Newsletter

College of Physical and Mathematical Sciences

January 2005

Long hours pay off for faculty, students working KBYU/Utah Colleges Exit Poll

Y-News

BYU political science professors Kelly Patterson and Quin Monson didn't get much sleep in the days leading up to Nov. 2. Then again, neither did statistics professors Howard Christensen and Dan Williams. Dale Cressman and Robert Walz of the Communications Department, or Mark Phillips of KBYU, not to mention countless others.

Patterson and Monson, who co-teach a class on exit polling, were only two members of a team that spanned disciplines, departments and even colleges to put together the KBYU/Utah Colleges Exit Poll, now in its 22nd year.

The College of Family, Home and Social Sciences, the College of Physical and Mathematical Sciences, and the College of Fine Arts and Communications all played a vital role in organizing the only statewide, student-run exit poll in the nation.

On Election Day, some 1,000 student volunteers from eight universities fanned out to polling places across Utah to survey voters as they left the voting booths. The collected results were used to project winners on Election Night and now serve as an invaluable database for researchers looking to understand voting behavior in Utah.

Political science undergraduates wrote the survey and then recruited and trained the volunteer pollsters under the guidance of Patterson and Monson. Both undergraduate and graduate statistics students designed the survey sample with the help of Christensen and Williams. And broadcast communications students—mentored by Cressman and Walz and producer Mark Phillips—produced the Election Night coverage on KBYU, featuring the results of the poll and related commentary.

To see the fruits of this large-scale collaboration, voters only had to read the papers or watch TV in the days after the exit poll accurately predicted the six races it called. On Election Night, television channels 2, 4 and 13 carried parts of KBYU's coverage, and the next day the Salt Lake Tribune featured BYU's numbers in several articles. Tribune columnist Vince Horiuchi referred to the students as the "best pollsters" in a column about election coverage highs and lows.

Those who worked on the project agree it proved more rewarding than taxing.

"There were a lot of meeting," said Phillips, who produced not only the Election Night broadcast but also several student-organized candidate debates. "But when we have students who rise to the occasion, that's always gratifying for me."

The exit poll was the brainchild of David Magleby, now dean of the College of Family, Home and Social Sciences, who in 1982 was a young political science professor new to campus.

He called up statistics professor Howard Christensen and said he was putting together an exit poll as an educational experience for the students.

Christensen signed onto the project and in time the Statistics Department assumed more and more of the planning burden. Today Christensen is the only member of the original team who is still involved with the exit poll.

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In the month of January:

- Jan. 4—first day of Winter 2005
- Jan. 11—Devotional: Eldter Glenn L. Pace
- Jan. 17—Martin Luther King holiday
- Jan. 18—Devotional: President and Sister Samuelson
- Jan. 25—Forum: Paul Woodruff, author of "Reverence."

In this issue:

BYU researchers target substance that helps immune system kick in

By Greg Lavine

The Salt Lake Tribune

11/16/2004

In the quest to better understand how the immune system works, researchers in Utah and Illinois appear to have uncovered a key substance that helps fight problems ranging from diabetes to cancer.

Studying mice and human cells, scientists at Brigham Young University and other institutions around the world uncovered a substance that activates natural killer T cells. These specialized T cells are key in determining whether the body's immune system attacks a health threat or ramps down its response.

Paul Savage, a BYU chemist, said the missing key is an antigen, a molecular substance that serves as a signal for the immune system. When this antigen is absent, the body creates few or no natural killer T cells.

"They really determine what type of immune responses are produced," Savage said of the T cells. The paper, authored in part by Savage and scientists from the University of Chicago, appears in the online version of the journal *Science*.

Knowing what this antigen looks like should allow scientists to determine where and how it is produced in the human body, he said.

When natural killer T cells are absent, a host of autoimmune diseases can occur, including Type I diabetes, lupus, multiple sclerosis and rheumatoid arthritis. In these medical problems, the body's immune system attacks itself.

The natural killer T cells direct other types of T cells to attack or ignore an unwanted visitor. Without these directors, it seems that T cells can rage out of control and create unneeded immune responses.

A link between natural killer T cells and some autoimmune diseases could lead pharmaceutical companies to target future treatments toward stimulating or suppressing the production of natural killer T cells, Savage said.

Albert Bendelac, a University of Chicago immunologist involved in the study, said there remains some debate over whether a lack of natural killer T cells causes autoimmune problems. He said it is a promising idea, but that some research is needed.

In addition to autoimmune problems, the work on natural killer T cells also holds potential for other health issues.

"They seem to be involved in a variety of anti-cancer activities," Bendelac said.

When cancer first appears in the body, it contains substances that prompt the body's immune system to produce natural killer T cells. A proper immune system response can eliminate the attacker before it takes hold and spreads, Bendelac said.

But when the immune system creates no natural killer T cells, the cancer can grow unchecked.

Researchers believed the trigger, or antigen, to create natural killer T cells was a lipid, which is a type of molecule. It remained unclear which of dozens of lipids was involved.

University of Chicago scientists studied laboratory mice that had been bred to have trouble producing a variety of lipids from a class known as glycolipids. Each group of mice was missing a different glycolipid than another group.

The group unable to produce natural killer T cells provided the clue about which missing glycolipid was key to the immune malfunction.

"It was just some great detective work at Chicago," Savage said. University of Chicago research Dapeng Zhou served as lead author of the study.

BYU's role in the study was to synthesize, or manufacture, this glycolipid, which was then tested in mouse and human cells. In each case, the glycolipid made natural killer T cells more active, Bendelac said.

