

25th Anniversary Waller Memorial Lecture Series

By Chris Wolverton

If you have ever wondered what the *real* difference is between olive oil and peanut oil, and how it is that plants can make so many different kinds of oils, you would have enjoyed the 2000 Waller Lectures. Professor John Browse of the Institute of Biological Chemistry at Washington State University was on hand to explain the "ins and outs" of fatty acid biosynthesis in plants.

Celebrating Science. This year marked the 25th anniversary of the A.E. Waller Memorial Lecture, and in addition to the usual festivities, Mr. & Mrs. Lynn Waller and the Waller family compiled a booklet commemorating this special occasion. It was a delightful atmosphere at the lecture, with much of the Waller family and their guests in attendance along with plant scientists from the campus community.

An informative and enlightening general lecture on June 8th covered issues related to the development of young scientists, as well as new models for funding basic research and biotechnology. Dr. Browse drew upon his recent experiences in establishing a

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Dr. John Browse (2nd from left) was the featured speaker at the 25th Waller Memorial Lecture. Members of the Waller family participated in this prestigious event including (1st left) Edward Waller, holding the Waller commemorative booklet, and Lynn Waller (1st right) sons of Professor A. E. Waller. Mr. Carlos Suarez (2nd from right), a friend of the Waller's was also in attendance.

Transitions

By Dick Sayre, Chair

The 1999-2000 academic year brought many changes to the Department of Plant Biology. This year saw the retirement of Dr. Mike Evans, one of the Department's outstanding educators and researchers. Mike published over 100 peer-reviewed articles during his career and maintained a record of extra-mural grant support that would be the envy of many a scientific investigator. Perhaps Mike's greatest legacy, however, is the students and postdocs that he trained. In recognition of their high regard for Mike many of his former students traveled cross-country and from Europe to honor Mike at his retirement symposium (see accompanying article). Fortunately for the Department Mike isn't going too far. He will maintain his research program, hopefully for many years to come.

The "Other" OSU. This year also saw the hiring of Dr. Biao Ding as an Associate Professor of Plant Biology (see accompanying article). Dr. Ding comes to the Department from the Botany Department at Oklahoma State University (the "other" OSU) and is recognized as a world leader in

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Cell Networking Is Essential to Life

By Dr. Biao Ding

“Read my lips.” We talk every day - to our family members, friends and our colleagues. We talk face-to-face, via telephones, faxes, telegrams, letters, and e-mails. Such talks enable us to identify ourselves and behave harmoniously in a community and in the society, make all games possible, and enable us to travel far and fly high. Not only do we humans talk. The tiny cells that make up our body talk to each other all the time. So do plant cells. The basic questions my research tries to answer are: how do cells talk to one another and how does such communication enable an organism to grow and function properly? I use plants as my systems of studies. Some general principles, however, could apply to humans and animals.

Cell talking is essential to life. Here’s one example of the importance of cell talk in life. Think about the development of a human or plant individual starting from a single cell. This cell divides and produces millions of cells that make up a body. If all cells that come from this very first cell were identical, there would be just a mass of cells and no body parts or organs. So subsequent to cell division, cells gradually become different from each other, a process called differentiation. These different cells build different organs that perform different functions. All together, they make a functional animal or plant body. The burning question is: how do cells that ultimately come from a single cell become so different? A simple answer is that during specific stages of development the cells use or express different genes. This leads to the formation of distinct types of cells. Then, how do cells know what genes to express to make them distinct? It is because they talk to each other! When doing so, a cell finds out what it and its neighbors are supposed to do. Not only is cell talk essential to the proper development of an organism, it is also essential to run the daily lives of all cells in our body. When you are reading this story, the cells in your eyes and cells in your brain are engaging in active communications! Now the next question is: how do cells talk so they know the correct things to do? We don’t know all the answers yet. Many scientists in the world are working, individually and as teams, to come up with some answers. Being part of a team to reach a common long-term goal is what keeps doing science interesting and rewarding.

