

“Jumping Genes” aid delivery and discovery in small cereal grains

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PIPRA, The Public Intellectual Property Resource for Agriculture, is an organization committed to the strategic management of intellectual property owned by universities and not-for-profit research institutions, encouraging the broadest applications of existing and emerging agricultural technologies for the development of subsistence crops for developing countries and specialty crops in developed countries.

www.pipra.org

Using a form of genetic hitchhiking, **UC Berkeley** scientists have developed a method to deliver genes in barley and other cereals using a naturally occurring system in maize. This method could ease safety concerns and minimize gene-silencing.

The new method uses so-called “jumping genes” to ferry new genes around the genome. The process does not use viral particles for transporting genes, does not rely on antibiotic-resistance markers nor does it result in extraneous DNA being present in the resulting plant. “Our method is available for use by plant biologists to create new varieties of cereal crops in a manner that is rapid, safe and less work-intensive than many other methods,” says UC Berkeley Cooperative Extension Specialist, **Peggy G. Lemaux**, who conducted the proof-of-concept work with post-doctoral researchers, **David McElroy**, **Thomas Koprek** and **Jaswinder Singh**.

A major challenge in genetically engineering small grain cereals, like wheat, barley and oats, is maintaining expression of the genes over time. Grains are surprisingly adept at stifling the implanted gene's activity, a proc-

ess known as gene silencing. Lemaux and her colleagues devised a way to surmount this hurdle, by engineering genes to hitchhike on mobile pieces of DNA, known as transposons or jumping genes – responsible for the mosaic color pattern in Indian corn. They hop from place to place inside the genome aided by the enzyme, transposase.

By removing transposase during genetic segregation, the transposed gene can be stabilized in a location that is devoid of selectable marker genes and plasmid backbone DNA.

Expression of the transposed gene is more stable with only ~10% of events becoming silenced after four generations, rather than the 80-90% that can be seen in lines developed by bombardment-mediated introduction.

Lemaux believes that this is an improved technology for gene delivery in cereal crops that addresses some of the difficult issues raised by other gene introduction technologies, and wants to make it available for use in the public sector. **(See U.S. patent 6,951,972 on Page 3.)**



Photo courtesy of Barbara Alonso, University of California, Berkeley.

Now 35 PIPRA members

Welcoming Oregon State, University of Tennessee, UC Riverside, the St. Augustine University of Tanzania, and CIP

This winter three US and two international research institutions have become members.

Researchers at **Oregon State University** had engaged PIPRA staff to study the IP landscape around plant growth regulators. In the process the institution formalized its PIPRA relations.

University of Tennessee selection systems were featured in the last PIPRA newsletter. Now they are in the PIPRA community.

Researchers at **University of California, Riverside** have long known and supported PIPRA.

Now the entire California Ag Experiment Station (UC Davis, UC Berkeley, and UC Riverside) is represented.

The **International Potato Center (CIP)**, located in Lima, Peru, is one of the centers of the CGIAR. CIP is a longstanding center of excellence in breeding and research.

The **St. Augustine University of Tanzania** is the first African research institution to join PIPRA. Newly founded in 1998, this private university is soon to open an agricultural research center.

FTO analyses at PIPRA

PIPRA's multiple activities are all built upon a bedrock of careful analysis. Specific technologies are scrutinized in order to understand whether and how Freedom to Operate (FTO) can be maximized for applications in specialty crops or humanitarian projects. The work begins with PIPRA staff or affiliated law school students (*see article in Issue 1 of the PIPRA Newsletter*) conducting a thorough background search of prior art in the patent and scientific literatures. Once complete, the file is reviewed by a patent attorney in PIPRA's growing *pro bono* legal network.

To suggest or request other analyses, or to consult with PIPRA on the results of completed analyses, contact Alan Bennett, Sara Boettiger, or Cecilia Chi-Ham. (*See Contacts on page 4.*)

PIPRA analyses completed:

- **Fruit E8 Promoter**
- **Constitutive FMV-34S Promoter**
- **Inducible Heat Shock Promoter**
- **Rubisco Promoter**
- **Kanamycin/Antibiotic resistance**
- **Transbacter™ (two opinions)**
- **P-DNA Plant Transformation Borders (two opinions)**

PIPRA analyses in process:

- **Inducible Estrogen Promoter**
- **Constitutive Actin Promoters (monocot and dicot)**
- **Peptide Deformalase Plant Selectable Marker System**
- **ABC Transporter Plant Selectable Marker System**
- **Transposon-based Elimination System**

PIPRA collaborating with Brazilian IP Law Center and Light Years IP

PIPRA has been fortunate to add two new organizations to our growing network of collaborators. The **Instituto de Direito do Comércio Internacional e Desenvolvimento (IDCID)** is a non-governmental and non-profit organization that aims to foster research activities and other advanced scholarly work in the fields of international trade law and development, on a local and regional basis in Brazil. We will be working with the IDCID on agricultural intellectual property issues as we prepare for our 2006 Latin American workshop.

