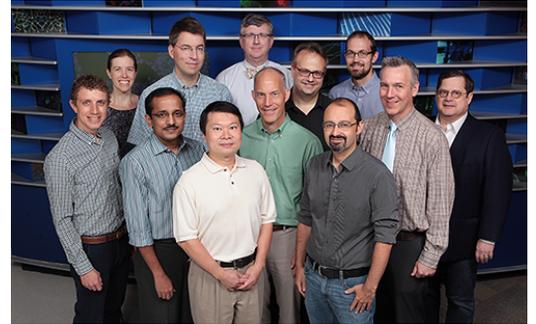


Biomedical Informatics

Division Details

RESEARCH AND TRAINING DETAILS

Faculty	12
Joint Appointment Faculty	15
Research Graduate Students	22
Total Annual Grant Award Dollars	\$6,007,115



Row 1: K Dufendach, A Jegga, L Lu, P White, N Salomonis, E Hall

Row 2: E Miraldi, M Wagner, A Spooner, K Roskin, K Marsolo, J Pestian

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Division Highlights

New Data Tool Enhances Drug Safety, Aids Search for New Uses of Existing Drugs

Sarangdhar M, Tabar S, Schmidt C, Kushwaha A, Shah K, Dahlquist JE, Jegga AG, Aronow BJ. [Data mining differential clinical outcomes associated with drug regimens using adverse event reporting data](#). *Nat Biotechnol*. 2016 Jul 12;34(7):697-700.

Mayur Sarangdhar, PhD, under the direction of [Bruce Aronow, PhD](#), and [Anil Jegga, DVM](#), developed a new web-based analytical tool called [AERSMine](#) that allows any website visitor to carry out sophisticated clinical drug response outcome analyses across millions of patients using a powerful new database approach pioneered in the Division of Biomedical Informatics. Anyone from physicians, to researchers, to the general public can use the open-source tool to rapidly find, combine, and analyze the growing volume of drug information stored in the U.S. Food and Drug Administration's Adverse Event Reporting System (FAERS). AERSMine allows users to create virtual cohorts and identify patterns of differential short- and long-term outcomes as a function of medication, underlying disorders, other co-occurring conditions, age and gender. The database also has the potential to help researchers develop novel treatments for diseases by identifying improved uses of individual drugs or drug combinations.

New Bioinformatics Pipeline Helps Interpret Fate of Blood Cells

Olsson A, Venkatasubramanian M, Chaudhri VK, Aronow BJ, Salomonis N, Singh H, Grimes HL. [Single-cell analysis of mixed-lineage states leading to a binary cell fate choice](#). *Nature*. 2016 Sep 29;537(7622):698-702.

[Nathan Salomonis, PhD](#), developed a new bioinformatics computer program as part of his AltAnalyze suite called Iterative Clustering and Gene-Guided Selection ([ICGS](#)) to give researchers a comprehensive view of the overwhelming amount of data generated by single-cell RNA sequencing. ICGS offers an intuitive platform that can comprehensively process and analyze sequencing as well as biological data to identify various transitioning or shifting genomic and cellular states of cells. Salomonis worked with [H. Leighton Grimes, PhD](#), and his team, to blend laboratory biology with this new bioinformatics approach to better understand how blood cells develop. The researchers used single-cell RNA sequencing technology to identify and study the different genes and regulatory networks within individual cells. Identifying the shifting genomic states of cells is possible by using the ICGS pipeline. Researchers found developing blood cells caught in tugs of war

between competing gene regulatory networks before finally deciding what type of cell to become. The research offers a foundation for better understanding how blood and immune system disorders develop.

Machine Learning Automates Identification of Verbal, Nonverbal Suicidal Behaviors

Pestian JP, Sorter M, Connolly B, Cohen KB, McCullumsmith C, Gee JT, Morency L-P, Scherer S, Rohlf L. [A Machine Learning Approach to Identifying the Thought Markers of Suicidal Subjects: A Prospective Multicenter Trial](#). *Suicide Life Threat Behav.* 2017 Feb;47(1):112-121.

John Pestian, PhD, MBA, and his team are developing new ways to predict risk of suicide. Suicide is the third leading cause of death among 15-25 year olds. Determining whether or not a patient is suicidal can be a major challenge, and one that was largely unsupported by technology, until now. Pestian and his team have created a new machine learning algorithm that can analyze verbal and nonverbal cues to help identify suicidal individuals. In a study, they used the algorithm to analyze subjects' words and vocal characteristics—such as tone, pauses, and pitch—in order to classify their behavior as suicidal, mentally ill but not suicidal, or neither. Results showed that the machine learning algorithm could classify subjects with up to 93 percent accuracy. The study provides insight into how to use advanced technology as a decision support tool to identify and prevent suicidal behavior.

