

Institute for Integrative Genome Biology
FY 2012-13

ANNUAL REPORT

(Report must be typed or Word processed - handwritten forms will not be accepted. Four copies of this annual report should be routed to the Office of Research.)

Institute Director: Natasha Raikhel

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Period of Review: 2010-11

Name of Center:

Institute for Integrative Genome Biology

Title: Distinguished Professor, Plant Cell Biology; Ernst
and Helen Leibacher Endowed Chair

Department: Botany & Plant Sciences

College: College of Natural & Agricultural Sciences



Director's Signature

Date

INSTRUCTIONS: Please submit four (4) copies of this review to the UCR Office of Research, University Office Building Room 200 and (1) copy to the College Dean as appropriate. For information about the process for preparing an annual report, please contact the Office of the Vice Chancellor for Research at 951.827.5535.

A1. GENERAL NARRATIVE: Please provide a short statement highlighting the main activities in which the center has engaged during the review period and how they relate to the mission, goals and objectives of the research center and to the challenges/issues/problems central to the work of the research center. How did the center contribute to UCR's graduate and undergraduate teaching programs? What activities did the center provide to UCR's external communities?

MAIN ACTIVITIES RELATED TO MISSION, GOALS, AND OBJECTIVES:

IIGB SEED GRANTS

In an effort to promote cutting-edge multi-disciplinary research in genomics, bioinformatics, microscopy and proteomics at UCR, IIGB and the Research & Economic Development Office (RED) sponsored six starter grants of \$5K each to assist in the development of innovative research and/or the exploration of new approaches. The starter grants were intended to provide preliminary data in support of obtaining extramural funding and the use of multiple core facilities and disciplines was encouraged.

As determined by a committee composed of Glenn Hicks, David Carter, Thomas Girke and Songqin Pan and based on the criteria above, the following were selected as award recipients based on their proposals:

Thomas Eulgem (BPS)
Establishing a mechanistic basis for hormensis in Arabidopsis
(genomics, bioinformatics)

Sean Cutler (BPS)
Target identification by co-chromatography
(proteomics)

Ma (PPM) and Dahanukar (ENT)
Characterization of a novel chromatin remodeling protein in Arabidopsis and Drosophila
(genomics, microscopy)

Bradley White (ENT)
Genotyping by sequencing for high throughput quantitative and population genomics in malaria mosquitoes
(genomics, bioinformatics)

Michael Allen, Matthew O'Neill, Edith Allen (BPS)
Characterizing the introduction dynamics and genetic variation of the invasive grass Bromus rubens
(genomics)

Chunhua Zhang and Natasha Raikhel (BPS)
Endosidin 2 (ES2): Identification by biotin affinity matrix combined with mass-spectrometry(MS) proteomics analysis
(proteomics)

CEPCEB 10TH ANNIVERSARY SYMPOSIUM

CEPCEB celebrated its 10th anniversary with a full-day symposium on Friday, December 14, 2012 in the Genomics Auditorium. The program featured five external speakers, including our Noel T. Keen Lecturer, three CEPCEB speakers, an interview video of CEPCEB members and a powerpoint presentation of past and present CEPCEB researchers created by Strategic Communication. The day attracted 120 researchers and included lunch and refreshments, an awards ceremony honoring outstanding research achievements by CEPCEB lab members, closing statements by CEPCEB's founding director Natasha Raikhel and succeeding director Julia Bailey-Serres, and a reception. The event was organized by CEPCEB members Julia Bailey-Serres and Linda Walling.

TWO NOBEL LAUREATES PARTICIPATE IN 2013-13 IIGB SEMINAR SERIES:

Due to the efforts of IIGB Seminar Coordinator **Alex Raikhel**, the following two Nobel Laureates accepted invitations to present talks at UCR:

Andrew Fire, recipient of the 2006 Nobel Prize in Physiology and Medicine, launched the 2013 IIGB seminar series with a presentation on Friday, February 22, 2013 at 12:10pm in the Genomics Auditorium titled: "Dynamics of antibody and small RNAs populations: tracking adaptive immune responses through effector repertoires." Fire is a member of the National Academy of Sciences and of the American Academy of Arts & Sciences. He serves on the Board of Scientific Counselors and the NIH's National Center for Biotechnology. He has received and shared numerous awards, including the Maryland Distinguished Young Scientist Award, Meyenburg Prize, Genetics Society of America Medal, National Academy of Sciences Award in Molecular Biology, Passano Family Foundation Award, Wiley Prize, H.P. Heineken Prize in Biochemistry and Biophysics, Warren Triennial Prize, Rosenstiel Award, Gairdner Award, Massry Prize and Ehrlich/Darmstaedter Prize. In 2006, the Nobel Prize in Physiology and Medicine was awarded to Andrew Z. Fire and Craig C. Mello "for their discovery of RNA interference".

Nobel Laureate **David Baltimore** presented a talk titled "Using Viruses to Fight Viruses" as part of the IIGB Seminar Series on Monday, April 15, 2013 in HUB 302S at 12:10pm. David Baltimore, former president of the California Institute of Technology (1997-2006) and President Emeritus and the Robert Andrews Millikan Professor of Biology at Caltech, was awarded the Nobel Prize in 1975 in Physiology or Medicine for his research into viral replication that provided the key to understanding the life cycle of retroviruses. Baltimore is an accomplished researcher, educator, administrator and public advocate for science and engineering and is considered one of the world's most influential biologists. He has profoundly influenced national science policy on such issues as recombinant DNA research and the AIDS epidemic.

Academic Recruitments:

TWO FACULTY POSITIONS IN MAMMALIAN VIROLOGY/EPIGENETICS

In order to strengthen UCR's expertise in state-of-the-art mammalian biology programs and be more competitive for project grants and other funding opportunities sponsored by NIH and private foundations, two college searches were conducted simultaneously in 2012-13. The following individuals served on a college-search committee to recruit two assistant professors in the area of mammalian virology/epigenetics.

Epigenetics Search Committee Members:

Xuemei Chen, Botany & Plant Sciences (Epigenetics Position Chair)
Natasha Raikhel, Botany & Plant Sciences
Karine Le Roch, Cell Biology & Neuroscience
Yinsheng Wang, Chemistry
Jikui Song, Biochemistry

Virology Search Committee Members:

Shou-Wei Ding, Plant Pathology & Microbiology (Virology Position Chair)
Sarjeet Gill, Cell Biology & Neuroscience
Anupama Dahanukar, Entomology
I-Chueh Huang, Cell Biology & Neuroscience
David Lo, Biomedical Sciences

An offer was made to **Weifeng Gu** from the University of Massachusetts Medical School for the epigenetics assistant professor position, who would be housed in the Cell Biology & Neuroscience department. The offer was accepted. An initial offer was made to Stacy Horner from the University of Washington, for the virology position, who declined. A second offer was then made to **Alex B. Balazs** from Caltech – who also declined.

BIOINFORMATICS ACADEMIC COORDINATOR RECRUITMENT

As the current Director of Bioinformatics Facilities, Thomas Girke, became a full-time faculty appointment in the Botany & Plant Sciences department effective July 1, 2012, a college-search recruitment was conducted for an Academic Coordinator Level III to manage the IIGB/CEPCEB Bioinformatics Core Facility. The following members served on the committee:

Search Committee Members:

Thomas Girke, Botany & Plant Sciences (Chair)
Jason Stajich (Plant Pathology & Microbiology)
Julia Bailey-Serres (Botany & Plant Sciences)

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Anandasankar Ray (Entomology)
Glenn Hicks (Botany & Plant Sciences)
Stefano Lonardi (Computer Sciences & Engineering) – Outside Member

An offer was made to **Sean MacEachern** from Cobb-Vantress, Inc. in Siloam Springs, Arkansas, who declined the offer. The search was reinitiated in FY 2014 since the second round failed to secure an appropriately qualified candidate.

AWARDS/HONORS

Yinsheng Wang Receives First Biemann Award at UCR (June 2013)

IIGB/CEPCEB professor and chemist Yinsheng Wang was the first person at UC Riverside to receive the Biemann Medal, awarded by the American Society for Mass Spectrometry (ASMS) to an individual early in his/her career in recognition of significant achievement in basic or applied mass spectrometry. Wang received the medal and gave an award lecture in June 2013 at the annual conference of the ASMS in Minneapolis, Minn. The medal is accompanied by a cash prize of \$5,000.

Wang focuses his research on discovering the biological consequences of DNA damage and on unraveling mechanisms of action for anti-tumor drugs and environmental toxicants. His laboratory's use and development of mass spectrometry, synthetic organic chemistry, biochemistry and molecular biology to understand, at the molecular level, how various DNA damage products are repaired, and how they perturb the efficiency and fidelity of the flow of genetic information during DNA replication and transcription.

The Biemann Medal was established by contributions from students, postdoctoral associates and friends to honor Klaus Biemann, a biochemist at the Massachusetts Institute of Technology. Nominees for the award must be within the first 15 years of receiving the Ph.D. at the time of nomination.

UCR Today dated June 25, 2013: <http://ucrtoday.ucr.edu/16046>

Susan Wessler Elected to Country's First Learned Society (May 2013)

Renowned IIGB/CEPCEB geneticist Susan Wessler has been elected a member of the American Philosophical Society (APS), the country's first learned society. She is the first faculty member at UC Riverside to be elected a member of the APS.

The APS has played an important role in American cultural and intellectual life for more than 250 years. It was founded in 1743 by Benjamin Franklin for the purpose of "promoting useful knowledge." Membership in the APS is entirely honorary and reflects extraordinary accomplishments in all fields of intellectual endeavor. This year, the APS offered membership to 34 new members.

"It is humbling to be elected to membership in the historic APS," Wessler said. "I am delighted that my contributions to plant genetics and the contributions of my current and former students have been recognized by the institute."

UCR Today dated May 3, 2013: <http://ucrtoday.ucr.edu/14469>

Xuemei Chen Elected to the National Academy of Sciences (April 2013)

IIGB/CEPCEB researcher Xuemei Chen was elected a member of the National Academy of Sciences (NAS) for her excellence in original scientific research. Membership in the NAS is one of the highest honors given to a scientist or engineer in the United States. Elected along with 83 other new members and 21 foreign associates from 14 countries, Chen brings the number of current IIGB faculty elected to the NAS to four (three in CEPCEB - Chen, Natasha Raikhel, Susan Wessler; one in CDVR - Alexander Raikhel) out of 6 at UCR.

Chen started her independent career as an assistant professor at the Waksman Institute, Rutgers University, NJ, in 1999. During the studies of floral patterning genes, she and her group became one of the first discoverers of microRNAs in plants and subsequently a major force in dissecting the biogenesis, modification, and degradation of microRNAs. In 2005, she won the Board of Trustees Research Fellowship for Scholarly Excellence at Rutgers University. Chen moved to UC Riverside in 2005, and was promoted to full professor in the Department of Botany and Plant Sciences in 2009 and an endowed chair professor in 2010.

Chen is frequently invited to speak at key national and international meetings where her seminal contributions have established her as a recognized leader in both the plant and RNA silencing research communities. In 2011, she was named a Howard Hughes Medical Institute – Gordon and Betty Moore Foundation Investigator. She is the recipient of the prestigious Charles Albert Shull award from the American Society of Plant Biologists and the University Scholar Award from UCR.

UCR Today dated April 30, 2013: <http://ucrtoday.ucr.edu/14274>

Natasha Raikhel Recipient of ASPB Adolph E. Gude, Jr., Award (April 2013)

IIGB Director **Natasha Raikhel** was announced the recipient of the 2013 American Society of Plant Biologists (ASPB) Adolph E. Gude, Jr., Award This monetary award is granted every three years in recognition of outstanding service to the plant biology field.

Raikhel was recognized for making lasting scientific contributions to plant biology with her studies in the field of protein trafficking, including fascinating work on the vacuole, cell wall biosynthesis, nuclear import signaling, and lectins. Her work ranges over the broad areas of plant biochemistry and plant cell biology, and her extraordinary discoveries in these realms have proved to be extremely relevant to plant growth and development as well. She was the first to correctly identify a plant vacuolar targeting domain, the first to identify components of the targeting machinery in plant cells and the first to analyze nuclear localization signals in plants. Her lab applied a chemical genomics approach to discover additional processes involved in protein trafficking and the developmental mechanism dependent upon these processes. Her work has resulted in several major publications in the past few years, which have become seminal literature for chemical genomicists studying a range of eukaryotes. The award, created by the Society 30 years ago, is named after the Gude Family who made possible the establishment of the Gude Plant Science Center.

ASPB Announcement dated April 12, 2013: http://my.aspb.org/?page=AF_Awards

UCR Today dated April 25, 2013: <http://ucrtoday.ucr.edu/14178>

Sue Wessler Recipient of ASPB Fellow Award (April 2013)

IIGB researcher Susan Wessler was the recipient of a 2013 American Society of Plant Biologists (ASPB) Fellow award, granted in recognition of distinguished and long-term contributions to plant biology and service to the Society. Wessler was recognized for her pioneering work involving the identification and study of plant transposable elements and the roles of these elements in shaping genomes. Her election to the National Academy of Sciences in 1998 and subsequent awards such as Fellow of the American Academy of Arts and Sciences, the ASPB Stephen Hales Prize in 2011, and the Federation of American Societies for Experimental Biology Excellence in Science Award in 2012, reflect her long history of contributions to plant biology. Lastly, her outstanding service and leadership demonstrated by her current role as NAS home secretary, her innovative undergraduate laboratory-classroom teaching program, her organization of numerous conferences, and her advisory and editorial board participation, was also recognized.

ASPB Announcement dated April 12, 2013: http://my.aspb.org/?page=AF_Awards#fellows

UCR Today dated April 25, 2013: <http://ucrtoday.ucr.edu/14178>

Linda Walling was also elected to the **Plant Sciences Section of the AAAS Membership Committee (2013)**.

INITIATIVES/MOTIVATIONAL EVENTS

IIGB Lobby Screens (Keen Hall/Genomics Building)

High-Definition TVs with mini-computers were installed in the lobbies of both Genomics and Keen Hall to continuously advertise IIGB's accomplishments, events, infrastructure, affiliated centers, awards, and news releases. Over 100 powerpoint slides are continuously updated throughout the year.

IIGB Forums (6/14/2013) [Attachment A]

An IIGB Forum was held during FY 2012-13 in an effort to encourage participation, stimulate ideas and input regarding goals and objectives, increase morale, and inform faculty of important activities/announcements. The forum was held Friday, June 14, 2013 to discuss ongoing IIGB recruitments and ideas regarding research focus areas for future recruitment. Upcoming multidisciplinary grant opportunities were mentioned (NIH T32 training grant spearheaded by Iryna Ethell, potential RED \$75K collaborative seed grants, IIGB seed grants). New instrumentation purchases were mentioned (LTQ Orbitrap Elite Mass Spectrometer through NIH High-end Instrumentation Grant) and ongoing core facility endeavors (Southern California consortium of facility institutions with the goal of sharing resources and ideas). Management changes were also noted, specifically Julia Bailey-Serres' replacement of Natasha Raikhel as director of the Center for Plant Cell Biology. New, ongoing and future initiatives were also reviewed, i.e., monthly IIGB PI Brainstorming Luncheon Sessions, IIGB-related seminars, annual CEPCEB award ceremony, biennial IIGB Career Day, 2nd International Hemipteran-Plant Interactions Symposium, etc. For additional information, please see Attachment A.

