Newsletter

College of Physical and Mathematical Sciences

November 2007

In this issue:

Adam Woolley Wins Award	1
A Statement from the NIH Director	2
Izatt-Christensen Lecture Series	2
How to make a tiny wire and connect it to DNA	3
Statistics study on NBA essentials	4
College Publications	5

BYU chemist wins government's 'highest award' for young scientists

Joe Hadfield

The White House named Brigham Young University chemist Adam Woolley a winner of the highest award the government offers to young scientists, citing his research on detecting cancer marker proteins.

Woolley is one of 58 researchers across the country awarded this year's Presidential Early Career Award for Scientists and Engineers. It's the first such award to a BYU professor. Woolley is also the only Utahan in this year's crop of winners.

"I am delighted for Professor Woolley and for BYU," said Academic Vice President John Tanner. "This is a significant recognition for a young scientist. It speaks highly of Professor Woolley's past accomplishments and bodes well for a bright future."

The National Institutes of Health nominated Woolley for the award and funds his work on the development of miniature devices that separate and analyze proteins. The NIH-funded project aims to enable these devices to detect liver cancer at early stages.

"Adam is an exceptionally talented scientist who combines that talent with an outstanding work ethic," said Paul Farnsworth, chair of the Chemistry and Biochemistry Department at BYU. "He adds dedicated teaching and citizenship to his scholarly achievements, making him, in my view, an excellent model for young faculty at BYU."

A ceremony held Nov. 1 in Washington included a group photo with President George W. Bush on the north portico of the White House.

Woolley earned a bachelor's degree in chemistry from BYU in 1992. He went on to complete a Ph.D. at Cal-Berkeley in 1997 and was a postdoctoral fellow at Harvard before returning to teach at BYU in 2000. In addition to his work on protein analysis, Woolley collaborates with BYU scientists on two other projects. One is a multi-disciplinary team at BYU working on a new approach to making nano-electronic devices. The other project aims to develop enhanced methods for chemical separations.

According to The Office of Science and Technology Policy, the award was established in 1996 to honor "the most promising researchers in the nation within their fields." With the award, Woolley gets up to five years of funding from the NIH to further his research on miniature protein analysis devices. More information about the award program is available at http://www.ostp.gov/.

Important Dates & Events in the College

College Christmas Social
Friday December 14, 11:30am-1:30pm
Pendulum Court of the ESC

Spring Research Abstracts Submittal
January 15 - February 29, 2008

College Annual Banquet
January 18, 2008 WSC Ballroom

A Statement from the NIH Director, Elias A. Zerhouni, M.D., Regarding the 2006 NIH-Supported Presidential Early Career Award for Scientists and Engineers (PECASE) Recipients

"NIH is extraordinarily proud of supporting 12 PECASE winners who have, early in their research careers, shown exceptional potential for scientific leadership during the twenty-first century — the essence of this award. We look forward to continued innovation from these outstanding investigators as they push the frontiers of medical research during this pivotal time for scientific discovery."

Eleven NIH grantees and one intramural scientist have been selected by the White House Office of Science and Technology Policy to be among this year's 58 researchers to receive the Presidential Award. Since the program began in 1996, NIH has now funded a total of 129 PECASE recipients. A complete list of NIH-supported PECASE recipients and program information is available at http://grants.nih.gov/grants/policy/pecase.htm.

The Office of the Director, the central office at NIH, is responsible for setting policy for NIH, which includes 27 Institutes and Centers. This involves planning, managing, and coordinating the programs and activities of all NIH components. The Office of the Director also includes program offices which are responsible for stimulating specific areas of research throughout NIH. Additional information is available at http://www.nih.gov/icd/od/.

The National Institutes of Health (NIH) — *The Nation's Medical Research Agency* — includes 27 Institutes and Centers and is a component of the U.S. Department of Health and Human Services. It is the primary federal agency for conducting and supporting basic, clinical and translational medical research, and it investigates the causes, treatments, and cures for both common and rare diseases. For more information about NIH and its programs, visit www.nih.gov.

First Izatt-Christensen Lecture Series

Featuring Sir J. Fraser Stoddart of Northwestern University

Sir J. Fraser Stoddart of Northwestern University presented two lectures during Brigham Young University's first annual Izatt-Christensen Lecture series sponsored by the Department of Chemistry and Biochemistry Thursday and Friday, Nov. 15-16.

