

## Division Details

### Division Data Summary

#### Research and Training Details

|                                     |             |
|-------------------------------------|-------------|
| Number of Faculty                   | 15          |
| Number of Joint Appointment Faculty | 1           |
| Number of Research Fellows          | 11          |
| Number of Research Students         | 6           |
| Number of Support Personnel         | 19          |
| Direct Annual Grant Support         | \$1,205,844 |
| Peer Reviewed Publications          | 25          |

#### Clinical Activities and Training

|                            |        |
|----------------------------|--------|
| Number of Clinical Staff   | 17     |
| Number of Clinical Fellows | 1      |
| Inpatient Encounters       | 1,111  |
| Outpatient Encounters      | 22,595 |

### Division Photo



Row 1: C West, T Schwartz, M Yang, F Hamada  
Row 2: K Lusk, R Lang, T Cook

## Significant Accomplishments

### Pediatric Low Vision Rehabilitation Program

Our division recruited Terry Schwartz, MD, Professor of Pediatric Ophthalmology, and Rebecca Coakley, MA, CLVT, to build a comprehensive low vision program in Ohio and the surrounding states. They have worked together for the past 16 years building a low vision rehabilitation program around the world. We recruited Kelly Lusk, PhD, to lead the research for this program.

The program provides access to the visual environment for children from age 3 through high school who have permanent vision impairment. It provides comprehensive eye evaluation, low vision devices, evaluates children for assistive technology, screens for orientation and mobility and recommends classroom adaptations. A low vision device library dispenses magnification aides as well as non-optical devices. Follow up services are included in the evaluation.

Our goal is to collaborate with the regional education system and teachers of the visually impaired to provide children with the tools to become independent and employable by optimizing visual function both at home and school. This team has successfully collaborated with other departments to gain outside funding to increase the scope and delivery of this specialized service.

## Division Highlights

### **Zubair Ahmed, PhD**

Zubair Ahmed's lab continued to investigate the molecular and genetic basis of Usher syndrome and oculocutaneous albinism (OCA), utilizing human, mouse and zebrafish genetics. His lab has recently identified a novel gene causing Usher syndrome type I and non-syndromic hearing loss in 60 large families from Pakistan, Turkey and Netherland. In addition his lab has recently published a comprehensive phenotypic and molecular genetic analysis of 40 families segregating OCA. Dr. Ahmed in collaboration with Dr. Robert Sisk enrolled five large kindreds from Cincinnati-Kentucky area. In the past year, work from Dr. Ahmed's lab was at the annual meeting of the Association for Research in Otolaryngology (ARO), and at the annual meeting of The Association for Research in Vision and Ophthalmology (ARVO).

### **Tiffany Cook, PhD**

Dr. Cook's research continues to explore evolutionarily conserved processes underlying retina and lens formation. Her group has made important advances in understanding into how the decision to become neuronal (retina) vs non-neuronal (lens) is made during development. In addition, Dr. Cook's retina research has provided mechanistic insight into how the various light-sensing photoreceptor cells are generated and maintained. This work has implications for developing better diagnostic and therapeutic tools for retinal degenerative diseases. Last year, Dr. Cook presented her work at the University of Georgia, the University of Kentucky, and members of her laboratory received awards at the Association for Research in Vision & Ophthalmology Annual Conferences, and the Midwest Society for Developmental Biology Meeting.

### **Fumika Hamada, PhD**

Dr. Hamada's laboratory studies circadian rhythm of body temperature (body temperature rhythm). Body temperature rhythm is critical for the maintenance of homeostasis functions, such as metabolic energy generation and sleep. Her lab progress has been remarkable as their work reveals the hitherto unknown molecular mechanisms underlying body temperature rhythm and has led to the first identification of a molecule that links circadian clock to body temperature rhythm. Dr. Hamada has presented her work at Cold Spring Harbor, Janelia Farm and SRBR (The Society for Research on Biological Rhythms) meeting.