RESEARCH WORKSHOP/SEMINAR ACTIVITIES [Attachment D]

Seminar Activities:

Previous and newly-appointed faculty and student seminar coordinators met at the beginning of the 12-13 fiscal year to review IIGB/CEPCEB-related seminar goals and ways to improve their scope and education/research benefits. It was determined that IIGB, CEPCEB and CDVR would once again coordinate weekly schedules so as not to inundate IIGB researchers and promote maximal attendance. As in the previous year, \$5K was allocated to IIGB, CEPCEB and CDVR for their seminar series, and \$3K was allocated to students to meet the stated goals for the IIGB student series. All faculty and student coordinators met to review campus/IIGB seminar policies and emails were sent to Institute and Center PIs soliciting speaker ideas.

All seminar activities are advertised on the UCR and IIGB homepage website (www.genomics.ucr.edu). The following faculty members coordinated seminar activities within FY13:

IIGB Seminar Series [ATTACHMENT F]

IIGB seminars are devoted to systems biology and high-throughput genomics across all organisms. This seminar series features prominent speakers in the field and is often announced, when appropriate, as an IIGB Distinguished Lecture.

Alexander Raikhel – Entomology

CEPCEB Seminar Committee

Established in 2002, the CEPCEB seminar series (BPSC252: Special Topics in Botany) allows prominent speakers as well as internal faculty and postdocs the opportunity to present and discuss noteworthy research discoveries in the fields of plant cell and molecular biology and genomics.

Faculty Members:

Patricia Springer (Chair) – Botany & Plant Sciences

Julia Bailey-Serres – Botany & Plant Sciences

IIGB Student Seminar Series

The following three graduate students assumed responsibility for inviting three speakers for the 2012/2013 academic year:

Christi Scott (Anand Ray lab, Entomology)

Stephanie Coffman (Shou-wei Ding lab, Plant Pathology & Microbiology)

Erin Brinton (Julia Bailey-Serres lab, Botany & Plant Sciences)

CEPCEB 10th Anniversary Committee

As 2012 marked the tenth year since CEPCEB's inception, a symposium was scheduled for December 2012 to celebrate the decade and discuss goals and new initiatives. The following individuals assumed roles in coordinating the event with five external speakers (including the Noel Keen Lecturer) and three internal speakers.

Faculty Members:

Linda Walling (Chair) – Botany & Plant Sciences

Julia Bailey-Serres – Botany & Plant Sciences

CEPCEB REU Applicant Selection Committee

The following individuals reviewed the applications submitted for the NSF CEPCEB REU (Research Experience for Undergraduates) program in plant and plant-pathogen cell biology (2010-15), which is geared towards providing opportunities to students from two- and four-year colleges with limited research infrastructures who are interested in the cellular and molecular biology of plants and their pathogens.

Howard Judelson – Plant Pathology & Microbiology (Project PI)
Isgouhi Kaloshian – Nematology
Eugene Nothnagel – Botany & Plant Sciences

CEPCEB Noel T. Keen Lecture and Award Committee

Established in 2002, the Center for Plant Cell Biology (CEPCEB) scholarship award fund sponsors an annual Special Lecture and Awards Ceremony where an invited leading scientist presents his or her work and where postdocs, graduate students and undergraduate students receive public recognition of their accomplishments. The Noel T. Keen Lecture has become a top-notch lecture series. Previous lecturers have included: Fred Ausubel (Harvard), Jeffrey Dangl (University of North Carolina at Chapel Hill), Chris Somerville (Stanford), Joanne Chory (Salk Institute), Bernhard Palsson (University of California, San Diego) Gloria Coruzzi (New York University), Joseph Ecker (Salk Institute), Philip Benfey (Duke University), Rob Martienssen (Cold Spring Harbor Laboratory) and James Carrington (Donald Danforth Plant Science Center).

CEPCEB Award Committee Members:

Faculty Members:

Venu Gonehal Reddy (Award Committee Chair) – Botany & Plant Sciences
Chia-en Chang – Chemistry
Stefano Lonardi – Computer Science & Engineering

Other Academics:

Glenn Hicks – IIGB Administrator, Genomics Core
Shengben Li (postdoc) – Botany & Plant Sciences

Graduate Student:

Gregory Barding – Chemistry/CEPCEB ChemGen IGERT Program

CDVR Seminar Committee

Started in 2005, the Center for Disease Vector Research (CDVR) continues to bring leading as well as young researchers together to discuss seminal discoveries related to molecular biology and the genomics of disease vectors.

Joao Pedra – (Chair) Dept of Entomology
Peter Atkinson – Dept. of Cell Biology and Neuroscience
Karine LeRoch – Dept. of Plant Pathology

INSTITUTE'S CONTRIBUTIONS TO UCR'S GRADUATE AND UNDERGRADUATE TEACHING PROGRAMS:

Contributions to Graduate Students

Annual CEPCEB Award Ceremony and Noel Keen Lecture (December 14, 2012):

Postdoctoral, graduate student, undergraduate student and high school students achieving research excellence in the fields of plant cell biology, genomics, bioinformatics or engineering were recognized at the Tenth Annual CEPCEB Award Ceremony and Noel Keen Lecture held on December 14, 2012 in the Genomics Auditorium. A leading scientist was invited as the Noel Keen Special Lecturer. CEPCEB faculty, postdocs and students serve on the award committee.

a. Invited Speakers:

Susan McCouch Professor, Departments of Plant Breeding and Genetics, and Plant Biology Cornell University *Research Focus:* identification and characterization of genes that enhance the performance of modern rice cultivars.

Neelima Sinha Professor, Department of Plant Biology University of California, Davis *Research Focus:* fundamental mechanisms of leaf development, using model organisms such as tomato and a variety of developmental, genetic, and genomics tools.

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Wolf Frommer Director, Department of Plant Biology Carnegie Institution for Science Professor, Biology Department Stanford University *Research Focus:* glucose, sucrose, ammonium, amino acid, and nucleotide transport across plant membranes and signaling networks.

Jen Sheen Professor, Department of Genetics Harvard Medical School Department of Molecular Biology Massachusetts General Hospital *Research Focus:* developing innovative strategies to molecularly and genetically dissect the dual metabolic and signaling functions of glucose.

James Carrington [2012 Noel T. Keen Lecturer] President, Donald Danforth Plant Science Center *Research Focus:* gene silencing, the mechanisms through which plants and other organisms use non-coding RNA to control growth and development and defend against viruses, and virus-host interactions.

b. **Awardees:**

The following outstanding CEPCEB researchers were selected by the CEPCEB award committee (Venu R. Gonehal, Chia-en Chang, Stefano Lonardi, Glenn Hicks, Shengben Li, Gregory Barding) and awarded \$500 each:

- Outstanding CEPCEB Postdoc(s): Joint award to **Abel Rosado and Ruixi Li** from Natasha Raikhel's lab
- Outstanding CEPCEB Graduate Student: **Yuanyuan Zhao** from Xuemei Chen's lab
- Outstanding CEPCEB Undergraduate Student: **Ashley Yee** from Linda Walling's lab.

Graduate Student Mentoring:

Ford Foundation Predoctoral Award: IIGB/CEPCEB graduate student **Irma Ortiz** was one of 60 national students awarded the prestigious Ford Foundation Predoctoral Fellowship announced in April 2013. Irma is in the plant biology graduate program and a member of professor and geneticist Linda Walling's laboratory. The awards include an annual stipend of \$20,000 and paid expenses to the three-day annual Conference of Ford Fellows.

These awards, administered by the National Research Council, are "made to individuals who, in the judgment of the review panels, have demonstrated superior academic achievement, are committed to a career in teaching and research at the college or university level, show promise of future achievement as scholars and teachers, and are well prepared to use diversity as a resource for enriching the education of all students." Eligibility for the award requires US citizenship, evidence of superior academic achievement, and a commitment to teaching and research at the college or university level.

Irma Ortiz also was awarded an Honorable Mention from NSF in the Graduate Research Fellowship Program (GRFP) national competition.

National Science Foundation's Graduate Research Fellowship Program (GRFP) Awards: Three IIGB graduate students, Barbara Davis (CMDDB) from Pru Talbot's lab, Lauren Dedow (GGB) from Julia Bailey-Serres' lab, and Leopold Noel Green (BIEN) from Elisa Franco's lab, were among 14 UCR and 2,000 national recipients of NSF's 2013 Graduate Research Fellowship Program (GRFP) awards. **Irma Ortiz** (PLB) from Linda Walling's lab and **Tyler William H. Backman** (BIG) from Thomas Girke's lab were awarded honorable mentions.

Awardees receive an annual stipend of \$30,000 for three years, a \$10,500 cost of education allowance for tuition and fees, professional development opportunities and the ability to select any accredited U.S. institution in which to pursue their graduate education.

Awards have historically been received by individuals who have become high-level achievers, contributors and leaders in their fields. The program recognizes excellence and diversity among graduate students in the science and engineering disciplines who are pursuing master's and doctoral degrees at accredited US institutions. Underrepresented populations are encouraged to apply and 13,000 applications were submitted this past year.

Highlander Day Tours of Genomics Building (April 13, 2013)

A CNAS tour was conducted for approximately 1000 prospective students who visited UCR on Highlander Day, April 13, 2013. The Genomics Building was included as part of this tour and the following graduate students provided an introduction about the features, floorplan, activities, operation and research programs of the Genomics Building every 15 minutes to ~25 students for four hours:

Nolan Ung (Coordinator)

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 Yasemin Bektas
 Illva Cabrera
 Serena Cervantesd
 Geoffrey Harlow
 Robert Koble

Contributions to Undergraduate Students

CEPCEB Research Experiences for Undergraduates (REU) Program (2010-15)

The NSF Research Experience for Undergraduates (REU) program was first awarded to CEPCEB researchers in 2002 for a period of three years, and renewed in 2005 for five years. In 2010, under PI Howard Judelson and co-PI Patricia Springer, the REU Program was renewed for an additional five years. The 2010-2015 award titled “REU Site: Research Experiences for Undergraduates in Plant and Plant-Pathogen Cell Biology” totaled \$614,097.

As an NSF REU Site, CEPCEB brings research experiences to students of two- and four-year colleges who have limited opportunity to learn about the excitement and career options that research in plant cell biology offers. Eight to twelve students are accepted into the ten-week residential program. The program begins with a one-week workshop, in which students are introduced to techniques and approaches used for analysis of plant and plant fungal pathogen cell function, including basic molecular biology, genomic and bioinformatic analyses, and confocal microscopy methods used to study live cells. Students then spend nine weeks working with a CEPCEB faculty mentor and a graduate or postgraduate mentor on a research project of their choice. Students also participate in workshops to enhance learning skills and professional development, and to discuss ethics in science. Thus far (incl. Summer 2013), 118 undergraduate students have been trained in CEPCEB labs since the program’s inception, with 43 of them proceeding to graduate school. It is estimated that approximately 40% have pursued studies related to plant biology.

Participating Faculty in the CEPCEB REU Program: <http://cepceb.ucr.edu/reu/faculty.html>.

The following 12 students participated in the 2012 REU Program in CEPCEB Labs and presented a poster session at the REU Symposium on Friday, August 17, 2012.

REU Student	College/University	CEPCEB Faculty
Jessica Ball	Clemson University, SC	Larson Lab
Derreck Carter-House	Southwestern College, CA	Yang Lab
Kyle DeHart	University of Pittsburgh, PA	Roper Lab
Aubrie De La Cruz	Cal Poly Pomona, CA	Bailey-Serres Lab
Justin Durancik	Northern Illinois University, IL	Borkovich Lab
Christopher Galley	Chaffey College, CA	Springer Lab
Caren Khachatoorian	California State University, Northridge, CA	Judelson Lab
Andrew Lyne	Kansas Wesleyan University, KS	Cutler Lab
Minhtu Nguyen	South Seattle Community College, WA	Ding Lab
Megan Riley	Moorpark College, CA	Nothnagel Lab
Benjamin Schlau	Portland State University, OR	Eulgem Lab
Erin Sternburg	California State University, Long Beach, CA	Chen Lab

IIGB Facilities Tours: [see below]

OUTREACH ACTIVITIES:

Southern California Instrumentation Facility Consortium (May 16-17, 2013)) [ATTACHMENT

A SoCal Consortium of Centralized Lab Facility Managers met on Friday May 17, 2013 to think about ways to share expertise and services in a mutually beneficial manner. Based on attendees, the focus was primarily on bioinformatics and genomics aspects, but microscopy and proteomics academic coordinators provided presentations as well, covering their instrumentation and services, customer base and other statistics for comparative purposes. Invited guests also presented an overview of their operations in order to generate an open discussion about how to pool resources to work together in the future.

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IIGB/CEPCEB Researcher Presents Free Public Lecture on Plant-Insect Interaction (May 2, 2013)

On May 2, 2013, IIGB geneticist **Linda Walling** gave a free lecture titled "Friends and Enemies: Dynamic Interactions of Plants and Insects" at 5:30 pm in Rooms C, D and E, University Extension Center (UNEX) as part of the second annual Science Lecture Series hosted by CNAS. This year the theme is "The Science of Disease." The series aims to boost the public's awareness and understanding of science and of how scientists work.

With 50 percent of the insect species obtaining their nutrition from plants, the field of plant-insect interactions is a robust and exciting field. The goals of Walling's laboratory are to identify the plant genes that control defense traits to

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insects and utilize these genes to identify new mechanisms to control the losses due to herbivory. Currently, Walling's lab is focused on understanding the plant defenses that protect plants from damage by tissue-damaging caterpillars and phloem-feeding whiteflies. She performs these studies in crops (tomato, squash, alfalfa) and model plant species (*Arabidopsis*).

UCR Today: <http://ucrtoday.ucr.edu/14194>

IIGB/CEPCEB Chemist Presents Free Public Lecture on Anticancer Drugs (May 16, 2013)

IIGB/CEPCEB Chemist **Yinsheng Wang** gave a talk on Thursday, May 16, 2013 at 5:30 p.m. in Rooms C, D and E, University Extension Center (UNEX) on the mechanisms of action of some commonly used anticancer drugs and how laboratory research may lead to novel targets and new strategies for cancer treatment.

Anticancer drugs save lives and/or improve the quality of life for many cancer patients. Many anti-cancer drugs work by killing tumor cells after inducing damage to DNA. Wang's talk discussed those drugs that induce damage to DNA, as well as those biomolecules that allow for selective targeting of tumor cells. He also discussed the implications of personalized medicine in cancer treatment.