Admission to these lectures was free and the public was invited to attend. The topic of Sir Fraser's first lecture was "Mingling of Art with Science" and was held Thursday. His second lecture, "Chemistry and Nanotechnology in Tomorrow's World," was held Friday .

Sir Fraser is a pioneer in nanoscience and organic chemistry. He has received many prestigious awards for his work, including the International Izatt-Christensen Award in Macrocyclic Chemistry, the Nagoya Gold Medal in Organic Chemistry, the King Faisal International Prize in Science and several awards from the American Chemical Society. He occupies the Fred Kavli Chair in NanoSystems Sciences at the University of California, Los Angeles, directs the California Nanosystems Institute and recently joined the faculty at Northwestern University, where he will direct the Center for the Chemistry of Integrated Systems. An alumnus of Scotland's Edinburgh University, Sir Fraser also holds honorary doctorates from BYU, Birmingham University and The Netherlands' University of Twente. This year, Queen Elizabeth II appointed him as a Knight Bachelor for his services to chemistry and molecular nanotechnology. The lecture series is named for Reed M. Izatt and James J. Christensen, the initiators of BYU's internationally recognized joint research program in chemical thermodynamics and chemical separations. During their careers, these scientists authored or coauthored nearly 900 books, book chapters and peer reviewed articles. They also hold many U.S. and foreign patents.

This endowed lecture is made possible by the generous donations from the scientists' family members, associates and former students.

Nature and electronics meet: How to make a tiny wire and connect it to DNA

Joe Hadfield

Using the structure of DNA as electrical circuitry in computer chips may shrink the costs of production in the field of nano-electronics.

In a new study published in *Chemistry of Materials*, a team of Brigham Young University scientists introduces a method for making tiny wires on an insulating surface and connecting them at pre-determined points on a strand of DNA.

"We're using a bottom-up approach to see if we can get things like DNA, proteins and other chemicals to assemble exactly where we direct them," said Matthew Linford, associate professor of chemistry and biochemistry at BYU. "We hope this will provide new models for shrinking the size for semiconductor chips."

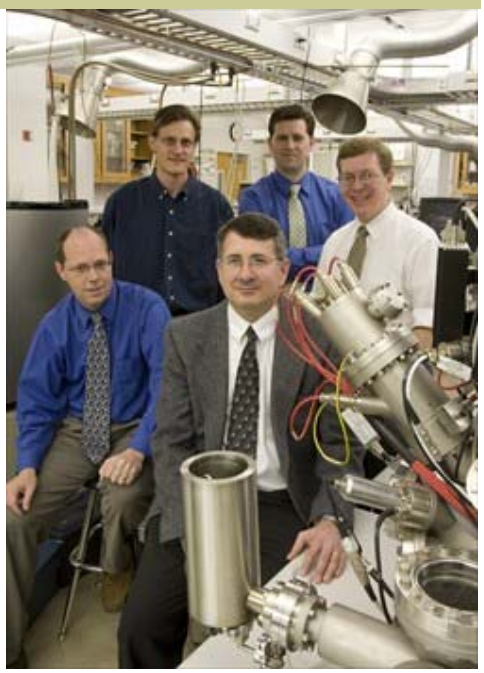
The study's publication coincides with the award of a $1 million grant from the National Science Foundation for the BYU researchers to continue the project. The grant will fund the project for four years with the goal of advancing the use of DNA as a template for tiny electrical circuits.

The process begins by etching a carefully controlled pattern onto a surface using an atomic force microscope. This is done in a chemical solution that leaves an extremely thin layer of metal over the pattern, making tiny wires. To these wires, the researchers bind strands of DNA that become the scaffolding for an electrical circuit.

"What we are borrowing from nature is the great flexibility DNA has to form a wide variety of shapes," said Robert Davis, associate professor of physics and astronomy at BYU. "The DNA is also robust and can handle a wide variety of conditions."

Along with the prospect for developing a cheaper way to make computer chips, the researchers hope their work leads to devices that are packed more densely than today's semiconductors.