### **Richard Lang, PhD**

Dr. Lang's laboratory continued making significant scientific contributions during FY2012. His lab has made important advances in our understanding of epithelial morphogenesis mechanisms and has shown that the small GTPases RhoA and Rac1 control the shape of cells and thus epithelial curvature during lens formation. Dr. Lang has also shown that during development of the retina, microglia, a type of immune cell, regulate the formation of blood vessels branches and ultimately determine the density of the blood vessel network. This has important implications for understanding the many diseases in which immune cells play a role. In this past year, Dr. Lang has presented his work at the Mechanisms of Organ Regeneration & Repair (MORR) in Maryland, at the Wilmer Ophthalmological Institute at John Hopkins University, and at the Keystone Symposium on Angiogenesis in Utah. Internationally, he traveled to Tel Aviv University, Weizman Institute, and Hadassah Medical Center to further strengthen his scientific collaborations. Dr. Lang was awarded the inaugural Mentoring Achievement Award by CCHMC in February 2012.

### **Sarah Lopper, OD**

Dr. Lopper is a Team Member of the Uveitis Task Force with the Division of Rheumatology. This task force has been working on various educational tools and a reporting system for area eye care providers that will ultimately assess and define the Juvenile Idiopathic Arthritis (JIA) disease outcomes goal of the percentage of JIA

patients without active uveitis. Current projects have included updating of the CCHMC Best Evidence Statement (BEST) on screening for uveitis in children with JIA. An educational tool outlining these guidelines was developed for community ophthalmologists as well as a reporting tool for these eye care providers to communicate the eye screening findings back to CCHMC Rheumatology.

### **Kelly Lusk, PhD, CLVT**

Dr. Lusk is the Director of Education and Research for the Cincinnati Children's Vision Rehabilitation Program (CCVRP), a clinical low vision service delivery program serving children (ages 3-22) with low vision. Current collaborative efforts in research within CCHMC include the Aaron W. Perlman Center, the Division of Neonatology and Pulmonary Biology, and the Division of Occupational Therapy and Physical Therapy. Dr. Lusk is also the principal investigator on a nationwide research effort in pediatric low vision in conjunction with Robert Wall-Emerson, Ph.D., COMS, a co-investigator at Western Michigan University.

### **Saima Riazuddin, PhD**

Dr. Riazuddin's lab continued to investigate the molecular and genetic basis of hearing loss, utilizing human and mouse genetics. Her lab recently identified the ELMOD3 gene that is responsible for autosomal recessively inherited deafness (DFNB88). Using the genetic, molecular biological and cell biology techniques her lab is currently characterizing the molecular mechanisms of auditory dysfunction resulting from mutation in ELMOD3 gene. In addition her lab has recently discovered a new locus for recessively inherited deafness (DFNB86) in another Pakistani family. In the past year, Dr. Riazuddin presented her work at the two international meetings 1) at the Islamic World Academy of Sciences, where she was awarded "IAS- Ibrahim Memorial Award by the Islamic World Academy 2) at the Newborn hearing screening conference. Dr. Riazuddin's research is expected to stimulate the next critical step of clinical improvements in the treatment and prevention of hearing loss.

### **Daniele Saltarelli, OD**

Dr. Saltarelli is a provider of optometric services within the division. He has developed a special interest in the area of pediatric contact lenses, and continues to pursue advances in this field. His current interests revolve around pediatric aphakia and the development of an infant aphakia database with the eventual goal of improving the visual outcome for this special population of children.

### **Terry Schwartz, MD**

Dr. Schwartz is the Director of the Cincinnati Children's Vision Rehabilitation Program (CCVRP), a transdisciplinary program serving school-aged children with permanent vision impairment. CCVRP includes clinical and research components. She continues to direct the WVU Children's Vision Rehabilitation Program providing low vision rehabilitation services throughout West Virginia. For the past 10 years, Dr. Schwartz has participated in an ongoing program of international humanitarian work with her clinical team, on the island-country of St. Lucia. Current funded research collaborations include; "Functional MRI to predict visual, auditory, and motor outcomes in infants with brain injury" with Stephanie Mehar, MD (PI) and visual function and interventions in children with cerebral palsy with Perlman Center.