Division Publications

1. Kugathasan S; Denson LA; Walters TD; Kim MO; Marigorta UM; Schirmer M; Mondal K; Liu C; Griffiths A; Noe JD. [Prediction of complicated disease course for children newly diagnosed with Crohn's disease: a multicentre inception cohort study](#). *The Lancet.* 2017; 389:1710-1718.
2. Sarangdhar M; Tabar S; Schmidt C; Kushwaha A; Shah K; Dahlquist JE; Jegga AG; Aronow BJ. [Data mining differential clinical outcomes associated with drug regimens using adverse event reporting data](#). *Nature Biotechnology.* 2016; 34:697-700.
3. Olsson A; Venkatasubramanian M; Chaudhri VK; Aronow BJ; Salomonis N; Singh H; Grimes HL. [Single-cell analysis of mixed-lineage states leading to a binary cell fate choice](#). *Nature.* 2016; 537:698-702.
4. Fang J; Bolanos LC; Choi K; Liu X; Christie S; Akunuru S; Kumar R; Wang D; Chen X; Greis KD. [Ubiquitination of hnRNPA1 by TRAF6 links chronic innate immune signaling with myelodysplasia](#). *Nature Immunology.* 2017; 18:236-245.
5. Jain AK; Xi Y; McCarthy R; Allton K; Akdemir KC; Patel LR; Aronow B; Lin C; Li W; Yang L. [LncPRESS1 Is a p53-Regulated LncRNA that Safeguards Pluripotency by Disrupting SIRT6-Mediated De-acetylation of Histone H3K56](#). *Molecular Cell.* 2016; 64:967-981.
6. Malek E; Abdel-Malek MAY; Jagannathan S; Vad N; Karns R; Jegga AG; Broyl A; van Duin M; Sonneveld P; Cottini F. [Pharmacogenomics and chemical library screens reveal a novel SCFSKP2 inhibitor that overcomes Bortezomib resistance in multiple myeloma](#). *Leukemia.* 2017; 31:645-653.
7. Chandrakasan S; Jayavaradhan R; Ernst J; Shrestha A; Loberg A; Dexheimer P; Jordan M; Pang Q; Aronow B; Malik P. [KIT blockade is sufficient for donor hematopoietic stem cell engraftment in Fanconi anemia mice](#). *Blood.* 2017; 129:1048-1052.
8. Hinge A; Xu J; Javier J; Mose E; Kumar S; Kapur R; Srour EF; Malik P; Aronow BJ; Filippi MD. [p190-B RhoGAP and intracellular cytokine signals balance hematopoietic stem and progenitor cell self-renewal and differentiation](#). *Nature Communications.* 2017; 8:14382.
9. Kanisicak O; Khalil H; Ivey MJ; Karch J; Maliken BD; Correll RN; Brody MJ; Lin SCJ; Aronow BJ; Tallquist MD. [Genetic lineage tracing defines myofibroblast origin and function in the injured heart](#). *Nature Communications.* 2016; 7:12260.