UCR Today: <http://ucrtoday.ucr.edu/14551>

High School Recipients of CEPCEB Plant Cell Biology Awards at Science Fairs (judged by CEPCEB faculty, postdocs and students)

- a. In 2002, CEPCEB initiated the CEPCEB Award Fund to recognize research excellence in plant cell biology, genomics and bioinformatics by pre-college students, graduate students, and postdoctoral researchers.
- b. CEPCEB awarded **Natalie Ng** the first place CEPCEB Award of \$500 at the California State Science Fair held on April 16, 2013 for her poster titled "Advancing Precision Medicine: MicroRNA Prognostic Signatures and Prediction Models for Breast Cancer." Natalie was in the 11th Grade at the Monta Vista High School in Cupertino. CEPCEB also awarded a \$100 honorable mention award to **Eric Chen**, also in the 11th grade at Canyon Crest Academy in San Diego for his poster titled "Discovery of Novel Influenza Endonuclease Inhibitors to Combat Flu Pandemic." Images of both awardees were posted on the IIGB site at: <http://genomics.ucr.edu/about/CEPCEB-award-fund.html>.
- c. David Carter and Shengben Li represented CEPCEB as judges at the event mentioned above.

Additional Outreach by IIGB Faculty:

Tim Close: Tropical Legumes project included support of genotyping for African breeder partners.

Tim Close and Stefano Lonardi: Webinar, "Combinatorial Pooling Enables Selective Sequencing of the Barley Gene Space", eXtension webinar (August 2013).

Peter Atkinson, Linda Walling, Marylynn Yates and Mary Gauvain presented lectures at the Nelson Mandela African Institutions of Science and Technology in Arusha, Tanzania (February 2013). **Linda Walling** presented three 3-hr lectures on plant-herbivore interactions and one interactive session on interdisciplinary research.

Stefano Lonardi: Distinguished lecture, "Computational Epigenetics", Indiana University School of Informatics, Indiana University-Purdue University Indianapolis, IN (November 2012).

David Carter: The Hitachi TM-1000 scanning electron microscope was featured at Highland Elementary on May 17 2013. Eighty students were given hands-on experience operating a working electron microscope and identifying some of the images that it produced.

Zev Wisotsky, a Neuroscience graduate student in Anupama Dahanukar's lab, was an organizer for Brain Awareness Day held at UCR in the summer of 2013.

IIGB Facilities Tours: [see Attachment C]

In an effort to showcase Keen Hall's advanced tools in bioinformatics, microscopy and imaging, proteomics and genomics and assist in recruitment efforts of top-notch faculty and graduate students, IIGB's academic staff regularly

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participates in conducting tours to a wide range of groups. During fiscal year 2012-13, a total of 26 tours were conducted throughout the cores for over 90 visitors. Many tours of Keen Hall were conducted as part of faculty recruitments (Virology/Epigenetics), CNAS undergraduate student orientations, Biological Sciences Graduate Programs (CMDB, GGB, ENT, MIC, PB, Biomed, PPM), Research Experience for Undergraduates (REU) programs, Visiting Professors, and other groups in an effort to assist in recruitments. These tours have a real impact as guests are highly impressed by the quality of the facilities and personnel.

IIGB INSTRUMENTATION FACILITIES

The IIGB instrumentation facilities continued to meet the needs of campus researchers and stay abreast of scientific trends, while vastly changing the nature of research being conducted at UCR. This has been accomplished through upgrades, the acquisition of new technology, collaborations with a variety of researchers working on a broad range of organisms, and regular training in the use of new instrumentation.

Bioinformatics Core

Expansions of Compute Infrastructure

Users have now access to a greatly expanded compute infrastructure which includes ~400 CPU cores, ~96TB of shared disk space and 16-256GB of RAM per compute node. The Bioinformatics facility maintains now by far the largest supercomputing resources at UCR that are heavily used by over 250 scientists on our campus. To address rapidly growing BIG DATA storage needs in modern high-throughput DNA sequencing and chemistry, the Bioinformatics Core is now offering several options to expand the base storage maximum of 20GB per user to up to 2TB per lab, or in increments of 100GB. Many analysis tasks of large data sets, e.g. genome assemblies, require extensive amounts of RAM. To support these activities, the Bioinformatics Core has added over the past year two high memory nodes, one with 256GB of RAM and one with 64GB of RAM. Another one with 512GB of RAM will be added soon. All new compute nodes that will be added to the cluster will have at least 48 CPU cores each. This architecture has many advantages, such as acceleration of many applications with a high overhead of interprocess communication, smaller physical footprint, etc. So far, the Core has added two of these new compute nodes and two more will be added soon.

Microscopy Core

The Microscopy and Imaging Core Facility supports users from 125 laboratories in 15 different departments. It offers a comprehensive range of imaging instrumentation; including six confocal microscopes, an environmental scanning electron microscope (SEM), a laser capture microdissection system, a luminescence dark box, gene gun, fluidics robot and complete range of microtomes (for wax, plastic, ultrathin plastic, live and frozen sectioning). The SEM has been ruggedized and made portable for use in outreach, including local schools, the San Bernardino County Museum, and Mount San Jacinto Community College in support of their summer STEM bridge program.

In September 2010 the Microscopy Core was successful in obtaining a high content screening confocal system, the Pathway HT 855, which replaces the working prototype that has been the mainstay of high content screening and chemical genomics initiatives. This upgrade has advanced software for ease of use and deeper analysis capability. It has many new features including laser auto-focus, calibrated on-the-fly fluid handling, and improved image quality.

In May 2012, the cutting-edge inverted Leica SP5 Spectral prism-based confocal system was acquired through funding provided by HHMI and through the campus loan asset acquisition program (five-year payment schedule). The Leica TCS SP5 II Spectral Confocal Microscope is the most sensitive, most versatile point scanning system on the market and was essential for keeping IIGB's imaging capabilities up to date.. Its new HyD detector technology can easily see signals that are lost in the noise of conventional photomultiplier tubes and is suitable for imaging extremely dim signals. The new Leica inverted SP5 confocal microscope is already running at full capacity, with several hundred trained users, and usage at over 40 hours per week. It has been modified with a chlorophyll blocking filter for better observation of green fluorescent proteins in green plant tissues. Also, an epi-illumination system was designed and built to allow for visual observation of opaque samples such as micro-patterned metal stent materials. These are both capabilities that are not available off-the-shelf.

For image analysis, the Imaris Bitplane suite of software is maintained on a power Mac (OS10 and 64-bit XP) with over a terabyte of local storage. Software is only as good as the features that are used, and the Bitplane leads the industry in user-friendly productivity. It readily imports, analyzes and presents data from any of our confocal systems. An Auto-Aligner module was added to the software to enable reconstruction of very large 3D data sets from images of histological sections, taken on the Arcturus automated microscope (DeMason lab). Quantitative analysis of signal intensity is particularly challenging when co-localization of two or more signals are essential, but the Microscopy Core

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has been successful in analyzing immuno-localized protein distributions in rat brain sections (Curras-Callozo lab), and cell cytoskeleton morphology in individual animal cells (DeFea lab).

The Biomek FXp robot is now equipped with pin dispensing tools to allow sub-microliter volumes of liquid to be transferred from our chemical library directly into 24 well assay plates.

Proteomics Core

NIH S10 Instrumentation Grant Awarded for Purchase of LTQ-Orbitrap

In early 2012, IIGB re-submitted a grant proposal to NIH S10 Shared Instrumentation Program to request funds (\$600,000) for the purchase of an LTQ-Orbitrap Elite ETD LC/MS/MS system to upgrade the Proteomics core's aging instrumentation. Prof. Yinsheng Wang in Chemistry served as the proposal's leading PI with Songqin Pan, Proteomics Coordinator, as the co-PI. Ten other NIH-funded major users supported the proposal with detailed project descriptions. The proposal was well reviewed and was awarded \$600,000 from NIH. The Proteomics Core/Purchasing is currently negotiating with vendors regarding the purchase. UCR also contributed \$120,000 as institutional commitment for this grant through the combined efforts of CNAS, OR, and IIGB.

New method for Chemical Biology Studies

The Proteomics Core upgraded a nanoAcquity UPLC system to a newer version of 2-dimensional UPLC following Waters technologies. The upgraded system now is able to perform MudPIT proteomics experiments on a routine basis. This MudPIT approach has found an important application in chemical biology, specifically for screening cellular protein targets of small molecules, which is still a big challenge in the field. When using affinity tagged, such as biotin-labeled small chemicals, the chemical molecules can be immobilized on affinity beads such as Streptavidin-coupled agarose beads. When cellular proteins are incubated with these affinity beads, the specific target protein will interact with the small chemical molecules and are retained on the beads in a pull-down assay. Then the bound target protein can be eluted from beads with free chemical molecules and analyzed by the MudPIT. In a first pilot experiment using samples of *tuberculosis* bacteria from Los Alamos National Lab, the Proteomics Core was able to screen protein targets for more than a dozen small chemicals in a single batch with a high success rate. Later, the same method was also used in discovering the target protein of ES2 chemical in Arabidopsis seedlings, and a component of an exocytosis protein complex, Exo70 A1, was discovered as a ES2-specific target. Further genetic and biochemical studies of Exo70 A1 were consistent with proteomics results. With the success of the two case studies, the Proteomics Core is now offering this method to the entire campus research community for chemical biology studies.

Addition of New Equipment

Conventional SDS-PAGE gel electrophoresis is commonly used in MS proteomics, but protein and peptide recovery from the gel could be limited given the low quantity of biological samples in general. In order to achieve much better protein sample recovery and to simplify the sample preparation processes, the Proteomics Core purchased an alternative in-solution SDS electrophoresis system - the GEL-FREE8100 system from Protein Discovery Inc. Using this system, any complex protein samples can be fractionated by SDS-in-solution electrophoresis, and each fraction can be conveniently collected in liquid with pipetting in a time-interval fashion. These fractionated liquid protein samples then can be further precipitated with acetone, and resulting pellets can be digested with any protease of choice with high efficiency (another disadvantage of the SDS-PAGE gel system is that trypsin is the only protease for digestion). This will certainly help to identify low-abundant proteins, which are usually the major interests in proteomics studies.

Analysis of MS proteomics may not be highly reproducible due to several reasons. An important factor is the poor sample homogeneity. Common tissue or cell culture grinding using mortar and pestle may not be a good method to generate proteomic samples because of the uncontrolled degree of sample homogeneity. Therefore, the Proteomics Core purchased a Precellys24 sample homogenizer for more robust sample lysis with precisely controlled mechanical conditions including sample volume, beads size, vibration frequency, and duration. These controlled parameters will be able to provide much needed high degree of sample homogeneity so that MS proteomics analysis will be more reproducible from sample to sample with results that can be readily evaluated with statistics. Moreover, these parameters have a wide range of choice, and therefore, any samples such as fungal spores that are very hardy can also be lysed efficiently with high homogeneity.

Ongoing proteomics projects:

Mike Adams: The Adams group studies the mechanisms of venom-induced hypokinesia in host insects such as cockroach. Hypokinesia affects host animal's behavior and ability and motivation to walk, making it easy for subjugation by the wasp. Proteomic methods are used to discover small peptide molecules released from wasp venom, and these peptides may be the effectors that impact the nerve systems of host animals. The Adams group used HPLC to purify these effector peptides and determined their sequences with tandem MS spectra. Approximately a dozen peptide

sequences are confirmed, and their potential functions in nerve systems will be studied by other biological assays.

Howard Judelson: *Phytophthora* is a pathogenic fungus causing late blight in potato and related crops, a billion-dollar-loss disease. The Judelson group has been in the battling field of controlling this disease for a long time. They found that CDC14 is a critical protein for sporelation in *Phytophthora*, which may serve as a potential cellular target for disease control. To dissect the function of CDC14, they employed an MS proteomics approach to discover the other proteins that interact with CDC14 using co-immunoprecipitation combined with on-beads trypsin digestion and MudPIT analyses. The same method is also used to map the N-terminus of CDC14 protein to determine the long or short version of the sequence that may regulate its cellular localization.

Dmitri Masloy: Trypanosome mitochondria contain a unique 45S ribosomal SSU-related complex that is involved in translational activation of the long poly(A/U)-tailed mRNA. To discover novel protein components of the SSU-related complex, a MudPIT proteomics method was used to profile a fraction of mitochondria proteins. Several proteins that are not typically found in ribosomes, including pentatricopeptide repeat (PPR) proteins, rhodanese-domain protein (Rhod), and a large (200 kDa) coiled-coil protein, are determined with the proteomic study to be associated with the 45S SSU as a separate complex designated as 45 SSU*. Further RNAi assays have shown that this specific 45 SSU* complex functions as a translational activator for a specific set of edited mRNAs such as the long poly(AU)-tailed COI and edited Cyb mRNAs.

Natasha Raikhel: A proteomics approach was employed to screen the target protein of small chemicals such as ES2 in Arabidopsis seedlings. Using a biotin-affinity pull-down assay combined with MudPIT analysis and background subtraction, a component of an exocytosis protein complex, Exo70 A1 was found to be an ES2-specific target. Consistent with this, a T-DNA insertion knock-out line of Exo70 A1 Arabidopsis seedlings showed resistance to ES2 treatment. Exo70 A1 co-immunoprecipitation and proteomics analysis has also shown several specific A1-interaction proteins within the exocytosis protein complex. Whether ES2 can enhance or interfere with the interaction between A1 and other proteins will be evaluated with further quantitative analysis of the interactions.

Genomics Core and New IIGB Illumina Sequencing Service

The second next-generation sequencer acquired for UCR, the HiSeq2000, was installed January 2011 and services are in high demand. This instrument requires a high level of expertise to operate within the Genomics Core, but also a dedicated programmer to process the raw data to usage sequence reads. This is then followed by actual data analysis which requires additional programming expertise. This instrument was upgraded in July 2013 to the latest version, the HiSeq2500. This version adds new capabilities such as the ability to provide longer DNA sequence reads, and it can operate in two modes. The high output mode is the mode that we have come to expect from the HiSeq2000. The rapid mode, however, is a new feature that permits the completion of sequencing in about one-fifth the time of the high output mode but with somewhat lower yield. Both run modes have been adopted by our customer base.

Workshops are continuously offered to train campus researchers in the capabilities of this relatively new and powerful technology. In addition to past Illumina special workshops in partnership with Illumina that included UCR researchers faculty and postdocs active in Nextgen sequencing. In the 2011/2013 period four workshops were offered in Illumina sample preparation. These sponsored workshops provided training for about 60 participants from UCR and included all reagents, sequencing and analysis for little or no cost thanks for corporate sponsors. These workshops provided training and research opportunities for UCR labs who processed their own experimental samples. All workshops were multi-day events including lecture, hands-on lab instruction, sequencing, and follow-up meetings to discuss results with attendees.