Cell talking in plants – a moving story. The seed for my passion for studying plant cells was sown in my first year at Beijing Forestry University, when I took a Plant Anatomy course, which is about plant cells and tissues. Among all of the subjects I studied, nothing thrilled me more than the sight of the tiny cells in a light microscope. In particular, seeing the chloroplasts, the tiny bodies within a leaf cell that capture sun’s energy to feed the whole world, “dancing” within a cell was absolutely exciting. This seed of passion finally started to grow four years later when I attended the Graduate School at Cornell University. Among the number of things I studied at Cornell were the plant cell structures that network all cells for communication, under the supervision of Professors Mandayam V. Parthasarathy and Robert Turgeon. These structures, called plasmodesmata, are very tiny holes made of proteins and lipids that go across the rigid walls that “separate” plant cells. Many molecules flow between cells through plasmodesmata. Plasmodesmata are so small that we have to use an electron microscope to magnify them at least 100,000 times to see their detailed structure. Using several techniques to prepare cell samples and a powerful electron microscope, we obtained perhaps the clearest views of the plasmodesmata structure to date. These views, recorded on photos, were used to reconstruct a three-dimensional structural model of the plasmodesmata, which has been used by many scientists around the world to discuss how things move between plant cells.

After receiving my Ph.D. degree at Cornell, I continued working on plasmodesmata as a postdoctoral fellow in the laboratory of Professor William Lucas at the University of California, Davis. Professor Lucas’ lab was starting to use novel systems to study how things move through plasmodesmata. For many decades, scientists thought plasmodesmata were so small that only small molecules like sugars and

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amino acids could move through them. At Davis, we used a very fine glass needle to inject proteins and RNAs that would glow, because they were artificially tagged with special dyes, into plant cells. With the help of a special microscope called a fluorescence microscope, we were able to watch that certain glowing proteins and RNAs move quickly between cells. These include proteins that control when and where in a plant body a particular gene should be expressed. Why is this significant? It implies that intercellular movement of certain proteins may well be a way for cells to talk to each other. Recent studies showed that such intercellular protein exchange also occurs in animals.

Viruses hijack plant pathways to spread from cell to cell.

While intercellular movement of protein and RNAs is an essential plant function, plant viruses appear to have evolved mechanisms to hijack this function to spread their infectious materials from cell to cell. Plant viruses have either an RNA or DNA genome, which encodes special proteins for the viruses to replicate, to move intercellularly, and even to combat the plant defense systems. Viral infections cause billions of dollars in losses to world agricultural



Listening to cells talk. Dr. Biao Ding works with a fluorescence microscope in his laboratory in Rightmire Hall.

production each year. A virus won't cause much damage to a crop if it stays in just a single cell. However, damaging viruses have ways to make long treks from cell to cell in an infected plant. They do so by using some of proteins they make, called movement proteins, to open the holes of plasmodesmata to allow the viral RNA or DNA to pass through. My lab has been investigating how a movement protein opens plasmodesmata and moves itself between cells. We use a protein, called green fluorescent protein from jellyfish, to tag to a viral protein and then follow where the protein goes in a plant under a fluorescence microscope. Once we understand completely how a virus moves within a plant, we'll be able to find ways to curb this movement and therefore rescue crops from being damaged by viral infections.

Movement from the Heartland to Buckeyeland. After three years in Davis, I established my own lab, as an assistant professor, in the Botany Department at Oklahoma State University in Stillwater, Oklahoma. It was a wonderful experience. As a scientist doing basic research, you have the freedom of pursuing scientific issues that you judge to be important and that interest you. It is challenging and yet gratifying. One of the most rewarding aspects, among making new scientific discoveries, is the opportunity to meet and befriend colleagues from all corners of the world. It is truly awesome that although we use our own languages for daily lives, we all use the same language in scientific exchanges.

A few good years in the heartland gave me a chance to establish my own research programs and widen further my views of the world. Just as my favorite proteins traffic from one cell to another, my lab moved from one OSU to another in the summer of 2000. I'll continue working on figuring out how things move between plant cells, with the help of powerful research tools such as a confocal microscope which can visualize plant cells or tissues as thin slices without physically cutting the cells or tissues apart, and molecular and genetic techniques which allow us to identify plant proteins that serve as switchboards that regulate intercellular traffic of all kinds of information molecules and viruses.