Light Years Intellectual Property is a not-for-profit association adapting modern IP marketing, asset management and licensing techniques to help developing and least developed

countries increase export income. Most recently they have been involved in providing technical assistance and training needed to effectively manage Ethiopian coffee producers' intellectual property assets, including assistance with international trademark registration and licensing.

For more information:

IDCID: www.idcid.org.br

Lightyears Intellectual Property:
www.lightyearsip.net

"All that you have which is extra is needed by others. What you have more than enough of is needed by the poor."

-St. Augustine

Transbacter™ applications publish

In our last newsletter we announced that PIPRA is collaborating with BIOS to develop plant genetic transformation tools based on accessible public sector technologies. (*See Issue 2 of the PIPRA newsletter.*) Specifically, the pPIPRA vector project is being designed to work with the Transbacter™ gene transfer system. On December 29th USPTO published applications [20050289667](http://www.uspto.gov/patent/publications/20050289667) and [20050289672](http://www.uspto.gov/patent/publications/20050289672) titled "Biological gene transfer system for eukaryotic cells" and listing Richard A. Jefferson of Canberra, Australia, as inventor. These patent applications describe the Transbacter™ technology and can be licensed under the BIOS open source license.



Josef Geoola, was one of PIPRA's first undergraduate interns. After graduating from UC Davis in December with a Bachelor's in microbiology, Josef joined PIPRA as a full-time IP analyst. His work is supporting FTO analyses and technology landscapes, such as a project on Pierce's disease, a disease affecting grape and citrus cultivation. After gaining cutting edge experience in biotechnology patents at PIPRA, Josef plans on going to law school to pursue a career in patent law.



A PIPRA global summit in the works

The Rockefeller Foundation's Bellagio retreat center in Italy is intended "to bring together individuals for intense periods of discussion, debate, and collaboration around significant issues and problems." PIPRA will be hosting an international workshop at Bellagio in late 2006 to explore the possibilities for a "Global Alliance for Access to Public Intellectual Property in Agriculture".

The central question of the workshop will be how PIPRA can work to address issues of technology access globally.

PIPRA began in 2004 as a coalition of U.S. public sector research institutions. Since then, however, institutions from Canada and a number of other international locations have joined. (See, for example, "[Now 35 PIPRA members](#)" on Page 1 and the list of "[Current PIPRA Member Institutions](#)" on Page 4.)

The PIPRA model is based upon collaboration among public sector technology providers, which share common institutional mandates and similar IP access problems. Members seek to mobilize their IP base to address technology access problems. For this reason, representatives are being invited from institutions around the world that

are active technology providers in the area of the agricultural life sciences. These include institutions from the international agricultural research community, developed countries such as Australia, Japan, and Europe, and leading "innovative developing countries" such as India, China, and Brazil.

The objectives of the meeting will be threefold:

- To explore ways for PIPRA to interface with public sector agricultural research institutions in the capacity of being technology providers around the world.
- To identify elements of a common philosophical framework to promote technology access.
- To discuss how to link multiple research and IP management models through shared resources.

Insights and results from this exercise will be communicated to the larger community and used to develop a global strategy among public sector institutions for technology access in agriculture.

2006 PIPRA Membership Meeting Reminder Orlando, Florida March 1st 2006

Time is growing short. Sign up for the PIPRA annual meeting and join us for review of latest developments in agricultural IP, strategy setting, planning PIPRA's next steps, and networking with PIPRA staff and members: www.pipra.org/main/membershipmeeting2006.htm

The meeting will be on March 1, one day prior to the **2006 AUTM Annual Meetings** (March 2 -4) at the same venue, the **Disney's Yacht & Beach Club Resort**, in Orlando, Florida.