IIGB and CEPCEB have amazing facilities that are admired by virtually every visiting scientist and administrator. But this infrastructure will be absolutely critical as IIGB and the Genomics Core prepares for the upcoming new “fourth generation” DNA sequencers which will provide dramatic new capabilities that UCR will need to stay competitive with upper tier research institutions. These instruments will be on the market within a few years and promise to be an incredible resource for UCR research. Our challenge is to acquire the appropriate technologies which will place new demands on the Institute in the form of instrumentation, trained technical personnel, computational hardware, programming to process and analyze data, and a continuation of strong support by the university administration. From their introduction in late 2008 until the present 2011 Illumina services have remained in high demand. This instrument (GAIIX, HiSeq2000, and now HiSeq2500) requires a high level of expertise to operate within the Genomics Core, but also a dedicated programmer to process the raw data to usage sequence reads. This is then followed by actual data analysis which requires additional programming expertise.

In 2012 the Genomics Core and other Cores participated in six starter grants of about \$6,000 each funded through IIGB with some corporate sponsors who provided cash donations and low cost or free reagents. Many of these grants were

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focused on next-gen sequencing and thus were another opportunity to promote research on the UCR campus. In the 2013 year, the Genomics Core is planning to organize additional events focused around newer instrumentation such as the MiSeq DNA sequencer. Throughout the year there were ongoing seminars presenting new technologies from vendors to educate IIGB members about new technologies that could impact research. Examples include digital droplet PCR, Pacific Biosciences sequencing technology, Nanostring, and more recently Bionano Genomics. Throughout the year the Genomics Core has negotiated on behalf of campus researchers for lower cost reagents and these are offered by the Core through approved recharge rates.

In 2012 and 2013 the Genomics Core also acquired several new instruments and upgrades including a new Promega plate reader/luminometer, a Gel Doc system, a Blue Pippin fragment isolation system, an additional NanoDrop (2000), and a Qbit fluorometer for DNA and protein quantification. The Core also upgraded its older ABI 3100 fragment analyzer to an ABI 3130XL in order to maintain this service. Several new freezers were also acquired for storage of high value reagents, especially for the Illumina sequencer. These freezers have dial out alarms to prevent the loss of high-cost reagents.

In the coming year new services are planned including Illumina library prep.

Below are several examples of IIGB researchers utilizing Illumina and other core services:

High-Throughput Research:

Xinping Cui has focused on developing statistical methods for high-throughput microarray-based single feature polymorphism detection in crop genomes. Due to the recent advances in high-throughput sequencing technology (HTS) which now provides the potential to detect all polymorphisms including rare ones in a genomic region with a significantly higher resolution than microarray technology, Xinping Cui has been shifting her research direction to single nucleotide polymorphism (SNP) detection using HTS technology. Her lab has one paper along this line of research accepted by "Bioinformatics."

Brad Hyman developed multiplex sequencing on the Illumina platform including a set of 25 adaptors and made these protocols and reagents available to the campus community. He also instructed several laboratories as to how to build libraries using the adaptor set. This eventually led to a project to discover a novel animal mitochondrial replication mechanism. The student working on this project, Samantha Lewis, defended her thesis on Sept 25, 2013.

Glenn Hicks and IIGB Director Natasha Raikhel utilized the high throughput chemical screening facility at IIGB to identify novel compounds that perturb vesicular trafficking in plant cells. Their novel screening approach utilized the automated microscopy and robotics available at IIGB. The resulting compounds promise to uncover new knowledge about the dynamic movement of vesicles. The highly novel approach was published in several papers in Proc Natl Acad Sci, USA, one of which was chosen by Faculty of 1000 as being highly significant.

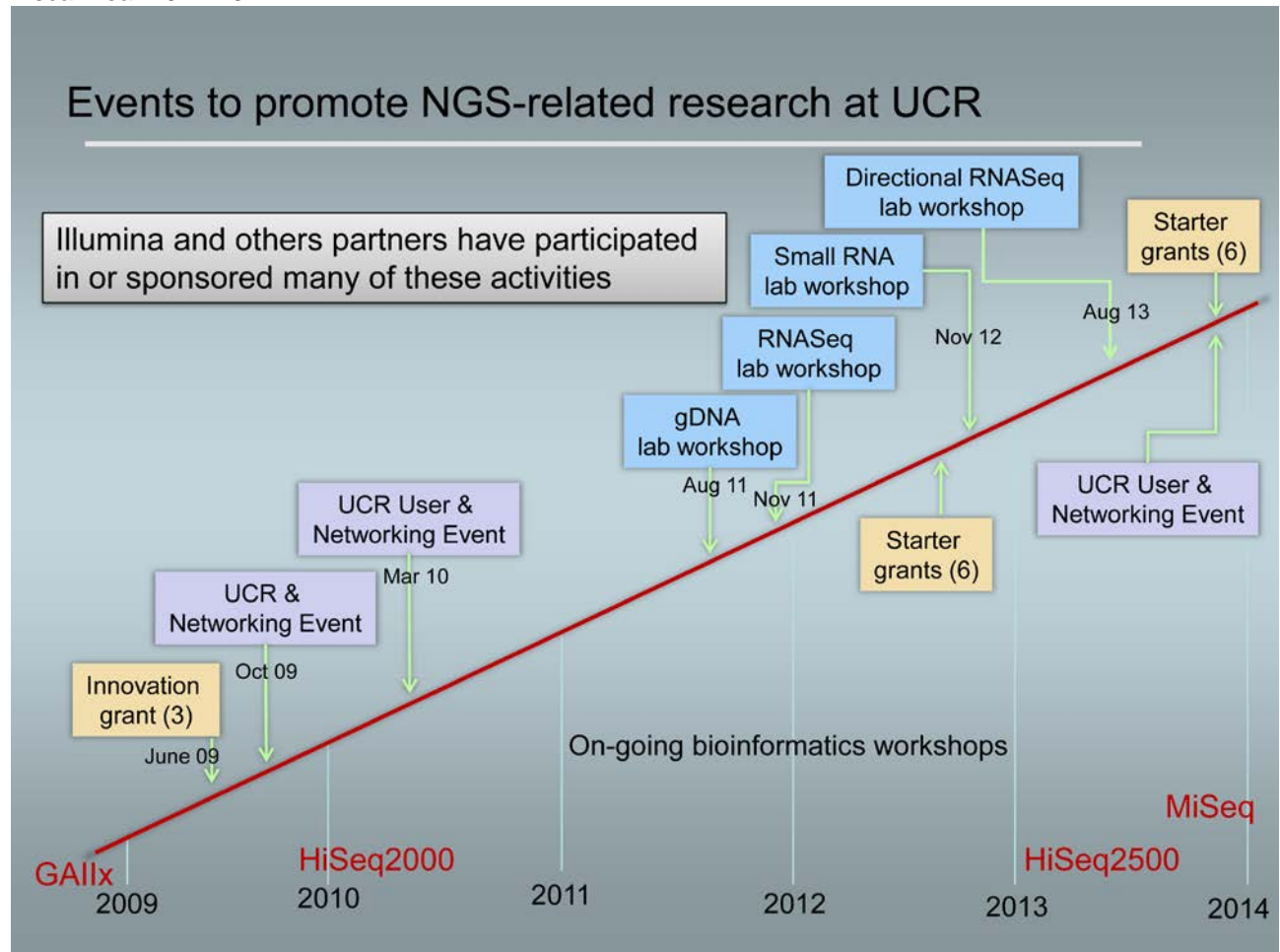
Tim Close and Stefano Lonardi utilized Illumina services to sequence the genome of the cereal crop barley and more recently cow pea which is an important crop in Africa.

Susan Wessler's lab has been utilizing the Illumina HiSeq2000 and 2500 system to obtain genome sequence from rice. One focus of her program is to understand the evolution of DNA transposons. The sequencing of many genomes is critical toward understanding how these mobile elements move within the genome affecting plant evolution.

RUI Collaborative Research: Functional Genomics of Spider Silk Synthesis and Fiber Performance within the Western Black Widow and Among Cobweb Weaving Spiders (Cheryl Hayashi)

Cheryl Hayashi's project was inspired and made possible by the acquisition of Illumina technology and the IIGB support staff. Her lab group embarked on de novo transcriptome assembly of spider silk gland tissue using the Illumina platform (mRNA-seq). Using the success of the earlier Illumina sequencing, the work is now expanding to include large numbers of samples for transcriptome sequencing.

Shou-Wei Ding's laboratory developed new culture-independent methods for discovering viruses (PNAS 107:1606-11) and viroids in plants and animals, demonstrated an essential role for viral secondary siRNAs in antiviral defense (PNAS 107:484-9), and established a conceptual framework for RNA-based antiviral immunity (Nat Rev Immunol 10:632-44). The Illumina sequencing instrument in the core facility of the Institute has been used to sequence many small RNA samples from plant and humans and is incorporated into papers published and cited in the grant applications.



IIGB events that have promoted next-generation sequencing (NGS) on campus. Most of the workshops were fully sponsored by company partners, who donated cash and reagents. In addition, UCR labs awarded grants received 50% discounts on sample kits.

The following additional research projects were collaborations among IIGB researchers and/or facilitated by IIGB core facilities' usage/technology.

\$2M to Study Structure of Malaria Parasite Genome (June 26, 2013)

IIGB/CEPCEB cell biologist **Karine Le Roch** is the principal investigator of a \$2M NIH grant awarded to discover the 3-D structure of the malaria parasite's genome during the erythrocytic cycle that is responsible for disease in humans. Her lab will work closely with the lab of William Stafford Noble, a professor of genome sciences at the University of Washington. Approximately \$1 million of the total funding will be allocated to UCR.

The parasite that causes malaria is Plasmodium, which requires specific human and mosquito tissues to complete its life cycle. The progression and control of this life cycle could be better understood by studying changes of the 3-D structure of the parasite's genome.

The researchers will use the resulting 3-D structure data from their work in combination with new genome-wide data sets to develop a computational three-dimensional model that they expect will yield insights into how parasite genes are regulated. By providing fundamental insight into the regulatory mechanisms of the malaria parasite, the project aims to improve the ability to design new drugs and novel lines of defense against malaria. The start date of the four-year grant is July 1, 2013.

UCR Today dated July 26, 2013: <http://ucrtoday.ucr.edu/16056>

Studying Role of Sleep in Memory (June 4, 2013):

IIGB neuroscientist **Maxim Bazhenov** and a team of researchers were awarded a nearly \$7.5 million grant from the Department of Defense to investigate the role of sleep in memory and learning.

Bazhenov's laboratory will collaborate with laboratories at UC San Diego, the University of Arizona and Harvard Medical School in the five-year funded research that aims to explore the role of sleep in memory and learning and develop biologically realistic computer models of a brain. These models will learn complex patterns, consolidate the resulting memory traces over time in a process that is similar to human sleep, and retrieve the patterns given a cue.

The researchers also plan to use computer models and experiments to develop non-invasive techniques of sensory and pharmacological interventions in modulating memory replay during sleep.

The start date of the grant is July 1, 2013. UC Riverside will receive approximately 27 percent (or about \$2 million) of the total grant amount. UCR is one of 15 academic institutions recently given grants by the Department of Defense to perform multidisciplinary basic research. The awards, totaling \$105 million, are the result of the fiscal year 2013 competition conducted by the Army Research Office and the Office of Naval Research under the Department of Defense Multidisciplinary University Research Initiative (MURI) Program.

The highly competitive MURI program supports research by teams of investigators that intersect several traditional science and engineering disciplines in order to accelerate research progress.

UCR Today dated June 4, 2013: <http://ucrtoday.ucr.edu/15478>

Discovery of Gene Silencing Site (April 25, 2013)

A team of IIGB scientists led by geneticist **Xuemei Chen** conducted a study on plants (*Arabidopsis*) showing that the site of repression of target gene expression occurs on the endoplasmic reticulum (ER), a cellular organelle that is an interconnected network of membranes. Study results appear in the journal *Cell*. This opened up a new area of research that will help understand the mode of action of microRNAs.

"Our study is the first to demonstrate that the ER is where miRNA-mediated translation repression occurs," said lead researcher Xuemei Chen, a professor of plant cell and molecular biology and a Howard Hughes Medical Institute-Gordon and Betty Moore Foundation Investigator. "To understand how microRNAs repress target gene expression, we first need to know where microRNAs act in the cell. Until now no one knew that membranes are essential for

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microRNA activity." Next, her lab will attempt to crack the mechanism of miRNA-mediated translational inhibition. They will investigate, too, how miRNAs are recruited to the ER.

Chen was joined in the study by Shengben Li (first author of the research paper), Lin Liu, Xigang Liu, Yu Yu, Lijuan Ji and Natasha Raikhel at UC Riverside; Xiaohong Zhuang and Liwen Jiang at the Chinese University of Hong Kong; Xia Cui and Xiaofeng Cao at the Chinese Academy of Sciences, Beijing; Zhiqiang Pan at the University of Mississippi; Beixin Mo at Shenzhen University, China; and Fuchun Zhang at Xinjiang University, China.

UCR Today April 25, 2013: <http://ucrtoday.ucr.edu/14112>

IIGB/CEPCEB Researcher Combats Citrus Greening (April 23, 2013)

IIGB/CEPCEB researcher and associate professor of plant pathology and microbiology **Hailing Jin** potentially developed early diagnosis markers for "citrus greening" or Huanglongbing (HLB) - probably the most devastating citrus disease threatening the global citrus industry.

Her findings appeared in the journal *Molecular Plant* in which she reports having profiled small ribonucleic acid (sRNA) from citrus plants, some of which were affected by HLB. Her research showed that several sRNAs were found to have been induced specifically by HLB.

The study also showed that the diseased trees suffered from severe phosphorus deficiency and that application of phosphorus solutions to the diseased trees significantly alleviated HLB symptoms, thus improving fruit yield in a three-year field trial in southwest Florida. She cautioned that the application of phosphorus solutions did not cure the trees. Her research suggests, however, that additional phosphorus application may help diseased trees look healthier and improve fruit yield.

UCR Today April 23, 2013: <http://ucrtoday.ucr.edu/13946>

IIGB/CEPCEB Chemist Develops Compound to Fight Renal Cancer (February 2013)

IIGB/CEPCEB Chemist **Michael Pirrung** announced the development of a compound with the potential to fight renal cancer, in a lecture he gave on Feb. 19 at the 5th International Conference on Drug Discovery and Therapy, held in Dubai, UAE.

Named TIR-199, the compound targets the "proteasome," a cellular complex in kidney cancer cells, similar to the way the drug bortezomib, approved by the Food and Drug Administration, targets and inhibits the proteasome in multiple myeloma cells, a cancer coming from bone marrow. The proteasome breaks down proteins in the cell. Drugs that block the action of proteasomes are called proteasome inhibitors, and have been shown to have activity against a variety of cancer cell lines.

The TIR-199 research project at UC Riverside began about four years ago after a multidisciplinary, international team reported on a class of compounds that act on the proteasome. These compounds are the "syngolin" natural products — such as a compound produced naturally by the wheat-infecting bacterium *Pseudomonas syringae*. TIR-199 is a synthetic relative of syngolin.

Pirrung submitted TIR-199 samples to the National Cancer Institute at the National Institutes of Health, where the compound was subjected to a rigorous 60-cell screening used routinely to test compounds for their effectiveness in battling 60 kinds of cancer, including leukemia, lung, colon, brain, breast, ovarian prostate and renal cancers.