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Leading the Way: Chris Wolverton Wins Graduate School Leadership Award for 2000

By Dr. Mike Evans

Chris Wolverton was a recipient of this year's Graduate School Leadership Award. The award recognizes graduate students who have served with distinction in University organizations, on University Committees, and in the larger community. Chris' nomination was based on his exceptional service to the Department of Plant Biology while maintaining a strong record of scholarship and research. He was recognized for his leadership role in organizing or facilitating events such as the Waller Lecture and the annual graduate student recruitment symposium. Chris has also served as President of the Plant Biology Graduate Student organization for the past two years and has taken on other tasks such as coordinating the interaction of graduate students with job candidates and serving as the Department's representative on the Dean's Graduate Student Liaison organization.

Going the Extra Mile. Nomination letters from the Chair and from Chris' advisor also recognized his unselfishness in helping to solve staff computer problems which arise on a regular basis and his active participation in positive public relations for the Department through his contributions to a video highlighting some of the research of this Department and his interaction with the media in 1998 during NASA's "John Glenn Shuttle Flight" (STS-95) which carried an experiment designed in part by Chris.

Chris was among eight students campus-wide who received the award in a ceremony held in the Grand Lounge of the Faculty Club on June 6. He was presented with a plaque and a \$200 book award. The award not only brings recognition to Chris for his accomplishments but also reflects positively on the Department of Plant Biology and the quality of its students.

Answer to the photo question: The photo of the original greenhouse was taken in 1914 and faces west towards the Olentangy River.



Chris Wolverton (center) received the Graduate School Leadership Award for 2000. He is pictured talking with Lynn Waller during the 25th Annual Waller Lecture.

Focus on the Plant Biology Graduate Program

By Dr. Randy Scholl

The graduate program of the Department of Plant Biology covers all areas of modern experimental plant biology including molecular biology, development physiology, gene regulation, and biochemistry. This quarter 23 students are enrolled in the graduate program, most working toward their Ph. D. degrees. Students come from all parts of the U.S., as well as South America, India, China and Korea. The academic credentials which these students bring to the program are outstanding. The Plant Biology graduate program competes with the best plant molecular biology programs in the nation.

All graduate students of the Department are supported by fellowships of different types. Approximately one-half of the students are Graduate Teaching Associates (GTAs) and earn their support by assisting the faculty in recitation and laboratory duties. The majority of the remainder are supported by Graduate Research Associateships (GRAs), for which they conduct laboratory research in their advisor's laboratory. The funding for the GRAs comes from research grants awarded to the faculty. Additional support is in the form of first-year and final-year Fellowships awarded by the Graduate School on a competitive basis.

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Symposium Honors Evans' Retirement

Professor Michael Evans retired on April 1, 2000 after 30 years of service in the Department of Plant Biology. Mike received his Master's degree from the University of Michigan in 1963 and his Ph.D. from the University of California at Santa Cruz in 1967. He joined the faculty at OSU in the fall of 1970 after serving three years on the faculty at Kalamazoo College in Michigan and completing a NATO Postdoctoral Fellowship at the University of Freiburg in Germany. The Department celebrated the occasion on March 15 with a research symposium attended by former students and postdoctoral fellows from the Evans lab.

Chairman Richard Sayre made introductory comments including an overview of Mike's 30 years in the Department and Miller McDonald from the College of Agriculture reviewed Mike's many interactions with colleagues in that college including his frequent service on student committees, especially in the Department of Horticulture and Crop Science (HCS).