### **Michael B. Yang, MD**

Dr. Yang has continued his research on retinopathy of prematurity (ROP). As a result of his efforts, the division will be involved in the recently funded G-ROP (Growth for ROP) Multicenter Study on analyzing weekly weight gain after birth in premature infants as a predictor of ROP outcome. This combined retrospective and prospective study of 5 years' duration may result in a reduction in the number of screening eye examinations that have to be performed on premature infants to detect the small number of infants who develop severe ROP.

Dr. Yang has also been collaborating with Dr. Lang on the role of light exposure during gestation in the development of severe ROP. His clinical research data has contributed to a very well scoring basic science grant proposal by the Lang laboratory that is likely to be funded. In addition, through his participation with the Ophthalmic Technology Assessment Committee of the American Academy of Ophthalmology, Dr. Yang has co-authored two papers that assess the current status of cryotherapy for the treatment of ROP and the accuracy of digital retinal photography in detecting clinically significant ROP.

## Significant Publications

Ali RA, Rehman AU, Khan SN, Husnain, T, **Riazuddin S**, Friedman TB, **Ahmed ZM**. **DFNB86, a novel autosomal recessive non-syndromic deafness locus on chromosome 16p13.3**. *Clin Genet*. 81(5):498-500. May 2012.

Most significant publication for this year is mapping of a novel locus for deafness on chromosome 16 (Ali et al., 2012). In this study we established a linkage of recessive pre-lingual deafness to a new locus, designated as DFNB86. This locus was identified in a large consanguineous Pakistani family with a maximum two point LOD score of 8.54 was obtained for marker D16S3024. Future and ongoing studies in my laboratory will employ a massive parallel sequencing of the genomic DNA enriched for DFNB86 critical interval. Identification of additional genes for nonsyndromic hearing loss is the critical next step for understanding the mechanism of hearing and hearing loss.

Terrell D, Xie B, Workman M, Mahato S, Zelhof A, Gebelein B, **Cook T**. **OTX2 and CRX rescue overlapping and photoreceptor-specific functions in the *Drosophila* eye**. *Dev Dyn* 241(1):215-28, 2012.

OTX2 and CRX are essential for vertebrate photoreceptor differentiation and are mutated in various retinal degenerative diseases. This work provides evidence that OTX factors play a conserved role in the development of invertebrate and vertebrate photoreceptors, defines common and distinct functions for OTX2 and CRX not previously recognized, and reveals the first genotype-phenotype correlations for different disease-associated CRX mutations. Together, this work solidifies the use of the fly eye for defining events required to prevent retinal degeneration, and helps clarify the evolutionary relationship between invertebrate and vertebrate photoreceptors.

Chauhan BK, Lou M, Zheng Y, **Lang RA**. **Balanced Rac1 and RhoA activities regulate cell shape and drive invagination morphogenesis in epithelia**. *Proc Natl Acad Sci U S A*. 108(45):18289-18294. Nov 8 2011.

The Chauhan et al paper is significant because it has uncovered fundamental mechanisms of cell shape control. In the context of development, changes in cell shape are likely to generate the forces that drive the process of morphogenesis. In this case, we showed that two well-characterized GTPases, RhoA and Rac1, function in opposition to control the apical cell width and cell length, respectively. Thus, a balance of these activities controls cell shape and in aggregate, the curvature of the epithelium in which these cells reside.

## Division Publications

1. Ali RA, Rehman AU, Khan SN, Husnain T, Riazuddin S, Friedman TB, Ahmed ZM. **DFNB86, a novel autosomal recessive non-syndromic deafness locus on chromosome 16p13.3**. *Clin Genet*. 2012; 81:498-500.
2. Bodack MI. **Eye and Vision Assessment of Children with Special Needs in an Interdisciplinary School Setting**. *Optometry & Vision Development*. 2011; 42:220-227.
3. Charlton-Perkins M, Brown NL, Cook TA. **The lens in focus: a comparison of lens development in *Drosophila* and vertebrates**. *Mol Genet Genomics*. 2011; 286:189-213.