The UCR Office of Technology Commercialization has filed a patent application on TIR-199 and is currently seeking partners in industry interested in developing the compound commercially. Several biotechnology companies have already shown interest.

The project was funded by a grant from the University of California Institute for Mexico and the United States (UC MEXUS), to Tannya Ibarra-Rivera, a former postdoctoral researcher in Pirrung's lab who helped discover TIR-199 and after whose initials the compound is named; and to Pirrung from the UC Cancer Research Coordinating Committee.

UCR Today dated February 19, 2013: <http://ucrtoday.ucr.edu/12020>

IIGB/CEPCEB Researchers Target Irish Famine Pathogen (February 2013)

In the Feb. 3 issue of *Nature Genetics*, a team of IIGB researchers led by **Wenbo Ma** focused on *Phytophthora*, the pathogen that triggered the Irish Famine of the 19th century, and deciphered how it succeeded in crippling the potato plant's immune system.

When a pathogen attacks a plant, infection usually follows after the plant's immune system is compromised. The genus *Phytophthora* contains many notorious pathogens of crops. *Phytophthora* pathogens cause worldwide losses of more than \$6 billion each year on potato (*Phytophthora infestans*) and about \$2 billion each year on soybean (*Phytophthora sojae*).

The researchers focused their attention on a class of essential virulence proteins produced by a broad range of pathogens, including *Phytophthora*, called "effectors." The effectors are delivered to, and function only in, the cells of the host plants the pathogens attack. The researchers found that *Phytophthora* effectors blocked the RNA silencing pathways in their host plants (such as potato, tomato, and soybean), resulting first in a suppression of host immunity and thereafter in an increase in the plants' susceptibility to disease.

Ma was joined in the study by IIGB's Yongli Qiao, Lin Liu, Cristina Flores, James Wong, Jinxia Shi, Xianbing Wang, Xigang Liu, Qijun Xiang, Shushu Jiang, Howard S. Judelson and Xuemei Chen; Fuchun Zhang at Xinjiang University, China; and Qin Xiong and Yuanchao Wang at Nanjing Agricultural University, China.

The research was supported by a National Science Foundation grant to Ma and grants from the U.S. Department of Agriculture (USDA) to Judelson and Chen.

In 2011, UCR received a \$9 million USDA grant to research late blight, caused by *Phytophthora infestans*, that mainly attacks potatoes and tomatoes. Last year, UCR released avocado rootstocks that can help control *Phytophthora* root rot, a disease that has eliminated commercial avocado production in many areas of the world.

UCR Today dated February 6, 2013: <http://ucrtoday.ucr.edu/11746>

IIGB Researcher on State Carcinogen Identification Committee (November 2012)

David Eastmond, a professor of cell biology and an IIGB researcher, was reappointed by Governor Edmund G. Brown to the Carcinogen Identification Committee of the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment. Eastmond has served on the committee since 1999.

The committee identifies chemicals for addition to the list of chemicals known to the State of California to cause cancer, and determines whether a chemical has been clearly shown, through scientifically valid testing according to generally accepted principles, to cause the disease. As a member of the Carcinogen Identification Committee, Eastmond is responsible for reviewing the scientific studies performed on chemicals that have been nominated for listing and determining whether the evidence shows that the chemicals have been clearly shown to cause cancer.

UCR Today dated November 29, 2012: <http://ucrtoday.ucr.edu/10478>

IIGB/CDVR Researcher Discovers How Noses Detect Odors (Journal Cover: November 2012)

Research by IIGB and Stanford University scientists identifies a braking mechanism in olfactory neurons that helps generate an amazing diversity of sensors in the nose. The research, led by **Anandasankar Ray's** lab, is featured on the cover of the Nov. 15, 2012 issue of *Genes & Development*.

Focusing on the olfactory receptor for detecting carbon dioxide in *Drosophila* (fruit fly), researchers identified a large multi-protein complex in olfactory neurons, called MMB/dREAM, that plays a major role in selecting the carbon dioxide receptors to be expressed in appropriate neurons. Next, the researchers will test whether the receptor-braking mechanism they identified in *Drosophila* is also involved in other organisms like mosquitoes.

Besides Ray, UCR's Sarah Perry, the research paper's co-first author and a graduate student in the Genetics, Genomics and Bioinformatics program, and Sana Tharadra, a junior specialist in Ray's lab, were involved in the research. They were joined in the work by Stanford University's Choon Kiat Sim, the co-first author of the research paper, and Joseph S. Lipsick, a professor of pathology and genetics.

UCR Today dated November 14, 2012: <http://ucrtoday.ucr.edu/10175>

Genome Resource Developed Potentially Improving Barley Crop

An international effort involving ~70 scientists in nine countries (Germany, UK, Australia, USA, Finland, Japan, Israel, France, Italy) with nine working at UCR developed a high-resolution genomic resource for barley that could potentially help produce higher yields, improve pest and disease resistance, and enhance its nutritional value. IIGB/CEPCEB researchers Timothy Close and Stefano Lonardi made significant contributions to the research project.

The resource gives new molecular and cellular insight into the biology of barley, one of the world's most important and earliest domesticated cereal crops. It represents a hub for trait isolation, understanding and exploiting natural genetic diversity and investigating the unique biology and evolution of the crop. Study results appear in the journal *Nature* (Oct. 2012).

In the research paper, the scientists provide a detailed overview of the functional portions of the barley genome, revealing the order and structure of most of its 32,000 genes. They also give a detailed analysis of where and when barley genes are switched on in different tissues and at different stages of development. The scientists also describe the location of dynamic regions of the barley genome that carry genes conferring resistance to devastating diseases, such as powdery mildew, Fusarium head blight and rusts. The result, they say, is a better understanding of the crop's immune system and the genetic differences among barley cultivars.

The success of the barley genome sequencing and other grass family crops, such as wheat and rye, will allow breeders and scientists to effectively address the challenge of feeding the world's burgeoning population under the constraints of an environment that increasingly challenges farmers and ranchers with extreme weather events.

UCR Today dated October 17, 2012: <http://ucrtoday.ucr.edu/9588>

IIGB Chemists Assess DNA Damage (August 2012)

IIGB researcher **Yinsheng Wang** and other chemists have now developed a test in the lab to examine how DNA damage caused by anticancer drugs and environmental chemicals ultimately impedes protein synthesis. Transcription is a cellular process by which genetic information from DNA is copied to messenger RNA for protein production. But anticancer drugs and environmental chemicals can sometimes interrupt this flow of genetic information by causing modifications in DNA.

The chemists report that the method, called "competitive transcription and adduct bypass" or CTAB, can help explain how DNA damage arising from environmental chemicals leads to cancer development.

Wang explained that the CTAB method can be used also to examine various proteins involved in the repair of DNA. One of his research group's goals is to understand how DNA damage is repaired — knowledge that could result in the development of new and more effective drugs for cancer treatment.

Study results appeared online in *Nature Chemical Biology* (<http://www.nature.com/nchembio/journal/vaop/ncurrent/abs/nchembio.1046.html>) on Aug. 19, 2012.

For additional information, please visit:

- UCRToday August 21, 2012 (<http://ucrtoday.ucr.edu/8427>)

Miscellaneous Discoveries:

Antiviral Research

Morris Maduro's lab identified lipid metabolism as a contributing factor to antiviral immunity in the nematode, *C. elegans*. His lab is also studying stochasticity in specification of the endodermal germ layer.

Bioinformatics:

Tao Jiang's lab developed new methods for (i) correcting read biases in RNA-Seq data so isoforms can be inferred and quantified more accurately and (ii) detecting differential gene expressions by combining both RNA-Seq and coexpression data.

MicroRNAs:

Xuemei Chen's lab made a breakthrough discovery that microRNAs carry out one of their regulatory functions on the endoplasmic reticulum. This opened up a new area of research that will help understand the mode of action of microRNAs.

Plant Immunity

Thomas Eulgem's lab focused on two areas related to plant immune biology, (1) chromatin-related mechanisms of defense gene expression and (2) the mechanistic basis of plant hormesis. The latter one was a completely new focus area for the Eulgem lab. They discovered that synthetic elicitors (small drug-like compounds that induce plant immune responses) can trigger hormetic effects. Hormesis is a poorly understood pharmacological phenomenon that is manifested by biphasic dose response curves. Certain chemical or physical stimuli, that are detrimental at high doses, can trigger enhanced performance of biological systems when applied at low intensities.

Vector Research:

The ability of an animal to identify nutrient-rich foods and harmful toxins, as well as to regulate both the quantity and quality of its food, is critical for survival and reproduction. Anupama Dahanukar's lab is using the model insect *Drosophila* to identify taste receptors and the neural circuits that convey taste information and regulate feeding behavior. We have also initiated new projects to investigate the mechanisms by which food choice is altered by prior experience or by changes in mating status, and are dissecting the signaling pathways and neural circuits that are required for such behavioral modulation.

A3. ORGANIZATIONAL AND MANAGEMENT STRUCTURE: Have any changes been made to the organizational or management structure of the center during the review period? If so, please describe.

IIGB's active membership is currently 94, from 17 departments (Anthropology, Biochemistry, Bioengineering, Biology, Biomedical Sciences, Botany & Plant Sciences, Cell biology & Neuroscience, Chemical & Environmental Engineering, Chemistry, Computer Science & Engineering, Electrical Engineering, Entomology, Mechanical Engineering, Nematology, Plant Pathology & Microbiology, Psychology, Statistics), 3 Colleges (Bourns College of Engineering; College of Natural & Agricultural Sciences; College of Humanities, Arts & Social Sciences), 1 Division (Biomedical Sciences), and 9 Centers (Center for Plant Cell Biology, Center for Disease Vector Research, . During fiscal year 2012-13, the following faculty accepted an invitation to join the Institute for Integrative Genome Biology.

Huiwang Ai, Chemistry (eff. 8/12)
I-Chueh Huang, Cell Biology & Neuroscience (eff. 7/12)
Fedor (Ted) Karginov, Cell Biology & Neuroscience (eff. 1/13)
Ilhem Messaoudi Powers, Biomedical Sciences (eff. 1/13)

There are currently 42 members in CEPCEB from 12 departments, and 22 members in CDVR from 6 departments.

Leadership:

The following assumed notable roles in FY 2012-13 within the IIGB Genomics Building:

Genomics Building Advisory Committee

Jory Yarmoff, CNAS Divisional Dean
Natasha Raikhel, IIGB Director
Julia Bailey-Serres, CEPCEB Director (Alternate)
Peter Atkinson, CDVR Director
Sarjeet Gill, Professor, Cell Biology & Neuroscience
Cynthia Larive, Professor, Chemistry

Floor Contacts

Given the open design of the building, it is important that occupants of each floor have a primary contact for inquiries, suggestions, and concerns. The following faculty have been designated with responsibility for management of operations and space on their floor.

First Floor: Howard Judelson, Plant Pathology & Microbiology
Second Floor: Peter Atkinson, Entomology
Third Floor: Linda Walling, Botany & Plant Sciences

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Fourth Floor: Natasha Raikhel/Julia Bailey-Serres, Botany & Plant Sciences

Emergency Contacts:

Building Supervisor for Emergency Conditions (BSEC):

Mien Van de Ven, SRA, Botany & Plant Sciences

Fran Holzer, SRA, Botany & Plant Sciences (Alternate)

Building Emergency Staff:

Alcocer, Michelle (Floor 1)

Ma, Kai-Wai (Floor 1)

Sauer, Silvia (Floor 2)

Holzer, Frances (Floor 3)

Mandal, Jayati (Floor 3)

Chaudhary, Ritu (Floor 2)

Wang, Huan (Floor 3)

Lavagi, Irene (Floor 4)

Li, Shengben (Floor 4)

Sorenson, Reed (Floor 4)

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ADVISORY COMMITTEE MEMBERS

For Advisory Committee members, please indicate name, title, and affiliation. Below the table, list dates of meetings held for the period under review and attach a copy of the agenda for each meeting listed.

2012-13 IIGB Advisory Committee:

Formulated in 2006, the IIGB Advisory Committee is comprised of faculty representing each of the major research areas within the Institute (vector biology, mammalian biology, plant biology, biology, bioengineering, social/ethical considerations). The IIGB Advisory Committee serves as the primary consultative body for the director and provides input regarding daily operational issues, expenditures exceeding \$60k and the short- and long-term goals of the Institute. Committee members are approached on a regular basis by the director and have agreed to respond to all general and pressing issues within 12 hours via email whenever possible. The committee also meets on an as-needed basis, as determined by the Director or advisory committee members.

<i>Name</i>	<i>Title</i>	<i>Affiliation</i>	<i>Period of Service on Advisory Committee</i>
Atkinson, Peter	Professor	Entomology	2006-11
Borkovich, Katherine	Professor	Plant Pathology & Microbiology	2006-11
Carson, Monica	Assoc. Professor	Division of Biomedical Sciences	2006-11
Gill, Sarjeet	Professor, Chair	Cell Biology & Neuroscience	2006-11
Hayashi, Cheryl	Assoc. Professor	Biology	2006-11
Schultz, Jerome	Distinguished Professor	Bioengineering	2006-11

2010-11 Genomics Building Advisory Committee

The Genomics Building Advisory Committee is authorized to assess space allocations (general purpose, conference/public, research, bioinformatics training, and office/study) and make final decisions regarding unresolved procedural issues and concerns affecting occupants on floors or throughout the Genomics Building. Committee membership includes the IIGB director, IIGB center directors (Center for Plant Cell Biology (Alternate), Center for Disease Vector Research), two outside members (non-building residents), and the divisional dean responsible for facilities and research as an ex officio member. Current members are below.

Jory Yarmoff, CNAS Divisional Dean
 Natasha Raikhel, IIGB Director
 Julia Bailey-Serres, CEPCEB Director (Alternate)
 Peter Atkinson, CDVR Director
 Sarjeet Gill, Professor, Cell Biology & Neuroscience
 Cynthia Larive, Professor, Chemistry

B.2: IIGB PUBLICATIONS Information is dependent on PI response.

No maximum page limit. Provide information only for fiscal year under review. List only those publications resulting from programs administered through the Center and those authored jointly as a result of collaborations between or among Center participants. Use suggested format below. Use full citation and arrange alphabetically by author under the Center's major research programs.

AGRICULTURE/CROP BIOSAFETY

- Smith Becker J, **Borneman J**, Ole Becker JO (2013) *Dactylella oviparasitica* parasitism of the sugar beet cyst nematode observed in trixenic culture plates. *Biological Control* 64:51-56.
- Yang JI, Ruegger PM, McKenry MV, Becker JO, **Borneman J** (2012) Correlations between root-associated microorganisms and peach replant disease symptoms in a California soil. *PLoS One*. 2012;7(10):e46420.
- Ellstrand NC**. 2012. Over a decade of crop transgenes out-of-place. In *Regulation of Agricultural Biotechnology: the United States and Canada*. ed CA Wozniak, A McHughen, pp. 123-135.

