chapman  
Samuel P. Chapman

James W. DeYoung, Jr.  
Anne Economos

Jon T. Ender  
Peter E. Gidwitz

Lorill Haynes  
Patrick J. Haynes III

Lyra Hekmatpanah  
Ex-Officio

Beverly P. Joutras  
John G. Levi

Amy Shackelford Louis  
James L. Madara, M.D.

Ex-Officio  
Richard A. Mayer

Peter B. Pond  
Shirley L. Taubensee

## Honorary Trustees Council

Gwill L. Newman  
Chairman

Margaret H. Fay  
Margaret R. Frank

Nancy W. Hohfeler  
Peter Miller

I want to thank you for your generous response to our annual appeal letter. Even as the country weathers through this difficult financial period, our friends have continued to support essential discoveries in brain research. This year was an outstanding year. Not only was our annual appeal the most successful to date, but it was also an exceptional year for contributions to the Seed Grant Endowment Fund.

I want to thank our benefit co-chairs, Lorill Haynes and John Mabie, for organizing a spectacular evening of dining, dancing and reminiscing. On Friday, May 2, 2003, the Brain Research Foundation held our much-anticipated golden anniversary gala, "A Golden Celebration of Dreams and Discoveries." The Gold Coast Room at The Drake Hotel provided the elegant charm required for this unforgettable occasion. See more details and great pictures on the adjacent page.

Mark your calendars on October 24th for the 4th Annual Neuroscience Day. The Brain Research Foundation is proud to sponsor this day of scientific seminars. Speakers will include Fred H. Gage, Ph.D.,

Salk Institute and Pasko Rakic, M.D., Ph.D., Yale University, as well as various members of the Brain Research Institute at The University of Chicago. I hope some of you will join me in learning about the latest research at the university and throughout the nation.

If you were unable to stop by our open house on March 27th, I hope you will take the time to visit our new offices soon. As soon as you step on campus, you will experience an environment that is full of life and creativity, and understand how scientists become motivated to pursue innovative ideas.

Visit a lab and become inspired!

Sincerely,

Terre A. Sharma, Ph.D.  
Executive Director

# under the microscope

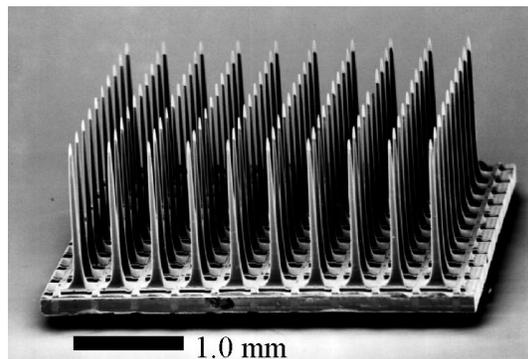
## Development of a brain-machine interface for paralyzed patients

Nicholas Hatsopoulos, Ph.D. is conducting research to improve neural prosthetic technologies and develop a brain-machine for paralyzed patients. Dr. Hatsopoulos' ultimate goal is to be able to have a paralyzed person stimulate and move his or her own muscles through thought control. Since a person with a spinal cord injury has muscles that are intact, a brain-machine interface would be able to override the injury and stimulate muscles directly through brain control.

**These experiments lend hope that people with spinal injuries will be able to someday use their brain to control a prosthetic limb, or even their own arm.**

This brain-machine is made up of three components. The first component is the implant device, or chronic multi-electrode array (Figure 1), that is inserted into the brain. This device records electrical signals from neurons in the motor cortex. Together, these signals create a language or code the brain speaks to control the body, such as a leg

Figure 1

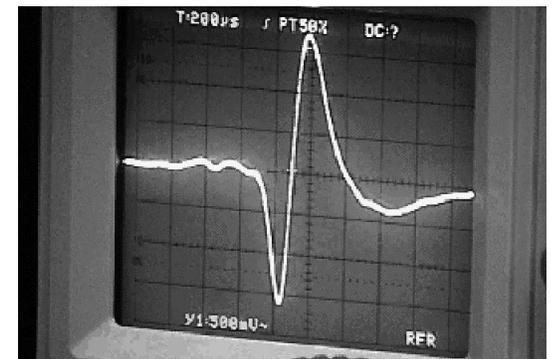


or an arm. In order for a researcher to understand the language of the brain, a computer, located outside or someday inside the body, would translate the signals. The final piece of the brain-machine is an output interface where the decoded signal can drive a computer cursor, robotic arm, prosthetic arm or muscle stimulator.

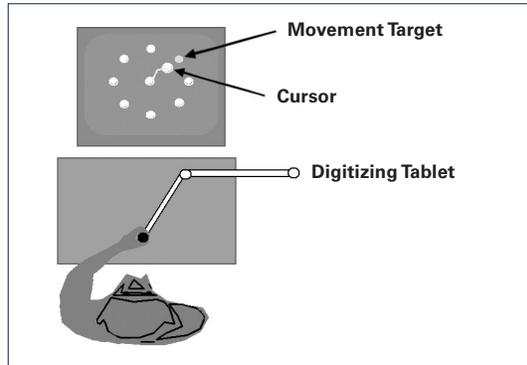
The recording device, or chronic multi-electrode array, is implanted in the brain's motor cortex. The array contains 100 electrodes that are made out of silicon. The signals that are recorded from single neurons in the brain are electrical action potentials, little spikes of activity, that last about 1 millisecond (Figure 2). The question is, how do these little pulses work together to communicate to a limb?

To uncover the answer to this question, Dr. Hatsopoulos needs to decode the neural activity involved with movement. There are two different classes of movements: discrete motor behaviors, and continuous motor behaviors. Discrete movements are common, simple movements, such as grasping a cup or picking up a book. Continuous movements are constant,

Figure 2



**Figure 3**



uninterrupted movements, such as following a fly with a flyswatter. Your hand is tracking a moving object.