4. Chauhan BK, Lou M, Zheng Y, Lang RA. **Balanced Rac1 and RhoA activities regulate cell shape and drive invagination morphogenesis in epithelia.** *Proc Natl Acad Sci U S A.* 2011; 108:18289-94.
5. Chiang MF, Melia M, Buffenn AN, Lambert SR, Recchia FM, Simpson JL, Yang MB. **Detection of Clinically Significant Retinopathy of Prematurity Using Wide-angle Digital Retinal Photography: A Report by the American Academy of Ophthalmology.** *Ophthalmology.* 2012; 119:1272-80.
6. Geh E, Meng Q, Mongan M, Wang J, Takatori A, Zheng Y, Puga A, Lang RA, Xia Y. **Mitogen-activated protein kinase kinase kinase 1 (MAP3K1) integrates developmental signals for eyelid closure.** *Proc Natl Acad Sci U S A.* 2011; 108:17349-54.
7. Hao J, Yang MB, Liu H, Li SK. **Distribution of propranolol in periocular tissues: a comparison of topical and systemic administration.** *J Ocul Pharmacol Ther.* 2011; 27:453-9.
8. Iqbal M, Naeem MA, Riazuddin SA, Ali S, Farooq T, Qazi ZA, Khan SN, Husnain T, Riazuddin S, Sieving PA, Hejtmancik JF. **Association of pathogenic mutations in TULP1 with retinitis pigmentosa in consanguineous Pakistani families.** *Arch Ophthalmol.* 2011; 129:1351-7.
9. Le TT, Conley KW, Mead TJ, Rowan S, Yutzey KE, Brown NL. **Requirements for Jag1-Rbpj mediated Notch signaling during early mouse lens development.** *Dev Dyn.* 2012; 241:493-504.
10. Leslie JR, Imai F, Zhou X, Lang RA, Zheng Y, Yoshida Y. **RhoA is dispensable for axon guidance of sensory neurons in the mouse dorsal root ganglia.** *Front Mol Neurosci.* 2012; 5:67.
11. Li-Kroeger D, Cook TA, Gebelein B. **Integration of an abdominal Hox complex with Pax2 yields cell-specific EGF secretion from Drosophila sensory precursor cells.** *Development.* 2012; 139:1611-9.
12. Maddala R, Chauhan BK, Walker C, Zheng Y, Robinson ML, Lang RA, Rao PV. **Rac1 GTPase-deficient mouse lens exhibits defects in shape, suture formation, fiber cell migration and survival.** *Dev Biol.* 2011; 360:30-43.
13. Motley WW, Golnik KC, Atilla H, Pilling R, Reddy A, Sharma P. **Ophthalmology surgical competency assessment rubric for strabismus surgery (OSCAR:Strabismus).** *Journal of American Association for Pediatric Ophthalmology and Strabismus.* 2012; 16:e23.
14. Motley WW, 3rd, Saltarelli DP. **Ophthalmic manifestations of mosaic Down syndrome.** *J AAPOS.* 2011; 15:362-6.
15. Plageman TF, Jr., Chauhan BK, Yang C, Jaudon F, Shang X, Zheng Y, Lou M, Debant A, Hildebrand JD, Lang RA. **A Trio-RhoA-Shroom3 pathway is required for apical constriction and epithelial invagination.** *Development.* 2011; 138:5177-88.
16. Plageman TF, Jr., Zacharias AL, Gage PJ, Lang RA. **Shroom3 and a Pitx2-N-cadherin pathway function cooperatively to generate asymmetric cell shape changes during gut morphogenesis.** *Dev Biol.* 2011; 357:227-34.
17. Ponferrada VG, Fan J, Vallance JE, Hu S, Mamedova A, Rankin SA, Kofron M, Zorn AM, Hegde RS, Lang RA. **CRIM1 complexes with ss-catenin and cadherins, stabilizes cell-cell junctions and is critical for neural morphogenesis.** *PLoS One.* 2012; 7:e32635.
18. Saravanamuthu SS, Le TT, Gao CY, Cojocar RI, Pandiyan P, Liu C, Zhang J, Zelenka PS, Brown NL. **Conditional ablation of the Notch2 receptor in the ocular lens.** *Dev Biol.* 2012; 362:219-29.
19. Schultz JM, Bhatti R, Madeo AC, Turriff A, Muskett JA, Zalewski CK, King KA, Ahmed ZM, Riazuddin S, Ahmad N, Hussain Z, Qasim M, Kahn SN, Meltzer MR, Liu XZ, Munisamy M, Ghosh M, Rehm HL, Tsilou ET, Griffith AJ, Zein WM, Brewer CC, Friedman TB. **Allelic hierarchy of CDH23 mutations causing non-syndromic deafness DFNB12 or Usher syndrome USH1D in compound heterozygotes.** *J Med Genet.* 2011; 48:767-75.
20. Simpson JL, Melia M, Yang MB, Buffenn AN, Chiang MF, Lambert SR. **Current role of cryotherapy in retinopathy of prematurity: a report by the American Academy of Ophthalmology.** *Ophthalmology.* 2012;