BIOMEDICAL

- Yamamoto ML, Maier I, Dang AT, Berry D, Liu J, Ruegger PM, Yang J, Soto PA, Presley LL, Reliene R, Westbrook AM, Wei B, Loy A, Chang C, Braun J, **Borneman J**, Schiestl RH (2013) Intestinal bacteria modify lymphoma incidence and latency by affecting systemic inflammatory state, oxidative stress, and leucocyte genotoxicity. *Cancer Research* 73:4222-4232.
- McHardy IH, Goudarzi M, Tong M, Ruegger PM, Schwager E, Weger JR, Graeber TG, Sonnenburg JL, Horvath S, Huttenhower C, McGovern DPB, Fornace AJ, **Borneman J**, Braun J (2013) Integrative analysis of the microbiome and metabolome of the human intestinal mucosal surface reveals exquisite inter-relationships. *Microbiome* 1:17.

COMPUTATIONAL BIOLOGY/BIOINFORMATICS CLUSTER

- Zhang, Z., Cui, X., Jeske, D. R. and **Borneman, J** (2013) Biclustering Scatter Plots Using Data Depth Measures. *Statistical Analysis and Data Mining* 6:102-115.
- Benecke S, Jeske DR, Ruegger P, **Borneman J** (2013) Bayes Neutral Zone Classifiers With Applications to Nonparametric Unsupervised Settings. *Journal of Agricultural, Biological, and Environmental Statistics* 18:39-52.
- E.W. Yang, **T. Girke and T. Jiang**. (2013) Differential gene expression analysis using coexpression and RNA-Seq data. *Bioinformatics*, accepted June 10, 2013.
- Lonardi S**, Duma D, Alpert M, Cordero F, Beccuti M, Bhat PR, Wu Y, Ciardo G, Alsaihati B, Ma Y, Wanamaker S, Resnik J, Bozdag S, Luo MC, **Close TJ** (2013) Combinatorial pooling enables selective sequencing of the barley gene space. *PLoS Comput Biol*. 9(4) e1003010. doi: 10.1371/journal.pcbi.1003010. Epub 2013 Apr 4.
- Bozdag S, **Close TJ, Lonardi S** (2013) A graph-theoretical approach to the selection of the minimum tiling path from a physical map. *IEEE/ACM Trans Comput Biol Bioinform*. 2013 Mar-Apr ; 10(2): 352-60.
- Bozdag S, **Close TJ, Lonardi S**. (2013) A Graph-Theoretical Approach to the Selection of the Minimum Tiling Path from a Physical Map. *IEEE/ACM Trans Comput Biol Bioinform*. 2013 Mar 26. [Epub ahead of print].
- S. Roy, L. Poidevin, **T. Jiang, and H.S. Judelson**. (2013) Novel core promoter elements in the oomycete pathogen *Phytophthora infestans* and their influence on expression detected by genome-wide analysis. *BMC Genomics* 14:106, 2013.
- E. Bao, **T. Jiang and T. Girke** (2013). BRANCH: boosting RNA-Seq assemblies with partial or related genomic sequences. *Bioinformatics* 29(10):1250-1259.
- P. Ruegger, E. Bent, W. Li, D. Jeske, **X. Cui**, J. Braun, **T. Jiang, and J. Borneman**. (2012) Improving oligonucleotide fingerprinting of rRNA genes by implementation of polony microarray technology. *Journal of Microbiological Methods* 90:235-240.
- O. Tanaseichuk, **J. Borneman and T. Jiang**. (2012) Separating metagenomic short reads into genomes via clustering. *Algorithms for Molecular Biology* 7(1):27.
- B. Fang, D. Mane-Padros, E. Bolotin, **T. Jiang, and F. Sladek**. (2012) Identification of a binding motif specific to HNF4 by comparative analysis of multiple nuclear receptors. *Nucleic Acids Research* 40(12):5343-5356.
- E.Y.Harris, N.Ponts, **K.G.Le Roch, S.Lonardi** (2012) BRAT-BW: Efficient and accurate mapping of bisulfite-treated reads. *Bioinformatics* 28(13) 1795-1796.
- A.Polishko, N.Ponts, **K.G.Le Roch, S.Lonardi** (2012) NORMAL: Accurate Nucleosome Positioning using a Modified Gaussian Mixture Model. *Bioinformatics*:28(12), i242-i249.

EVOLUTION OF INVASIVENESS

- Leak-Garcia JA, Holt JS, Kim S-C, Mu L, Mejías, **Ellstrand NC**. (2012) More than multiple introductions: Multiple taxa contribute to the genesis of the invasive California's wild artichoke thistle. *Journal of Systematics and Evolution* 51: 295-307.

GENOMICS/GENETICS

International Barley Genome Sequencing Consortium,

Mayer KF, Waugh R, Brown JW, Schulman A, Langridge P, Platzer M, Fincher GB, Muehlbauer GJ, Sato K, Close TJ, Wise RP, Stein N (2012) A physical, genetic and functional sequence assembly of the barley genome. *Nature*. 2012 Nov 29; 491(7426): 711-6.

Hufford MB, Lubinsky P, Pyhäjärvi T, Devengenzo M, Ellstrand NC, Ross-Ibarra J. (2013) The genomic signature of crop-wild introgression in maize. *PLoS Genetics* 9(5): e1003477.

MICRO RNAs

Shengben Li, Lin Liu, Xiaohong Zhuang, Yu Yu, Xigang Liu, Xia Cui, Lijuan Ji, Zhiqiang Pan, Xiaofeng Cao, Beixin Mo, Fuchun Zhang, **Natasha Raikhel**, Liwen Jiang, and **Xuemei Chen**. (2013). microRNAs inhibit the translation of target mRNAs on the endoplasmic reticulum in Arabidopsis. *Cell* 153, 562-574.

Thanh Theresa Dinh, Michael O'Leary, So Youn Won, Shengben Li, Lorena Arroyo, Xigang Liu, Andrew Defries, Binglian Zheng, **Sean R. Cutler**, and **Xuemei Chen**. (2013). Generation of a luciferase-based reporter for CHH and CG DNA methylation in Arabidopsis thaliana. *Silence* 4:1.

Kestrel Rogers and **Xuemei Chen**. (2013). MicroRNA biogenesis and turnover in plants. *Cold Spring Harbor Symposia on Quantitative Biology* 77, doi: 10.1101/sqb.2013.77.014530.

Lulu Wang, Xianwei Song, Liangfeng Gu, Xin Li, Shouyun Cao, Chengcai Chu, Xia Cui, **Xuemei Chen** and Xiaofeng Cao*. (2013). NOT2 proteins promote Pol II-dependent transcription and interact with multiple miRNA biogenesis factors in Arabidopsis. *Plant Cell* 25, 715-727.

Yongli Qiao, Lin Liu, Cristina Flores, James Wong, Xianbing Wang, Qijun Xiang, Xigang Liu, Shushu Jiang, Jinxia Shi, Fuchun Zhang, **Howard S. Judelson**, **Xuemei Chen**, **Wenbo Ma***. (2013). Oomycete Pathogens Encode RNA Silencing Suppressors. *Nature Genetics* 45, 330-333.

Rae Eden Yumul, Yun Ju Kim, Xigang Liu, Ruozhong Wang, Junhui Ding, Langtao Xiao, and **Xuemei Chen***. (2013). POWERDRESS and diversified expression of the MIR172 gene family bolster the floral stem cell network. *Plos Genetics* 9(1): e1003218. doi:10.1371/journal.pgen.1003218

Xurong Tang, Shaomin Bian, Mingjuan Tang, Qing Lu, Shengben Li, Xigang Liu, Gang Tian, Vi Nguyen, Edward W.T. Tsang, Aiming Wang, Steven J. Rothstein, **Xuemei Chen***, and Yuhai Cui*. (2012). MicroRNA-mediated repression of the seed maturation program during vegetative development in Arabidopsis. *Plos Genetics* 8(11): e1003091. doi:10.1371/journal.pgen.1003091

Yuanyuan Zhao, Beixin Mo, and **Xuemei Chen**. (2012). Mechanisms that impact microRNA stability in plants. *RNA Biology* 9, 1218-1223.

Xuemei Chen. (2012). Small RNAs in development – insights from plants. *Current Opinion in Genetics and Development* 22, 361-367. PMID: PMC3419802

So Youn Won, Shengben Li, Binglian Zheng, Yuanyuan Zhao, Dongming Li, Xin Zhao, Huilan Yi, Lei Gao, Thanh T Dinh and **Xuemei Chen***. (2012). Development of a luciferase-based reporter of transcriptional gene silencing that enables bidirectional mutant screening in Arabidopsis thaliana. *Silence* 2012, 3:6.

NEUROSCIENCE

Charlu, S., Wisotsky, Z., Medina, A. & **Dahanukar, A.** (2013) Acid sensing by sweet and bitter taste neurons in Drosophila melanogaster. *Nat Commun* 4:2042 doi: 10.1038/ncomms3042.

PARASITOLOGY/NEUROSCIENCE

Nance, J.Philip, Kevin M Vannella, Danielle Worth Clement David, **David Carter**, Shahani Noor, Cedric Hubeau, Lori Fitz, Thomas E. Lane, Thomas A. Wynn, **Emma H Wilson** (2012) Chitinase dependent control of protozoan cyst burden in the brain. *PLoS Pathogens* 11/2012;8(11):e1002990

PLANT DEFENSE

Scranton M, Yee A, **Park SY**, **Walling LL** (2012) Plant leucine aminopeptidases moonlight as molecular chaperones. *Journal of Biological Chemistry* 287: 18408-18417

Walling LL (2012) Leucyl aminopeptidase (plant). In: Rawlings ND, Salvesen G (eds) *Handbook of Proteolytic Enzymes*. Third Edition., In press

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Walling LL, Thompson GA (2013) Behavioral and molecular-genetic basis of resistance against phloem feeding insects. In: vanBel A, Thompson GA (eds) *Phloem: Molecular Cell Biology, Systemic Communication, Biotic Interactions*. Wiley-Blackwell.

PLANT IMMUNE BIOLOGY

Atamian, H.S, **Eulgem, T., Kaloshian, I.** (2012) SIWRKY70 is required for Mi-1-mediated resistance to aphids and nematodes in tomato. *Planta*, 235: 299–309.

Tokuji Tsuchiya & **Thomas Eulgem.** in press (SREP-13-00548A). Mutations in EDM2 selectively affect silencing states of transposons and induce plant developmental plasticity. *Scientific Reports*, 3: 1701.

PLANT MOLECULAR BIOLOGY

X.Zhang, Y.Lii, Z.Wu, A.Polishko, H.Zhang, V.Chinnusamy, S.Lonardi, J.K. Zhu, R.Liu, H.Jin (2013) Mechanisms of small RNA generation from cis-NATs in response to environmental and developmental cues. *Molecular Plant* 6(3): 704-715.

International Barley Genome Sequencing Consortium: N.Stein, A.Graner, A.Himmelbach, B.Steuernagel, D.Schulte, M.Mascher, N.Poursarebani, R.Zhou, R.Ariyadasa, T.Schmutzer, U.Scholz, H.Gundlach, K.Mayer, M.Spannagl, M.Pfeifer, M.Martis, T.Nussbaumer, A.Druka, D.Marshall, H.Liu, J.Morris, J.Russell, M.Bayer, J.Brown, P.Hedley, R.Waugh, Bujun Shi, P.Langridge, J.Svensson, **J.Resnik**, K.Madishetty, M.Moscou, **P.Bhat, S.Wannamaker, T.Close**, Y.Ma, D.Duma, F.Cordero, G.Ciardo, M.Beccuti, M.Alpert, **S.Lonardi**, H.Berges, A.Korol, Z.Frenkel, M.Groth, M.Felder, M.Platzer, S.Taudien, A.Schulman, C.Moisy, J.Tanskanen, T.Matsumoto, T.Tanaka, K.Sato, G.Fincher, D.Swarbreck, D.Sampath, M.Caccamo, M.Febrer, S.Ayling, R.Wing, G.Muehlbauer, A.Zuccolo, F.Cattonaro, M.Morgante, S.Scalabrin, S.Radovic, V.Vendramin, J.Poland, R.Wise (2012) A physical, genetical and functional sequence assembly of the barley genome. *Nature* 491(7426):711-716.

SMALL RNAs/GENE SILENCING

Zhao H, Sun R, Albrecht U, Padmanabhan C, Wang A, Coffey MD, **Girke T**, Wang Z, **Close TJ, Roose M**, Yokomi RK, Folim nova S, Vidalakis G, Rouse R, Bowman KD, **Jin H** (2013) Small RNA profiling reveals phosphorus deficiency as a contributing factor in symptom expression for citrus huanglongbing disease *Mol Plant*. 2013 Mar ; 6(2): 301-10.

B.3: DISTINGUISHED AWARDS RECEIVED OR HELD BY CENTER PARTICIPANTS Please list prestigious awards received or held by Center participants from professional organizations, industry, etc.

Recipient Name	Name of Award	Year Award Received
WESSLER, SUSAN Botany & Plant Sciences	Election to American Philosophical Society (APS)	2013
CHEN, XUEMEI Botany & Plant Sciences	Election to National Academy of Sciences	2013
WESSLER, SUSAN Botany & Plant Sciences	ASPB Fellow, American Society of Plant Biologists (ASPB)	2013
RAIKHEL, NATASHA Botany & Plant Sciences	Adolph E. Gude, Jr., Award, American Society of Plant Biologists (ASPB)	2013
ORTIZ, IRMA	Ford Foundation Predoctoral Fellowship, National Research Council (NRC); National Science Foundation's Graduate Research Fellowship Program (GRFP) Honorable Mention Award	2013
DAVIS, BARBARA Cell, Molecular & Developmental Biology Graduate Program	National Science Foundation's Graduate Research Fellowship Program (GRFP) Award	2013
DEDOW, LAUREN Genetics, Genomics & Bioinformatics Graduate Program	National Science Foundation's Graduate Research Fellowship Program (GRFP) Award	2013
GREEN, LEOPOLD NOEL Bioengineering Graduate Program	National Science Foundation's Graduate Research Fellowship Program (GRFP) Award	2013
LARIVE, CYNTHIA Chemistry	Chair, ACS Division of Analytical Chemistry	2013
WANG, YINSHENG Chemistry	Biemann Medal, American Society for Mass Spectrometry (ASMS) – First awarded at UCR	2013
WALLING, LINDA Botany & Plant Sciences	Elected to AAAS Membership Committee (Plant Sciences Section)	2013

B.4: EVENTS SPONSORED BY CENTER

Please list events sponsored by Center during the period under review.