"This current study by Dr. Bendelac and his colleagues provides the most compelling information so far on the identity of the [antigen trigger that creates natural killer T cells]," said Steven Porcelli, a researcher at Harvard University, Cambridge, Mass., who was not part of the study.

"A major goal in this field of research has been to identify the molecular signals that are involved in switching these cells on," Godfrey said. "The study by Zhou and colleagues offers an important piece to this puzzle."

If further research confirms that role of the glycolipid as the main key to switching on and off natural killer T cell production, the molecule would provide a tempting target for future drug therapy in cancer and autoimmune diseases, he said.

BYU graduate students Ning Yin and Ying Gao were involved in the study. BYU and the University of Chicago worked with the following groups: the Scripps Research Institute, La Jolla, Calif.; the National Institutes of Health, Bethesda, Md.; Gateborg University, Gateborg, Sweden; the Chinese Academy of Sciences, Beijing, China and the University of New Hampshire, Durham, N.H.

Poll, continued from page 1

"This is an exciting experience every two years," he said. "There's nothing quite like the pressure of getting into the TV studio and being asked, "Can we call this race? Should we call this race?""

It's a rush that makes up for all the hours spent in meetings, and all the sleepless nights, the professors agreed.

Celebrating sparkling success: Local founder of synthetic diamond process celebrates golden anniversary

By Grace Leong

Daily Herald

12/17/2004

Up until 50 years ago, only Mother Nature could make diamonds.

But on Dec. 16, 1954, H. Tracy Hall, an Ogden native and a scientist with General Electric in Schenectady, N.Y., broke that monopoly when he successfully created the first man-made diamond from carbon.

Hall's legacy is a multibillion dollar industry that his invention helped create in the past few decades and several generations of synthetic diamond cutter, grit and product makers. These cutters are used in industries including mining, oil and gas, aerospace, automotive, glass and ceramics, electronics and construction in Utah, nationally and globally.

Thursday, more than 150 industry participants gathered at a symposium at the Provo Marriott to mark the 50th anniversary of the first successful diamond synthesis process and to pay tribute to Hall, who now suffers from Alzheimer's disease.

Diamond cutters are typically found in masonry saws, mining drill bits, polishing machinery and cutting tools, But synthetic diamonds are increasingly used in everyday applications such as dentist drills, masonry saws, glass cutters, polishing equipment and even knife sharpening.

Eye glasses that once took weeks to order are now available within an hour, and road repairs that once required noisy jackhammers can now be made with precision-grinding diamond saw blades.

More than 10 industry experts spoke Thursday on the need to invest more in research and development to find new applications for the synthetic diamond, to reduce its wear-out rate, and foster a more open forum to share ideas on innovating technology.

That focus had led to a bout of industry consolidation in Utah in recent months. These include Provo-based maker Novatek Corp.'s $21 million merger with ReedHycalog, an oil and gas drill-bit maker, in June, and Orem-based U.S. Synthetic Corp.'s merger with Dover Resources, a diversified industrial products maker, in September.

"Novatek is reinventing itself by jumping on the trend toward using synthetic diamond picks instead of tungsten carbide picks to break up asphalt and resurface roads," Said Louis Pope, founder of U.S. Synthetic. Novatek began as a synthetic diamond cutter maker for the oil and gas industry, and is now exploring applications with asphalt.

And U.S. Synthetic, an Orem maker of synthetic diamond grit, specializes in making polycrystalline diamond inserts for the oil and gas drilling and mining industry. Today, the company is also exploring potential medical applications for synthetic diamonds in hip replacements.

Terry Kane, executive director of Industrial Diamond Association of America Inc., agreed.

"The aerospace and automotive industries are using more exotic materials like superalloys such as silica aluminum, which is light but strong, to make planes and cars, and the only thing that cuts through these alloys are synthetic diamond cutters," Kane said.

All this would not have been possible without Hall's pioneering invention—the belt press, which replicated the critical high temperature/high pressure conditions deep within the earth where diamonds are formed.

Christian Hultner, managing director of Element Six, formerly De Beers Industrial Diamonds, attributed the existence of the South African synthetic and natural industrial-grade diamond supplier to Hall's belt press invention.

"We would not be competitive without the belt press," said Hultner as he presented Hall with an hourglass filled with Element Six's best synthetic diamond grit on Thursday.

"But now, evolving the belt press to beat the cost of used technology to become more competitive is critical."

Born in 1919 and raised on a farm in Marriott, a rural northern Utah town, Hall became interested in real life heroes as a young boy, particularly men like Thomas Edison. He devoured books about Edison at the Ogden public library.

At a young age, he determined he would one day work for Edison's company, General Electric. That dream became a reality in 1948, after he obtained his doctorate degree from the University of Utah and joined General Electric Research labs in New York. Hall, who became director of research and professor of chemistry at Brigham Young University in 1955, also contributed to the founding of several industrial diamond product makers in Utah.

In 1966, he partnered with Bill Pope and M. Duane Horton, two other BYU professors, to found MegaDiamond in Provo.

Today, MegaDiamond is owned by Smith Tool. But other Utah companies were formed as a result of that venture, including Novatek, US Synthetic, and PreCorp, a Spanish Fork specialty tool maker.

To date, the industry generates more than $100 million in sales annually and has created more than 500 jobs in Utah, said David Hall, founder of Novatek and Hall's son. Globally, the finished diamond tools industry is valued at up to $5 billion, while the raw materials industry is valued at more than $1 billion, said Kane of Industrial Diamond Association.

Much of the credit there can go to Hall, who on the morning of Dec. 16, 1954, knew he had created history when he first saw "the flashing light from dozens of tiny crystals . . . and knew that diamonds had finally been made by man."

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