New Applications and Patents by PIPRA Members

New patent applications published:

University of Arizona, US 2005/223431, October 6, 2005, Methods of modulating glucosinolate production in plants

University of Florida, US 2005/246790, November 3, 2005, Regeneration system for grape and uses thereof

Iowa State University, US 2005/268352, December 1, 2005, Materials and methods for the alteration of enzyme and acetyl CoA levels in plants

Noble Foundation, US 2005/273887, December 8, 2005, Stress resistant plants

Michigan State University, US 2006/005265, January 5, 2006, Ryegrass CBF3 gene: identification and isolation

Salk Institute, US 2006/005278, January 5, 2006, Ethylene insensitive plants

New patents granted:

University of California, US 6,951,972, October 4, 2005, Transposon tagging and gene delivery in small grain cereals

Boyce Thompson Institute, US 6,984,776, November 15, 2005, Method of protecting plants by introduction of a gene coded for a protein which enhances virus infection of host insects

Noble Foundation, US 6,974,895, December 13, 2005, Transgenic legume plants modified to produce resveratrol glucoside and uses thereof

University of California, US 6,974,896, December 13, 2005, Trace element phytoremediation

Rutgers University, US 6,987,215, January 17, 2006, Translation control elements for high-level protein expression in the plastids of higher plants and methods of use thereof

University of Arizona, US 6,987,025, January 17, 2006, Dwf4 polynucleotides, polypeptides, and uses thereof

Current PIPRA Member Institutions

1. Arizona State University, as represented by Arizona Technology Enterprises LLC
2. Boyce Thompson Institute
3. Cornell University
4. Donald Danforth Plant Science Center
5. Fundación Chile, Chile
6. Iowa State University
7. International Maize and Wheat Improvement Center (CIMMYT), Mexico
8. International Potato Center (CIP), Peru
9. International Rice Research Institute (IRRI), Philippines
10. Kansas State University
11. Michigan State University
12. North Carolina State University
13. Ohio State University
14. Oregon State University
15. Parco Tecnologico Padano, Italy
16. Purdue University
17. Salk Institute
18. St. Augustine University of Tanzania
19. Samuel Roberts Noble Foundation
20. State University of New Jersey, Rutgers
21. University of Arizona
22. University of Arkansas, Division of Agriculture
23. University of California-Berkeley
24. University of California-Davis
25. University of California-Riverside
26. University of Florida
27. University of Georgia Research Foundation
28. University of Idaho
29. University of Kentucky
30. University of Missouri-Columbia
31. University of Saskatchewan, Canada
32. University of Tennessee
33. University of Wisconsin, Wisconsin Alumni Research Foundation
34. Virginia Tech, College of Agriculture and Life Sciences
35. Washington State University

PIPRA's 2005-6 Executive Committee

Gerard Barry

Golden Rice Network Coordinator
International Rice Research Institute (IRRI)
 E-mail: g.barry@cgiar.org

John Byatt

Associate Director, Life Sciences
University of Florida
 E-mail: jbyatt@rgp.ufl.edu

Carlos Fernandez

Fundación Chile
 E-mail: cfernandez@fundacionchile.cl

Lisa Lorenzen

Director of Industry Relations & Biotechnology Liaison
Iowa State University
 Email: llorenze@iastate.edu

Henry Lowendorf

Associate Director
 Office of Cooperative Research
Yale University
 Email: henry.lowendorf@yale.edu

Irvin Mettler

Senior Licensing Officer
 Office of Technology Licensing
University of California-Berkeley
 E-mail: imettler@berkeley.edu

Karel Schubert

Vice President, Technology Management & Science Admin.
Donald Danforth Plant Science Center
 E-mail: kschubert@danforthcenter.org

PIPRA Staff and Contact Information

Contact

PIPRA

Plant Reproductive Biology Building
 Extension Center Drive
 University of California
 Plant Sciences, Mail Stop 5
 Davis, CA 95616-8780

Tel: +1 (530) 754-6717
 Fax: +1 (530) 752-2278

www.pipra.org

[Alan Bennett](#), Executive Director
 Email: abbennett@ucdavis.edu
 Phone: +1 (530) 754-1411

[Sara Boettiger](#), Program Director
 Email: sara.hearn@ucop.edu
 Phone: +1 (530) 754-6725

[Cecilia Chi-Ham](#), Research Scientist
 Email: clchiham@ucdavis.edu
 Phone: +1 (530) 754-6717

[Josef Geoola](#), IP Analyst
 Email: jngeoola@ucdavis.edu
 Phone: +1 (530) 754-6717

[Gregory Graff](#), Research Economist
 Email: gdgraff@ucdavis.edu
 Phone: +1 (530) 752-2705



PIPRA's offices and laboratory at the University of California, Davis