EVENTS SPONSORED BY CENTER					
Title of Event	Type of Event	Date of Event	Number of Attendees	Names of Featured Speakers	Title and Affiliation of Featured Speakers
IIGB/CEPCEB/CDVR/GGB / IGERT Seminars	Seminar Series	See Attachment	~25	See Attachment D	
IIGB Tours	Tours of Instrumentation Facilities (microscopy, bioinformatics, proteomics, genomics)	See Attachment B	See Attachment B	Microscopy: David Carter Bioinformatics: Thomas Girke Proteomics: Songqin Pan Genomics: Glenn Hicks	Academic Coordinator, Imaging/Microscopy Asst. Professor/Dir. of Bioinf Facilities Academic Coordinator, Proteomics IIGB Academic Administrator
IIGB Forum	Forum	June 14, 2013	~40	Natasha Raikhel Julia Bailey-Serres Xuemei Chen Shou-wei Ding Thomas Girke Glenn Hicks	IIGB Director CEPCEB Director Professor, Botany & Plant Sciences Professor, Plant Pathology & Microbiology Assoc. Professor, Botany & Plant Sciences Academic Administrator, Institute for Integrative Genome Biology
CEPCEB REU Poster Symposium	Poster Symposium	August 17, 2012	~50	REU Students	
CEPCEB 10 th Anniversary Symposium	Lecture/Award Ceremony	December 14, 2012	~90	James Carrington Wolf Frommer Susan McCouch Jen Sheen Neelima Sinha	President, Donald Danforth Plant Science Center Director, Carnegie Institution for Science Professor, Cornell University Professor, Massachusetts General Hospital Professor, University of California, Davis
Southern California Instrumentation Facility Consortium	Workshop/Meeting	May 16-17, 2013	12	Charles Nicolet, Ph.D. Vincent Funari, Ph.D. Melanie L. Oakes, PhD Suzanne Sandmeyer	Director of Sequencing Technology, University of Southern California Technical Director, Genomics Core Cedars-Sinai Medical Center Genomics High-Throughput Facility Manager University of California, Irvine Professor/Director of Genomics High-throughput Facility University of California, Irvine

B.5: SPACE UTILIZED BY CENTER

Fiscal Year Period:

Center Name:

Please provide explanations or descriptions as required. Changes to number of square feet, space configuration, or space use should be described.

Space Description	Square Feet
Meeting Space	2,182 (2018 Keen Hall; 1102/1102A Genomics)
Office Support	1,372*
Research	6751**
Special Use	
Miscellaneous	214 (misc. storage, incl. AV equipment) 286
Total Assigned Space	10,519

* Space related to offices, office equipment, and support services at Keen Hall and Genomics building

** Research and support space at Keen Hall and Genomics Building.

B.6: SPONSORED FUNDING PROPOSALS AND AWARDS

Fiscal Year Period:

Center Name:

On the first table below, please list all current (new and continuing) awards for the fiscal year under review. This list should include only those projects where the intellectual content was a result of Center collaborations, not awards that were made possible simply because of the availability of Center facilities and/or equipment.

Current Awards

IIGB

Proposal Title	PI	Co-PIs	Funding Agency	Period of Funding	Total Award
Developmental Buffering in a Gene Regulatory Network	Morris Maduro		NSF	2013 – 2015	\$550,000
Collaborative Research: ABI Innovation: Genome-Wide Inference of mRNA Isoforms and Abundance Estimation from Biased RNA-Seq Reads	Tao Jiang	Xinshu (Grace) Xiao, UCLA	NSF ABI	9/1/2013 – 8/31/2016	\$771,000
Dietary Effects on the Gut-Brain Axis	Frances Sladek	James Borneman, Margarita Curras-Collazo, Tao Jiang, Chris Lytle	UCR Seed Grant	2013-14	\$70,000
Understanding the Role of Nucleosomes Turnover in the Malaria Parasite Infection	Karine Le Roch	Stefano Lonardi	NIH	11/2010 – 10/2014	\$1,839,568
ABI Innovation: Barcoding-Free Multiplexing: Leveraging Combinatorial Pooling for High-Throughput Sequencing	Stefano Lonardi	Timothy Close	NSF	5/2011 – 4/2014	\$420,635
III: Medium: Algorithms and Software Tools for Epigenetics Research	Stefano Lonardi	Karine Le Roch	NSF	9/2013 – 8/2016	\$994,370
Genome-wide Identification of Immediate Early Genes in Insects	Anupama Dahanukar	Anandasankar Ray	NIH (NINDS)	2/1/2011 – 1/31/2013	\$412,803
Decoding the Logic of Gustatory Input Diversity to Behavioral Output	Anupama Dahanukar		Whitehall Foundation	1/1/2011 – 12/31/2013	\$225,000
Receptors and Neurons Mediating Acid Taste in Drosophila	Anupama Dahanukar		NIH (NIDCD)	7/1/2012 – 6/30/2014	\$404,616
CAREER: Mechanisms of	Anupama		NSF	7/1/2012 –	\$1,179,282

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Feeding Behavior Regulation	Dahanukar		NIH	6/30/2017	
Integrated Statistical Algorithms with Ultra-high Performance Computing for discovering NSPs from Massive Next-generation Metagenomic Sequencing Data	Xinping Cui	Ping Ma (UIUC)	NSF	8/15/2013 – 7/31/2016	\$904,212
MoBe DAC: A data analysis core for the Sloan microbiome of the built environment initiative	Jason Stajich		Alfred P. Sloan Foundation	1/1/2011 – 12/31/2013	\$750,000
New Active Transposons for Mosquito Genomics	Susan Wessler	Jason Stajich	W.M. Keck Foundation	2/1/2011 – 1/31/2013	\$1,000,000
IOS “CPGS: Genome-wide impact of mPing transposition on rice phenotypic diversity”	Susan Wessler	Jason Stajich	NSF	3/1/2011 – 2/28/2015	\$1,006,539
A publicly-accessible Cryptococcus genome database: annotation of the Cryptococcus literature through comprehensive curation of the scientific literature	Jason Stajich		NIH	1/1/2013 – 12/31/2014	\$168,822
Effects of Intestinal Microflora on high - LET radiation mediated toxicity and genomic instability	James Borneman		NASA	11/1/2010 – 10/31/2013	\$68,000
Epigenetic regulation of seed maturation and germination in soybean	Xuemei Chen		USDA-NIFA	5/1/2011 – 4/30/14	\$500,000
REU Site: Research Experiences for Undergraduates in Plant and Plant=Pathogen Cell Biology	Howard Judelson	Patricia Springer	NSF	4/1/2010 – 3/31/2015	\$614,097

B.7: NON-SPONSORED RESOURCES

Sources of Funding(IIGB)		Amount
Funding Provided by UCR Institutional Sources	CNAS Staff funding	\$308,822
	CNAS Operating Budget	\$78,651
Funding Provided by UC System Sources		
Funding from Endowments or Gifts	Noel Keen Memorial Endowment Fund	\$6,695
		\$394,168 Total
Sources of Funding(CEPCEB)		Amount
Funding Provided by UCR Institutional Sources	CNAS Staff funding	\$275,636
	CNAS Operating Budget	\$8,488
Funding Provided by UC System Sources		
Funding from Endowments or Gifts	CEPCEB Award Fund	\$6,950
		\$291,074 Total

IIGB FACULTY FORUM
Friday, June 14, 2013: 12:00pm
Genomics Auditorium, Rm 1102

–AGENDA–

- I. Announcements (N. Raikhel, S.W. Ding, X. Chen, T. Girke, J. Bailey-Serres)**
- A. Recruitments
- i. Status of Two IIGB Faculty Recruitments (college-wide):
1. Virology: (Shou-wei Ding Search Committee Chair)
 - o Committee Members: Sarjeet Gill, Anupama Dahanukar, I-Chueh Huang, David Lo
 2. Epigenetics: (Xuemei Chen Search Committee Chair)
 - a. Committee Members: Natasha Raikhel, Karine Le Roch, Yinsheng Wang, Jikui Song
It was determined that X. Chen would write to P. Atkinson regarding delays in recruitments.
- ii. Bioinformatics Academic Coordinator:
1. Background: Natasha Raikhel
Currently, there is funding for a .5 FTE Academic Coordinator (T. Girke became 1.0 FTE faculty and funding redirected). Natasha offered to swap 1.0 FTE faculty line from retention agreement and asked for additional \$500K infrastructure setup; this was denied. The Dean's office will provide temporary funds of \$30K to supplement salary for the AC position for one year only. It was determined that funds from the bioinformatics programmer's salary will be used after one year as supplemental funding for the AC position, leaving the programmer position inadequately funded.
 2. Status (Thomas Girke Search Committee Chair)
Offer made to Sean MacEachern from Cobb-Vantress, Inc. (chicken breeding company) in Siloam Springs, Arkansas. Offer denied.
 3. Search Committee Members: Julia Bailey-Serres, Glenn Hicks, Stefano Lonardi, Anand Ray, Jason Stajich
 4. **Rebecca Sun (bioinformatics programmer) will be leaving in September 2013 and T. Girke is in the process of recruiting.**
- iii. CEPCEB Plant Cellular Biochemist: (Julia Bailey-Serres, search committee member)
1. Status
2012-13 search unsuccessful; slow recruitment process may have contributed. Search will be reopened.
 2. Committee members: Zhenbiao Yang (chair), Sean Cutler, Wenwan Zhong
- B. Management Changes (N. Raikhel)
- i. Effective 1/1/2013, Julia Bailey-Serres replaced Natasha Raikhel as director of CEPCEB
 - ii. Natasha Raikhel remains director of IIGB
- II. Faculty Recruitment 2014 (2): (N. Raikhel)**
- Two Asst. Professors: Natasha Raikhel and Shou-wei Ding retentions
 - Areas of Focus (solicitation – send to N. Raikhel/S.W. Ding)

- III. **NIH Institutional Training Grants (Ruth L. Kirschstein National Research Service Awards (NRSA) – T32s (I. Ethell))**
 - PI: Iryna Ethell
 - Participants: NIH-funded PIs
 - Focus: biomedical epigenetics

- IV. **IIGB Instrumentation Core Update (G. Hicks)**
 - i. NIH Award
 - 1. LTQ Orbitrap Elite Mass Spectrometer: \$651K (Proteomics: Yinsheng Wang/Songqin Pan)
It was reported that the equipment is on order!
 - ii. New Equipment/Service in Cores
 - iii. New High-End Instrumentation Proposals in FY14
 - iv. **Glenn reported that a consortium is being organized among southern California institutions with instrumentation facilities (Cedars-Sinai Medical Center, UC Irvine, University of Southern California) in order to share ideas and resources.**

- V. **IIGB Seed Grants (N. Raikhel)**
 - A. 2013:
 - i. Six seed grants of \$5,000 sponsored by IIGB/RED were awarded in FY13 to assist in development of innovative research and/or exploration of new genomics, bioinformatics, proteomics and imaging/microscopy approaches.
 - ii. Award Recipients:
 - 1. Thomas Eulgem (BPS)
 - 2. Sean Cutler (BPS)
 - 3. Wenbo Ma and Anupama Dahanukar (ENT)
 - 4. Bradley White (ENT)
 - 5. Michael Allen, Edith Allen, Matthew O'Neill (BPS)
 - 6. Natasha Raikhel and Chunhua Zhang (BPS)
 - B. 2014:
 - i. Fewer but higher amounts offered in FY14?
Group consensus was to offer a greater quantity of smaller grants rather than fewer larger ones. The goal is to offer \$50K in grant funding in FY14 if funding permits.
 - ii. Focus – TBD.

- VI. **RED (Research and Economic Development Office) Collaborative Seed Grant Program (N. Raikhel)**
 - A. Grants being offered up to \$75,000 each
 - B. Target: center, program project grants, large multi-investigator research grants
 - C. Criteria: two or more UCR faculty trying to obtain data results to be competitive for federal funding
 - D. Collaborative ideas?

- VII. **New/Ongoing IIGB Initiatives**
 - A. IIGB PI Luncheon Brainstorming Sessions (N. Raikhel)
 - i. Goal: Problem-solving; Collaborations
 - ii. Open to all IIGB PIs
 - iii. Frequency: monthly
 - iv. BYO lunch or order from menu (**Jammin' Bread**)
 - v. Coordinator volunteers? **Ted Karginov and Hailing Jin agreed to coordinate sessions, which will be held in the Genomics Boardroom.**
 - B. NSF-CEPCEB REU Program in Plant and Plant-Pathogen Cell Biology (H. Judelson)
Howard Judelson reported that 12 students this year were selected from 160 applicants.
 - i. Update
 - C. IIGB/CEPCEB/CDVR Seminars (N. Raikhel)
 - i. Every two weeks, not weekly
 - ii. PI Involvement in encouraging attendance

- iii. Seminar Coordinators:
 - 1. CEPCEB Seminars
 - a. 2012-13 Faculty Coordinators:
Patty Springer/Julia Bailey-Serres
 - b. 2013-14 Coordinators:
Patty Springer/Thomas Girke
 - 2. IIGB Seminars
 - a. 2012-13 Faculty Coordinator: Alex Raikhel
 - b. 2013-14 Faculty Coordinators:
Iryna Ethell/Jason Stajich
 - 3. CDVR Seminars
 - a. 2012-13 Faculty Coordinator: Joao Pedra
2013-14 Faculty Coordinators:
Karine Le Roch/Anupama Dahanukar
 - 4. Student Seminars
 - a. 2012-13 Student Coordinators:
Christi Scott (Ray lab), Stephanie Coffman (Ding lab)
 - b. 2013-14 Student Coordinator:
Lauren Dedow (Bailey-Serres lab)
- D. CEPCEB Award Committee (J. Bailey-Serres)
 - i. 2012-13 Members: Venu Reddy Gonehal (chair), Chia-en Chang, Stefano Lonardi, Glenn Hicks, Shengben Li (Chen lab), Gregory Barding (Larive/Bailey-Serres labs)
 - ii. 2013-14 Members: Same except for Graduate Student and Postdoc
 - iii. Pre-college Awards:
 - 1. State Science Fair held on April 16, 2013
 - a. Judges: David Carter, Shengben Li (Chen lab)
- E. CEPCEB Award Ceremony (J. Bailey-Serres)
 - i. 2012 10th Anniversary (Coordinators J. Bailey-Serres/L. Walling)
 - 1. Held December 14, 2012
 - 2. Speakers: Wolf Frommer, Jen Sheen, James Carrington (Noel. T. Keen Lecturer), Susan McCouch, Neelima Sinha
 - 3. Attendance: 120 researchers
 - 4. Full-day Symposium combined with annual CEPCEB award ceremony
 - ii. 2013 CEPCEB Award Ceremony
 - 1. Date: Wed, December 18, 2013
 - 2. Noel T. Keen Lecturer: Elliot Meyerowitz, California Institute of Technology, Pasadena
 - 3. Symposium – internal speakers?
 - 4. Committee members? Volunteers were encouraged..
 - 5. Postdoc and graduate student attendance will be encouraged by PIs
- F. Career Day 2014
 - i. Coordinator: Anand Ray
 - ii. Open to IIGB postdocs and students
 - iii. Date: Friday, May 23, 2014
 - iv. Faculty Committee Volunteers? Please call or email Anand Ray and/or Jocelyn
- G. 2nd International Hemipteran-Plant Interactions Symposium (HPIS) (Linda Walling)
 - i. Committee Members: Linda Walling, Isgouhi Kaloshian, Gregory Walker, James Ng
 - ii. First meeting held in Brazil in 2011
 - iii. Date: June 23-25, 2014
 - iv. Location: HUB 302
 - v. Expected attendance: 200

VIII. Questions?

SoCal Tribal Meeting Thursday and Friday May 16 and 17

Thursday May 16th

- 3 PM or later Check in at Mission Inn (we will provide directions)
- 6 PM Meet for dinner at Mission Inn Courtyard (discuss objectives of meeting)

Friday May 17th

- 9 AM **Introduction - Glenn**
- 915AM **Overview of IIGB centralized labs**
- 915 - 935AM David Carter - Microscopy (20 mins)
935 - 955AM Sonqin Pan - Proteomics (20mins)
10 - 1030AM Thomas Girke - Bioinformatics (30mins)
1030 - 11AM Glenn Hicks - Genomics (30 mins)
- 11AM – noon **Tour of IIG facilities**
- Noon – 1PM **Lunch and Discussion**
 - How can improve our facilities and operations?
- 1 - 230PM **Overviews of SoCal consortium centralized labs**
 UCI (30 mins)
 USC (30 mins)
 Cedars (30 mins)
- 230 - 3PM **Coffee break**
- 3 – 5PM **Discussion**
 - Would sharing services and expertise be mutually beneficial?
 - If so, how can this be achieved?
 - Next steps?