119:873-7.

21. Stefater JA, 3rd, Ren S, Lang RA, Duffield JS. **Metchnikoff's policemen: macrophages in development, homeostasis and regeneration.** *Trends Mol Med.* 2011; 17:743-52.
22. Tadjuidje E, Wang TS, Pandey RN, Sumanas S, Lang RA, Hegde RS. **The EYA tyrosine phosphatase activity is pro-angiogenic and is inhibited by benzobromarone.** *PLoS One.* 2012; 7:e34806.
23. Terrell D, Xie B, Workman M, Mahato S, Zelhof A, Gebelein B, Cook T. **OTX2 and CRX rescue overlapping and photoreceptor-specific functions in the Drosophila eye.** *Dev Dyn.* 2012; 241:215-28.
24. Xiang SY, Vanhoutte D, Del Re DP, Purcell NH, Ling H, Banerjee I, Bossuyt J, Lang RA, Zheng Y, Matkovich SJ, Miyamoto S, Molkentin JD, Dorn GW, 2nd, Brown JH. **RhoA protects the mouse heart against ischemia/reperfusion injury.** *J Clin Invest.* 2011; 121:3269-76.
25. Zhang S, Zhou X, Lang RA, Guo F. **RhoA of the Rho family small GTPases is essential for B lymphocyte development.** *PLoS One.* 2012; 7:e33773.

## Faculty, Staff, and Trainees

### Faculty Members

**Constance E. West, MD**, Associate Professor

**Leadership** Division Director

**James J. Augsburger, MD, FACS**, Professor

**Leadership** Chairperson, Department of Ophthalmology

**Richard A. Lang, PhD**, Professor

**Leadership** Emma & Irving Goldman Scholar; Director, Visual Systems Group

**Zubair Ahmed, PhD**, Assistant Professor

**Marie I. Bodack, OD, FAAO, FCOVD**, Instructor

**Tiffany Cook, PhD**, Associate Professor

**Fumika Hamada, PhD**, Assistant Professor

**Adam H. Kaufman, MD, FACS**, Associate Professor

**Sarah L. Lopper, OD**, Instructor

**Kelly Lusk, PhD, CLVT**, Assistant Professor

**William Walker Motley, III, MS, MD**, Assistant Professor

**Daniele Saltarelli, OD**, Instructor

**Terry Schwartz, MD**, Professor

**Robert Sisk, MD**, Assistant Professor

**Michael B. Yang, MD**, Associate Professor

### Joint Appointment Faculty Members

**Saima Riazuddin, PhD**, Assistant Professor (Department of Otolaryngology)

### Clinical Staff Members

- Laurie Hahn-Parrott, CO, COT, MBA
- Corey Bowman, COT, LDO, ABOC
- Adrienne Bradley, COA
- JaTawna Bush,
- Brandy Dearwater, COA
- Adrienne Distler, COA

- **Jennifer Duncan, COA**
- **Lisa Fite, COA**
- **Amanda Jackson, COA**
- **Debbie Lipps, COA**
- **Patty Lucas, COA**
- **Melody Klayer, COA**
- **Judy Masters, COT**
- **Nicole McLeod, COA**
- **Debbie Meister, COA**
- **Jill Simmons, COA**
- **Miqua Thomas, CO**
- **Kelli Vieson, COT,**  
*Clinical Manager*
- **Leanne Wagner, COA**