Roots of Discovery. Symposium speakers included Dr. Rainer Hertel from Albert-Ludwigs Universitaet in Germany: "How Can Phycomyces Help the Suffering Mankind?" Dr. Hertel was Mike's postdoctoral advisor and also spent a year in Mike's laboratory as a visiting distinguished professor. Dr. Karl Hasenstein (University of Louisiana), a former Postdoctoral Fellow in Mike's laboratory presented: "The Magnetic Side of Gravity - From Mike to Space" and Dr. Mary Jo Vesper (former graduate student and current Associate Dean at the University of Dayton) presented: "Acid, Auxanometers and Avena Rooms." Dr. Stanley Roux (University of Texas at Austin), a research colleague with a common interest in gravitational biology presented: "Gravity-directed Polarity Development in Single Germinating Fern Spores: Studies at 1-g and Micro-g." Following these presentations, people from Mike's laboratory presented updates on current research in the Evans laboratory. Speakers from the Evans lab included Dr. Hideo Ishikawa (Adjunct Associate Professor): "A B C, DEZ," Chris Wolverton (Ph.D. student): "Two Distinct Regions Drive Curvature in Root Electrotropism," and Jack Mullen (Ph.D. student): "Responses to Constant Gravitropic Stimulus Using a Feedback System."

These presentations were followed by comments from Dr. Evans on 30 years of teaching and research at Ohio State after which the entire group adjourned to the Faculty Club for a reception and luncheon. During the reception, Dr. Sayre presented Mike with a beautiful petrified wood art piece/plaque and Steve Myers (Chair of the Department of Horticulture and Crop Science) presented Mike with a wood carving by David Ferree (faculty member in HCS), commented on Mike's career, and recalled being a student in one of Mike's courses years ago.

Routes to Adventure. After the reception and luncheon, Mike's band, the Toll House Jazz Band (a traditional or "Dixieland" jazz band) presented a 40-minute concert, featuring solos by Mike on the banjo. The band has performed both nationally and internationally and performs regularly in Columbus. The events of the day were rounded off by a reception at the Evans home in the evening.

Although Mike has retired from teaching and service, he has been appointed

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Evans Retirement Symposium speakers
(from left) Dr. Rainer Hertel, Dr. Mary Jo Vesper, Dr. Mike Evans, Dr. Karl Hasenstein and Dr. Stanley Roux.

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The 1999-2000 year was eventful for the program. Six new students joined the Department, four students completed graduate degrees, one first-year and one final-year Fellowship were awarded, and one student received the prestigious service award from the Graduate School. Some of the highlights of the 1999-2000 academic year include:

Mr. Chris Wolverton received the prestigious Graduate School Leadership Award, which recognizes his participation in Departmental and University service activities. This award is bestowed on only a few students each year. In addition, Chris was awarded a Presidential Fellowship by the Graduate School, which enables him to conduct his final year of graduate studies without teaching or other duties. This Fellowship is awarded to approximately 20 students University-wide each quarter. This award recognizes Chris' substantial publication record (five peer-reviewed articles) to date. We congratulate Chris on his achievements.

Ms. Doreen Ware was accepted into a two-week workshop on bioinformatics that was held in October at the prestigious Cold Spring Harbor Laboratory on Long Island, NY. The enrollment in this course was on a competitive basis, and this experience will contribute to Ms. Ware's graduate education.

Three students advised by faculty of Plant Biology Department received their Ph.D. degrees in the 1999-2000 academic year. They are Jane Geisler Lee, Hai Li, and Mauricio Ramirez. All three are moving on to post-doctoral study. Ms. Li is in the laboratory of Dr. Joe Ecker at the Salk Institute, La Jolla, CA. Mr. Shihong Mao received his M.Sc. degree in 1999-2000.

The Department is pleased to welcome six new students into the program for the 2000-2001 academic year. This new class represents a diverse and talented group. They are: Mr. Min-Gab Kim, who previously held a research assistant position at Columbia University, NY; Ms. Niloufer Irani, from India, who holds the M.Sc. degree; Ms. Neela Kumari, M.S. degree from India; Mr. Genqing Liang, Hebei, China, who is transferring from the graduate program at Oklahoma State University; Ms. Jessica Lucas, B.S. degree, from Springfield, IL; Ms. Chitra Raghunathan, B.S. degree, from Pune, India. The Department is pleased to welcome these highly-qualified new students.

The Department is currently in the process of recruiting new students for the next class, and the 23 current enrollees are busy in the classroom and laboratory. We are looking forward to another good year in graduate training and achievement.



Graduate students Genqing Liang (far left) and Neela Kumari (far right) provide research assistance in Dr. Biao Ding's lab. Dr. Yali Zhu (2nd from left) is also a member of Dr. Ding's (3rd from left) research team.