2012-13 IIGB Instrumentation Facility Tours

FY12/13	Genomics	Proteomics	Microscopy	Bioinformatics	Title	Total Number of Attendees/Per Month
July						
August	1	1	1	1	Vice Chancellor	1
September						
October	1	1	1	1	Univ of China's Dean and former Dean	2
November						
December						
January	1	1	1	1	Epigenetics Faculty Candidate	1
February	6	6	6	5	Recruitment Day/ Students; Epigenetics Faculty Candidates; Virology Faculty Candidates; Visiting Faculty to UCR;	65
March	9	9	9	7	Plant Cell Faculty Candidates; Plant Biology Review Team; Entomology Faculty Candidates' ETOX;	9
April	1	1	1		Students	1
May	5	5	5	5	Entomology Faculty Candidates	5
June	2	1	1		Students	10
Subtotal	26	25	25	20		93

2012-13 IIGB INSTRUMENTATION FACILITY WORKSHOPS

FY12/13	Microscopy	Genomics	Proteomics	Bioinformatics
July	1			
August	2	1	1	
September	2	1		
October	2	1	1	
November	1	3		
December	1	1		11
January	2	1		
February		1		
March	1	2	1	
April	1			
May	4	2		
June	2	1		
Total	19	14	3	11

Grand total 47

IIGB-RELATED SEMINARS: 2012-13

September'12		SPEAKER	TITLE	HOST
CEPCEB	28	Grégory Vert CNRS, Montpellier/SALK	Cell-surface protein dynamics in stress responses and plant growth	Patty Springer
CDVR	29-30	CDVR Symposium(Sat/Sun)		
October'12				
CEPCEB	5	Huiwang Ai UCR Chemistry	Genetically encoded fluorescent probes for redox signaling	Patty Springer
CEPCEB special day 3-4 pm	10	Rishi Bhalerao Umea University(will be visiting Cal, we aren't paying expenses)	Identification of trans-golgi network (TGN) components mediating pectin transport in <i>Arabidopsis thaliana</i>	Natasha Raikhel
Student Seminar	12	Dr. Hanu Pappu Dept of Plant Pathology, University of Washington	Continued Emergence of New Topoviruses (<i>Bunyaviridae</i>): Biological and Molecular Insights and Management Strategies	Venkatesh Sivanandam (GGB student, Rao Lab)
CEPCEB	19	Judy Brusslan Department of Biological Sciences Cal State Long Beach	Leaf Senescence in Arabidopsis: Stromal Protein Degradation and Epigenetic Changes	Julia Bailey-Serres
IIGB	26	Sue Wessler Botany and Plant Sciences UC, Riverside	The strategies of a successful transposable element	Alex Raikhel
November'12				
CDVR	2	Paul Carlier Professor of Chemistry Virginia Tech	Development of species-selective and resistance-breaking insecticides against <i>Anopheles gambiae</i>	Alex Raikhel
CDVR	9	Sonja Best Chief, Innate Immunity and Pathogenesis Unit NIH/Rocky Mountain Laboratories	The battle between flaviviruses and the host interferon response	Joao Pedra
Special CEPCEB Seminar /Noon	13	Adi Avni Tel Aviv University	Endocytosis and sterol biosynthesis in the induction of Plant immunity	Natasha Raikhel
CEPCEB	16	Jason Stajich Plant Pathology and Microbiology UC, Riverside	Genetic and genomic studies of the fungal cell wall and genome defense in <i>Neurospora crassa</i>	Patty Springer
	23	Thanksgiving Holiday	No seminar	
CEPCEB	30	Li Fan Biochemistry Department UC, Riverside	Structural biology of citrus canker: structural and functional studies on <i>Xanthomonas</i> proteins important for the disease	Patty Springer
December'12				
CEPCEB	6	Juergen Kleine Institute of Applied Genetics and Cell Biology Universitat fur Bodenkultur Wien	Auxin-dependent differential cellular growth regulation to fine tune plant development	Natasha Raikhel
CEPCEB Sue Wessler's Keck grant will pay	7	Michael Terns Biochemistry and Molecular Biology and Genetics	Small RNA-Guided Prokaryotic Immune Systems	Sue Wessler

expenses		University of Georgia		
CEPCEB	14	CEPCEB 10 th anniversary symposium/Noel Keen Hall	TBA	Natasha Raikhel
January '13				
CEPCEB	18	Esther van der Knapp / Ohio State University/OARDC	Domestication-driven tomato diversity and functional analyses of the underlying genes	Isgouhi Kaloshian
IIGB **Location is Bourns Hall @4pm	15	Rajuk Kucherlapati Department of Genetics Harvard Medical School	Genomics of Colorectal Cancer	Frances Sladek
CEPCEB **Dr. Raikhel to pay expenses from Various Donors	15	Ariel Orellana Universidad de Andres Bello, Chile	“The Roles of the Ire1 ER-located sensor during the unfolded protein response in Arabidopsis thaliana”	Natasha Raikhel **Seminar in the boardroom
CEPCEB **Dr. Raikhel to pay from Various Donors		Asaph Ahroni Weizsman Institute Israel	Orchestration of Thiamin Biosynthesis and Plant Central Metabolism through the Combined Action of the TPP Riboswitch and the Circadian Clock	Natasha Raikhel
CEPCEB	25	Peter Quail Department of Plant and Microbial Biology UC Berkeley	Dissecting Phytochrome Signaling and Transcriptional Networks	Natasha Raikhel
February '13				
CEPCEB	8	Stacey Harmer Department of Plant Biology UC Davis	A clockwork green: understanding the plant circadian clock and its outputs	Julia Bailey-Serres
CEPCEB	15	Katayoon Dehesh Department of Plant Biology UC Davis	Defining an stress specific retrograde chloroplast-to-nucleus signaling pathway	Natasha Raikhel
IIGB	22	Andrew Fire Department of Pathology and Genetics Stanford	<i>Dynamics of antibody and small RNAs populations: Tracking adaptive immune responses through effector repertoires</i>	Alex Raikhel/Xuemei Chen
March '13				
CDVR	1	Marm Kilpatrick Dept. of Ecology & Evolution UC Santa Cruz	Urbanization on the Ecology of West Nile Virus Transmission	Matt Daugherty
IIGB	8	IIGB Retreat (all day) Botanic Gardens		
CEPCEB	15	Gloria Coruzzi Center for Genomics & Systems Biology New York University	From Predictive Network Modeling to Trait Evolution	Natasha Raikhel
CEPCEB	22	Roger Hangarter Dept of Biology Indiana University	Regulation of light-dependent chloroplast movements in leaf cells	Patty Springer
	29	Chavez Holiday	No seminar	

April'13				
Student Seminar	5	W. Ross Ellington Associate Vice President for Research Michael J. Greenberg Professor of Biological Science Florida State University	Cell Motility, Reaction-Diffusion Constraints and the Origin and Divergence of the Creatine Kinase Enzyme Family	Christi Ann Scott
CDVR	12	Serap Aksoy Division of Epidemiology of Microbial Diseases Yale University School of Public Health	"Role of the Microbiome on Host Physiology: Tsetse fly Model System"	Alex Raikhel
IIGB Hihglander Union 302 North	15	David Baltimore Division of Biology California Institute of Technology	Using Viruses to Fight Viruses	Alex Raikhel
IIGB	19	Shou-wei Ding Plant Pathology and Microbiology UC Riverside	Plant and Insect Models for Mammalian Antiviral Immunity	Alex Raikhel
CEPCEB	26	Steve Kay Dean of Dornsife College of Letters, Arts and Sciences University of Southern California	Large Scale Genomic and Chemical Biology Approaches to Understanding Circadian Networks	Julia Bailey-Serres
May'13				
IIGB	3	Greg Hannon Cold Spring Harbor	" A small RNA-based immune system guards germ cell genomes"	Shouwei Ding
	10	CMDB symposium-Cancelled		
CVDR	17	Bruce Beutler UT Southwestern Medical Center/Scripps	CANCELLED	Alex Raikhel
CEPCEB	24	Brian Federici Department of Entomology UC Riverside	<i>"Wasp/Viral Genome Integration Yields Novel Immunosuppressive Organelles in Insects"</i>	Julia Bailey-Serres
CEPCEB	31	Lucia Strader Department of Biology Washington University	<i>Roles for IBA-derived auxin in plant development"</i>	Zhenbiao Yang
June'13				
CEPCEB	7	José Dinneny Department of Plant Biology, Stanford	A Spatiotemporal Understanding of Environmental Response in Plants	Julia Bailey-Serres

LEGEND:

CEPCEB (BPS 252) Seminars: Special Topics on Botany

CDVR Seminars

IIGB Seminars



Second International CDVR Symposium
**"Facing the Challenges of Vector-borne Diseases
 in the 21st Century II"**

University of California, Riverside
 September 29-30, 2012

—PROGRAM—

DAY 1: September 29, 2012

8:45AM REGISTRATION

9:00AM Symposium Opening:
 ALEXANDER RAIKHEL, Organizing Committee Chair

CHAIR: ANUPAMA DAHANUKAR

9:10AM Keynote Presentation:
 LARRY ZWEIBEL, Vanderbilt University
 "The Molecular Genetics and Genomics of Anopheline Olfaction Drive Novel Approaches to Modify Insect Behavior"

10:10AM TUSAR T. SAHA, Alexander Raikhel Laboratory
 "Genome-wide analysis of genes controlled by juvenile hormone receptor methoprene-tolerant in the dengue fever mosquito, *Aedes aegypti*"

10:25AM ANGEL Y.S. CHEN, James Ng Laboratory
 "Further characterization of specific virion retention associated with the whitefly transmission of foregut-borne criniviruses"

10:40AM Coffee Break

11:00AM MAIARA SEVERO, Joao Pedra Laboratory
 "The E3 ubiquitin ligase XIAP controls *Anaplasma phagocytophilum* colonization of *Ixodes scapularis* ticks"

11:15AM KEIRA LUCAS, Alexander Raikhel Laboratory
 "The role of miRNAs during the reproductive life stages of the female mosquito, *Aedes aegypti*"

11:30AM ADAM ZEILINGER, Matt Daugherty Laboratory
 "Modeling the effects of host defense and vector preference on disease dynamics"

11:45AM MARIA TERESA FERNANDEZ-LUNA, Brian Federici Laboratory
 "Cyt1A forms small aggregates, not cation channels, resulting in large lesions of 8.5 nm in the midgut epithelial membrane of *Culex quinquefasciatus* larvae"

12:00PM Lunch

CHAIR: JAMES NG

1:30PM Invited Speaker:
 ANNA WHITFIELD, Kansas State University
 "Final Transmission: Exploiting Plant-Virus-Vector Interactions for the Development of New Disease Control Strategies"

CHAIR: JOAO PEDRA

- odor coding in the antennae of a herbivorous insect, the Asian citrus fly, *Drosophila*: towards push and pull strategies
- 2:30PM ZEV WISOTSKY, Anupama Dahanukar Laboratory
"Evolutionary differences in food preference rely on Gr64e, a receptor for glycerol"
- 2:45PM JACLYN ZHOU, Linda Walling/Gregory Walker Laboratories
"Silverleaf whitefly-Arabidopsis interactions examined by electrical penetration graph and genome-wide expression analysis"
- 3:00PM Coffee Break
- 3:30PM Invited Speaker:
FLAMINIA CATTERUCCIA, Harvard University
"Sex and Post-Mating Responses in *Anopheles gambiae*"

Day 2: September 30, 2012

CHAIR: BRADLEY WHITE

- 9:15AM Keynote Presentation:
NORA BESANSKY, University of Notre Dame
"Evolutionary and Ecological Genomics of the African Malaria Vector *Anopheles gambiae*"
- 10:15AM KARLA MEDINA-ORTEGA, Gregory Walker Laboratory
"Phloem sealing mechanisms and aphid saliva interactions"
- 10:30AM DYAN MACWILLIAM, Anandasankar Ray Laboratory
"Volatile inhibitors and activators of the carbon dioxide-sensitive neuron"
- 10:45AM REBECCA CARBALLAR, University of California, Irvine
"Effects of exogenous gypsy insulator sequences on mosquito transgene expression"
- 11:00AM Coffee Break
- 11:20AM SANDHYA CHARLU, Anupama Dahanukar Laboratory
"Acid detection by the taste system in insects"
- 11:35AM EMERSON LACEY, Ring Carde Laboratory
"Presence of human foot odor overrides the response to carbon dioxide in host-seeking female *Aedes aegypti*"
- 11:45AM JIANWU CHEN, Sarjeet Gill Laboratory
"Aedes cadherin is a receptor for the Cry11Aa toxin from *Bacillus thuringiensis*"
- 12:00PM Lunch

CHAIR: JOAO PEDRA

- 1:30PM **Invited Speaker:**
CECILIA TAMBORINDEGUY, Texas A&M University
"Challenges of Plant Vector-Borne Diseases"
- 2:15PM **RITU CHAUDHARY**, Isgouhi Kaloshian Laboratory
"GroEL from the aphid endosymbiont *Buchnera aphidicola* is recognized by plant defenses"
- 2:30PM **HAGOP ATAMIAN**, Isgouhi Kaloshian Laboratory
"Aphid secreted proteins manipulate host plant to their advantage"
- 2:45PM **Coffee Break**
- 3:15PM **Invited Speaker:**
ZHIYONG XI, Michigan State University
"Three-way interactions between *Wolbachia*, dengue virus, and mosquito host and their use in vector-borne disease control"
- 4:00PM **Symposium Closing:**
Peter Atkinson, Director of Center for Disease Vector Research