## **Trainees**

- **Nathan Bingham, MD, PhD,** Clinical Fellow, University of Texas Southwestern Graduate School of Biomedical Sciences, Dallas, TX
- **Rashid Bhatti, MPhil,** Visiting Research Fellow, University of the Punjab, Lahore, Pakistan
- **Hind Bouzid, BS,** Graduate Student, Université Paris Diderot-Paris 7, Paris, France
- **April Carpenter-Elrod, PhD,** Research Fellow, Hospital for Special Surgery, New York, NY
- **Mark Charlton-Perkins, BS,** Graduate Student, University of Otago, Dunedin, New Zealand
- **Bharesh Chauhan, PhD,** Research Associate, Oxford University, Oxford England
- **Angela Damen, MAT,** Graduate Student, Miami University of Ohio, Oxford, OH
- **Jieqing Fan, BS,** Graduate Student, Tsinghua University, Beijing, China
- **Arnaud Giese, PhD,** Research Fellow, Université Victor Segalen Bordeaux II, Bordeaux, France
- **Tadahiro Goda, PhD,** Research Fellow, Kyushu University, Fukuoka, Japan
- **Michael Gray, MD, PGY5,** Ophthalmology Resident, University of Cincinnati
- **Mary "Meg" Grulee, MD, PGY3,** Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
- **Khitab Gul, PhD,** Research Fellow, University of the Punjab, Lahore, Pakistan
- **Tasleem Kauser, MPhil,** Graduate Student, Bahauddin Zakariya University, Multan Pakistan
- **Hena Khaja, MD, PGY3,** Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
- **Haruna Kaneko, PhD,** Research Fellow, Tokyo Medical and Dental University, Japan
- **Ailee Laham, MD, PGY3,** Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
- **Shawn Lewis, MD, PGY3,** Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
- **Luke Lindsell, MD, PGY2,** Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
- **Amina Malik, MD, PGY4,** Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
- **Greg Mecoli, MD, PGY2,** Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
- **Mitul Mehta, MD, PGY4,** Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
- **Ajit Muley, PhD,** Anna University, Chennai, India
- **Gowri Nayak, PhD,** Research Fellow, University of Sussex, Brighton, United Kingdom
- **Jamey Osher, MD, PGY4,** Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
- **Jon Pargament, MD, PGY2,** Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
- **Timothy Plageman, PhD,** Research Fellow, University of Cincinnati, Cincinnati, OH
- **Sujata Rao, PhD,** Research Associate, Cornell University, Ithaca, New York
- **Elodie Richard, PhD,** Research Fellow, Université Victor Segalen Bordeaux II, Bordeaux, France

- **Adeel Shaikh, MD**, PGY4, Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
- **James A. Stefater, BS**, Graduate Student, Centre College, Danville, KY
- **David Terrell, BS**, Graduate Student, Texas State University - San Marcos, San Marcos, TX
- **Aaron Weber, MD**, PGY2, Ophthalmology Resident, University of Cincinnati, Cincinnati, OH
- **Baotong Xie, PhD**, Research Fellow, Chinese Academy of Sciences, Beijing, China
- **Eun-Jin Yeo, PhD**, Research Fellow, Seoul National University, Seoul, South Korea
- **Rizwan Yousaf, MS**, Graduate Student, Center for Excellence in Molecular Biology, Pakistan

## Division Collaboration

### **Developmental Biology** » Saulius Sumanas, PhD

Analysis of DFNB26 mutation using Zebrafish as a model system with Zubair Ahmed, PhD and Saima Riazuddin, PhD

### **Developmental Biology** » Rashmi Hegde, PhD

Molecular modeling of USH1 protein to identify the effect on the structure with Zubair Ahmed, PhD

### **Developmental Biology** » Brian Gebelein, PhD

Molecular control of Drosophila nervous system development with Tiffany Cook, PhD