Using rhesus monkeys, Dr. Hatsopoulos' lab sets out to understand the neural basis of movement control. The primates are trained with basic conditioning methods, using rewards, to play video games. They are taught to move a cursor, with a joystick, from a central position to a number of discrete peripheral targets (Figure 3). This creates movements in different directions and allows the researchers to record signals from the subject's motor cortex. Looking at the recorded neural activity, they try to uncover a pattern in the impulses that would allow them to predict the direction in which the subject will move the cursor. A slight

change in movement direction changes what the neural activity looks like. This decoding of signals and predicting of movement direction was very successful, up to 90% accuracy.

Dr. Hatsopoulos' next goal is to understand the more complicated, continuous movement. This time the primate is trained, over many months, to track or "chase" a moving target with the cursor. This allows the research team to measure the subject's continuous trajectories of movement. Like previously, they will determine a pattern in the recorded neural activity and then predict the continuous trajectory of the subject.

After all of this conditioning, they now want to see if the primate can move the cursor by using his brain, not with a joystick. Similar to biofeedback, the primate uses his thoughts to move the cursor. Interestingly, the time it takes to move the cursor to the target with his brain is about the same time it takes to move it with his arm and joystick. This last experiment lends hope that people with spinal injuries will be able to someday use their brain to control a prosthetic limb, or even their own arm.

#### **In Memory of...**

##### **Malcolm Cooper, M.B.Ch.B (1936 – 2003)**

Dr. Malcolm Cooper was a pioneer in the use of positron emission tomography (PET) to study how the brain functions in health and disease. He worked closely with the Brain Research Foundation to build the first PET scanner in the state. At the time of his death, Malcolm Cooper, M.B.Ch.B. was an Associate Professor and Director of Research in the Department of Radiology and the Franklin McLean Memorial Research Institute at The University of Chicago. He was 66.

##### **Rita Jennings-Forrestal (1931 – 2003)**

Rita Jennings-Forrestal was Executive Director of the Brain Research Foundation from 1976 – 1988. During those twelve years, she was devoted to raising funds for the Brain Research Institute at The University of Chicago. She spearheaded a campaign to raise money for the university to build the first PET scanner. From 1988 to 2000, she served on the foundation's board and became a liaison to the university. She was 72.

##### **Kate S. Levi (1917 – 2003)**

Kate Sulzberger Levi, widow of former U.S. Attorney General and University of Chicago President Edward Levi, died in March. Mrs. Levi was an extremely well respected individual. She was an active community leader on various civic boards. She also served on the Women's Board of The University of Chicago and the board of the Juvenile Protection Association at the time of her death. She was 85.

1. The Fay Family 2. Dr. Kurt Hecox 3. Robert Winter, Jr., Honorary Chair Gwill Newman, Dr. Bryce Weir, Nancy Hohfeler 4. Jay Levine, Mary Ann Childers, Co-chairs Lorill Haynes and John Mabie 5. William E. Fay, Jr. and Bobby Short 6. The Frank Family and friends



# A Golden Celebration

On May 2, 2003, the Brain Research Foundation celebrated its golden anniversary in the Gold Coast Room at the world-famous Chicago Drake Hotel. Over three hundred people were in attendance for this memorable occasion.

**Co-chairs Lorill Haynes and John Mabie organized a spectacular evening that raised nearly a half a million dollars for brain research.**

Masters of Ceremonies Jay Levine and Mary Ann Childers entertained the audience and introduced several special people involved with the Brain Research Foundation, such as Honorary Chair Gwill Newman and

Board President Thomas A. Reynolds III. The festivities focused on honoring the two families that were most important in the foundation's existence and longevity, the William E. Frank, Jr. and Clinton E. Frank Families. Bill and Margaret Fay, Margaret Frank and Cyndi McCarthy were on hand to accept a beautiful hand-painted enamel box with a personalized inscription. And there is no better way to top off an evening than with a captivating performance from the world-renowned cabaret singer-pianist, Mr. Bobby Short and his orchestra.

**Top Three Raffle Winners**  
**Mike Miller**  
 \$10,000 Cash  
**Manon Seebeck**  
 Designer Sapphire Earrings  
**Nell Fay**  
 Sterling Silver Atlas Watch



*(left to right): Jay Levine, Mr. & Mrs. Michael Miller and Mary Ann Childers*

# food for thought

## Women's Council Luncheon

On October 23, 2002, the Women's Council of the Brain Research Foundation held their fall luncheon at Le Méridian Hotel. Over 40 people were present to listen to a leading authority on multiple sclerosis (MS).

Dr. Anthony T. Reder, from the Department of Neurology at The University of Chicago, explained that MS is one of the most common diseases of the nervous system, yet researchers do not completely understand this sometimes devastating disease. MS is thought to be an autoimmune disease that affects the central nervous system. Several factors appear to be

involved in MS, including genetics and environmental triggers. Most people are diagnosed with MS between the ages of 20 to 50. Interestingly, twice as many women as men have MS.

Many new treatments have been developed over the last ten years. However, none have been the "magic bullet" for this disease. To make matters more difficult, Dr. Reder stated that researchers now feel there is more than one kind of MS. Even though this complexity may slow down research, it certainly does not stop the quest for a cure.

For more information on the Brain Research Foundation, please call (773) 834-6750 or visit our website at [www.brainresearchfdn.org](http://www.brainresearchfdn.org)

5812 South Ellis Avenue  
MC 7112, Room J-141  
Chicago, Illinois 60637

Non-Profit  
Organization  
U.S. Postage  
PAID  
Chicago, IL  
Permit No. 8374