The Autumn Welcome Reception was enjoyed by students, faculty and staff. Ling Xiong (left), a graduate student from China, asks staff member, Jill Williams (right) about Department policies.

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the field of intercellular communication and its regulation. Dr. Ding's research greatly strengthens the cell biology component of the Department. He also brings to the Department advanced microscopic instrumentation (laser confocal) capabilities. These capabilities will be greatly enhanced by the deconvolution microscopic facilities awarded to Dr. Fred Sack and colleagues through a National Science Foundation grant.

The Department continued to enhance its commitment to providing the best possible training for its undergraduate majors. Dr. Jennifer Smith organized and directed the new Plant Biology undergraduate student organization. The Department also hired two outstanding senior undergraduates, Ms. Toshia Myers and Ms. Karen Weise, as laboratory teaching assistants for the first time. Their teaching evaluations were among the best in the Department. This year we continue to provide teaching opportunities for exceptional undergraduates. In addition, our faculty provide outstanding research experiences for undergraduates. Nearly half of the research presentations at the College of Biological Sciences Undergraduate Research Symposium were from students mentored by Plant Biology faculty.

The 2000-01 academic year will continue to bring many changes to the Department. We will be searching for an additional faculty member, conducting a complete review of the undergraduate curriculum and major, assessing technology needs, and expanding our outreach to the community. We invite your input into this process and I encourage you to contact us.

Please visit us on the web at: www.biosci.ohio-state.edu/~plantbio/plantbio.html or contact us by phone at 614/292-8952.

Richard T. Sayre, Chair

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as Professor Emeritus in the Department of Plant Biology and will retain his laboratory space and continue with his funded research. Mike currently holds three research grants and we look forward to his active participation in the research activities of the Department for many years to come.

Waller Lecture *from page 1*

research consortium funded by private industry to focus on the engineering of seed oil crops. His visit was capped by an exciting lecture on Friday afternoon describing the isolation and characterization of several new mutants related to fatty acid biosynthesis and regulation.

In between lectures, Dr. Browse was offered a "behind the scenes" look at the Department through meetings, informal conversations and a dinner, all hosted by the graduate students. Professor Waller, a longtime faculty member of the Department, endowed the lecture series because he strongly believed that graduate students should have an opportunity to interact with eminent scientists. From its inception in 1976, the series has been entirely organized by students. Plans are underway for the next Waller Lecture, to be held in Spring Quarter, 2001.



Shadow Student. Dick Sayre, Department Chair, (left) hosted Mick D'Arcy (right) from the Shadow Student program at Columbus Alternative High School. Mick spent the day "shadowing" Dr. Sayre and happened to make his visit on the same day as the retirement symposium for Dr. Mike Evans. Mick attended the presentations made by the speakers and joined in many informal discussions during the day. He commented that what impressed him most about his experience was the enthusiasm and passion that the speakers exhibited about their various areas of expertise. What a valuable lesson to learn at a young age—to "seek your bliss."

A useful web site for links for kids' science projects— and general interest in plants— is:

<http://www.botany.org/bsa/www-bot.html>.

The web site is hosted by the Botanical Society of America.



Remember when?

- Can you guess what structure is pictured here?
- What year was it photographed?

The answer is on page 4.

Cell Networking *from page 3*

Life and science. The Ding family is still learning about Columbus and the state. My wife Yan is a veteran Chinese teacher and she now teaches a weekend Chinese course for Chinese children adopted by American families. My son Arthur attends first grade and my daughter Adeline goes to pre-school. My whole family enjoys music and we have family performances on some social occasions – just for fun. Arthur and Adeline are both taking piano lessons. This gives me a chance to pick up piano practice again after a ten-year break. We enjoy biking, walking and swimming. Arthur and Adeline are particularly excited when we explore nature trails in parks. I enjoy photography, in research as well as in life. We all look forward to be called true Ohioans someday.

Behind the Scenes. We wish to thank the following individuals for their contributions to *Plant Biology News*: Photographs provided by Mike Evans, Debra Gamble and Joan Leonard. Text formatting by Jill Williams.



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