The project crosses three disciplines at BYU: chemical engineering, chemistry and physics. Joining Linford and Davis on the NSF grant award is John Harb, professor of chemical engineering and associate dean of the Ira A. Fulton College of Engineering and Technology; Dean Wheeler, assistant professor of



chemical engineering; and Adam Woolley, associate professor of chemistry and biochemistry. Students at the graduate and undergraduate level also assist the project in the lab and benefit from exposure to scientific fields other than their major.

"This is providing the students with outstanding training across a number of disciplines," Linford said. "If you go into industry, people have problems to solve and it doesn't matter what discipline you tap into to solve that problem."

Statistically speaking: BYU study shows assists and teamwork important to winning on the court

By Loren Jorgensen—Deseret Morning News

Luke Walton of the Los Angeles Lakers is a solid NBA player, but nobody would consider him a superstar by any stretch of the imagination. After all, the fifth-year small forward has never averaged more than the 11.4 points he scored per game last season.

Yet Walton may do more to help his team win than any other single player in the NBA, if you are to believe recent statistical analysis done by Brigham Young University statisticians. BYU statistics professors Gil Fellingham and Shane Reese and master's student Garritt Page compared the value of 13 box score statistics from an entire NBA season across the five player positions to see how much each contributed to winning games.

Ross D. Franklin, Associated Press—Common logic might have you believe that Kobe Bryant, center, does more to help his team win than Luke Walton. Statistics would tell you different.

Their findings? Small forwards who assist teammates and don't turn the ball over are golden. Of all the combinations of stats and positions, the study found that assists by small forwards contribute the most to a team's likelihood of winning. Meanwhile, turnovers by small forwards do more harm than turnovers by players at other positions.

That's where Walton comes in. His combination of averaging more than six assists with fewer than three turnovers per 48 minutes played last season at the small forward position makes him incredibly valuable, according to the BYU statistics.

"A lot of people wouldn't think of Walton being great because he doesn't light up a stat sheet in scoring," said Reese. "But the fact that he's starting on a team that can spend a lot of money on players shows that his coach values his contribution. ... Our analysis would give Luke Walton huge weight for the production he provides for his team."

The statisticians actually used the 1997-98 season for their study, which was recently published in a scientific journal. That season was the second year the Chicago Bulls beat the Utah Jazz in the NBA Finals. A follow up with a later season or season, which has yet to be done, could show how things have changed in the NBA in the past decade, but Reese suspects assists would still be the biggest indicator at each position of a player's success toward helping his team win.

That's because they found passing the basketball to set up a score is more important than actually making a field goal when it comes to winning, according to the analysis. "My initial guess would have been that field-goal percentage was the biggest thing," said Reese. "But that was quite a bit less impact than assists at every position."

That can explain some of the success for the Jazz last season, which led the NBA with 24 assists per game en route to a Northwest Division championship and two rounds of playoff victories. "This suggests having a group of players play as a single unit increases the chances of winning a game," Fellingham said.

Added Reese, "It really showed playing team basketball is best. I don't think modern NBA philosophy would agree with that, where it is very much about the individual player. But it speaks volumes for Jerry Sloan and his philosophy of basketball. Our paper really validates that coaching style."

Other findings show that steals by centers are more closely related to winning than steals by any other position. Last season's leader in that category was Ben Wallace of the Chicago Bulls, who averaged two steals per 48 minutes played. "It was a little surprising, but if your center gets more steals than your opponent's center, it has a fairly big impact on final score differential," said Reese.

Another difference maker was offensive rebounds by point guards. Getting to the offensive glass for point guards more than the opposing point guard was more valuable than offensive boards by other positions. Jason Kidd of the Nets was the leader in that stat, averaging 2.2 offensive boards per 48 minutes last season.

Also important, according to the BYU study, are defensive rebounds by shooting guards, a category led by Josh Childress of the Atlanta Hawks last season, with 8.3 defensive boards per 48 minutes. Analyzing box score statistics has limitations, of course. But the authors of the study feel the analysis could have value in game preparations."I'm a statistician, not a basketball guy," said Fellingham. "But I think a coach could look at these trends and it could help him exploit favorable matchups."

The study can be found in the current issue of the Journal of Quantitative Analysis of Sports.

College Publications

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