### **Developmental Biology** » James Wells, PhD

Wntless in pancreas development with Richard Lang, PhD

### **Developmental Biology** » Rashmi Hegde, PhD

CRIM1 Function with Richard Lang, PhD

### **Developmental Biology** » Yutaka Yoshida, PhD

Wntless in neurogenesis with Richard Lang, PhD

### **Developmental Biology** » Geraldine Guasch, PhD

Sox2 and Wnt in transitional zone formation with Richard Lang, PhD

### **Developmental Biology** » Rashmi Hegde, PhD

Eya function in angiogenesis with Richard Lang, PhD

### **Developmental Biology** » Yi Zheng, PhD

GTPase function in morphogenesis with Richard Lang, PhD

### **Otolaryngology** » David Brown, PhD

New-born hearing screening with Saima Riazuddin, PhD

### **Otolaryngology** » John Greinwald, PhD

Phenotypic analysis of families segregating mutation in TRIC with Saima Riazuddin, PhD

### **Reproductive Sciences; Developmental Biology** » Satoshi Namekawa, PhD and Rashmi Hegde, PhD

Eya function in germ cell development with Richard Lang, PhD

## Grants, Contracts, and Industry Agreements

Grant and Contract Awards

Annual Direct

AHMED, Z



|   |               |                            |                    |
|---|---------------|----------------------------|--------------------|
| <b>Molecular Genetics of Usher Syndrome Type I</b><br>National Institutes of Health                                       | R00 DC 009287 | 08/01/09-07/31/12          | \$157,403          |
| <b>RPB Career Development Award</b><br>Research to Prevent Blindness(University of Cincinnati)                            |               | 07/01/10-06/30/14          | \$50,000           |
| <hr/>   |               |                            |                    |
| <b>BHATTI, R</b>  |               |                            |                    |
| <b>International Research Support Initiative Program - T. Kausar</b><br>Higher Education Commission, Pakistan             |               | 04/01/12-10/01/12          | \$3,500            |
| <hr/>   |               |                            |                    |
| <b>COOK, T</b>  |               |                            |                    |
| <b>Pros/Prox1 and Lens Development in Drosophila</b><br>National Institutes of Health                                     | R01 EY 017907 | 09/15/07-07/31/12          | \$213,840          |
| <hr/>   |               |                            |                    |
| <b>KAUSAR, T</b>  |               |                            |                    |
| <b>International Research Support Initiative Program - T. Kausar</b><br>Higher Education Commission, Pakistan             |               | 09/12/11-03/11/12          | \$3,500            |
| <hr/>   |               |                            |                    |
| <b>LANG, R</b>  |               |                            |                    |
| <b>Macrophages and Tumor Angiogenesis</b><br>National Institutes of Health(Albert Einstein College of Medicine)           | R01 CA 131270 | 12/01/07-11/30/12          | \$90,558           |
| <b>Retinal Microglia and Angiogenesis</b><br>National Institutes of Health  | R01 EY 021636 | 05/01/12-04/30/17          | \$250,000          |
| <b>The Role of Sox2 in Lens and Retinal Development</b><br>US-Israel Binational Science Foundation                        | BSF-Lang      | 02/01/09-01/31/13          | \$14,000           |
| <b>Wnt Pathway Regulation of Lens Polarity</b><br>National Institutes of Health   | R01 EY 016241 | 03/01/11-02/28/15          | \$250,000          |
| <hr/>   |               |                            |                    |
| <b>NAMEKAWA, F</b>  |               |                            |                    |
| <b>Molecular Mechanisms Underlying Body Temperature Rhythm in Drosophila</b><br>March of Dimes                            | 5-FY11-577    | 02/01/12-01/31/14          | \$68,182           |
| <b>Understanding Neural Circuits of Body Temperature Rhythm in Drosophila</b><br>Japan Science and Technology Corporation |               | 10/01/11-03/31/14          | \$97,980           |
| <hr/>   |               |                            |                    |
| <b>WEST, C</b>  |               |                            |                    |
| <b>Save Our Sight Ohio Amblyope Registry</b><br>Ohio Department of Health(The Research Institute at Nationwide Hospital)  |               | 07/01/08-06/30/12          | \$6,881            |
| <hr/>   |               |                            |                    |
|   |               | <b>Current Year Direct</b> | <b>\$1,205,844</b> |
|   |               | <b>Total</b>               | <b>\$1,205,844</b> |