10. Glauser TA; Holland K; O'Brien VP; Keddache M; Martin LJ; Clark PO; Cnaan A; Dlugos D; Hirtz DG; Shinnar S. **Pharmacogenetics of Antiepileptic Drug Efficacy in Childhood Absence Epilepsy.** *Annals of Neurology*. 2017; 81:444-453.
 11. Hagedorn PA; Kirkendall ES; Kouril M; Dexheimer JW; Courter J; Minich T; Spooner SA. **Assessing Frequency and Risk of Weight Entry Errors in Pediatrics.** *JAMA Pediatrics*. 2017; 171:392-393.
 12. Bakeer N; James J; Roy S; Wansapura J; Shanmukhappa SK; Lorenz JN; Osinska H; Backer K; Huby AC; Shrestha A. **Sickle cell anemia mice develop a unique cardiomyopathy with restrictive physiology.** *Proceedings of the National Academy of Sciences of the United States of America*. 2016; 113:E5182-E5191.
 13. Guo M; Bao EL; Wagner M; Whitsett JA; Xu Y. **SLICE: determining cell differentiation and lineage based on single cell entropy.** *Nucleic Acids Research*. 2017; 45:gkw1278.
 14. Cnaan A; Shinnar S; Arya R; Adamson PC; Clark PO; Dlugos D; Hirtz DG; Masur D; Glauser TA; Study CAE. **Second monotherapy in childhood absence epilepsy.** *Neurology*. 2017; 88:182-190.
 15. Du Y; Kitzmiller JA; Sridharan A; Perl AK; Bridges JP; Misra RS; Pryhuber GS; Mariani TJ; Bhattacharya S; Guo M. **Lung Gene Expression Analysis (LGEA): an integrative web portal for comprehensive gene expression data analysis in lung development.** *Thorax*. 2017; 72:481-484.
 16. Verma SS; Cooke Bailey JN; Lucas A; Bradford Y; Linneman JG; Hauser MA; Pasquale LR; Peissig PL; Brilliant MH; McCarty CA. **Epistatic Gene-Based Interaction Analyses for Glaucoma in eMERGE and NEIGHBOR Consortium.** *PLoS genetics*. 2016; 12:e1006186.
 17. Salomonis N; Dexheimer PJ; Omberg L; Schroll R; Bush S; Huo J; Schriml L; Sui SH; Keddache M; Mayhew C. **Integrated Genomic Analysis of Diverse Induced Pluripotent Stem Cells from the Progenitor Cell Biology Consortium.** *Stem Cell Reports*. 2016; 7:110-125.
 18. Swertfeger DK; Li H; Rebholz S; Zhu X; Shah AS; Davidson WS; Lu LJ. **Mapping Atheroprotective Functions and Related Proteins/Lipoproteins in Size Fractionated Human Plasma.** *Molecular and Cellular Proteomics*. 2017; 16:680-693.
 19. Smith EA; Gole B; Willis NA; Soria R; Starnes LM; Krumpelbeck EF; Jegga AG; Ali AM; Guo H; Meetei AR. **DEK is required for homologous recombination repair of DNA breaks.** *Scientific Reports*. 2017; 7:44662-44662.
 20. Rindler TN; Hinton RB; Salomonis N; Ware SM. **Molecular Characterization of Pediatric Restrictive Cardiomyopathy from Integrative Genomics.** *Scientific Reports*. 2017; 7:39276-39276.
 21. Bian F; Gao F; Kartashov AV; Jegga AG; Barski A; Das SK. **Polycomb repressive complex 1 controls uterine decidualization.** *Scientific Reports*. 2016; 6:26061.
 22. Lynch TL; Ismahil MA; Jegga AG; Zilliox MJ; Troidl C; Prabhu SD; Sadayappan S. **Cardiac inflammation in genetic dilated cardiomyopathy caused by MYBPC3 mutation.** *Journal of Molecular and Cellular Cardiology*. 2017; 102:83-93.
 23. Ma J; He F; Xie G; Deng WM. **Maternal AP determinants in the Drosophila oocyte and embryo.** *Wiley Interdisciplinary Reviews: Developmental Biology*. 2016; 5:562-581.
 24. Gordon SM; Li H; Zhu X; Tso P; Reardon CA; Shah AS; Lu LJ; Davidson WS. **Impact of genetic deletion of platform apolipoproteins on the size distribution of the murine lipoproteome.** *Journal of Proteomics*. 2016; 146:184-194.
 25. Sigdel TK; Bestard O; Salomonis N; Hsieh SC; Torras J; Naesens M; Tran TQ; Roedder S; Sarwal MM. **Intra-graft Antiviral-Specific Gene Expression as a Distinctive Transcriptional Signature for Studies in Polyomavirus-Associated Nephropathy.** *Transplantation*. 2016; 100:2062-2070.
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Grants, Contracts, and Industry Agreements

Annual Grant Award Dollars

Investigator	Title	Sponsor	ID	Dates	Amount
Bruce Aronow, PhD	Multimodal Analysis of High-risk Psychosis Mutations in Induced Neuronal Cells	National Institutes of Health (Stanford University)	U19 MH104172	09/09/2014 - 07/31/2019	\$206,550
Bruce Aronow, PhD	RNA Deep Sequencing and Metabolomic Profiling of Microgravity-Induced Regulation of the Host-Pathogen Interaction: An Integrated Systems Approach	National Aeronautics and Space Admin (Arizona Board of Regents)	NNX13AM01G	07/01/2013 - 06/30/2017	\$21,218
Michal Kouril, PhD	Data Coordination and Integration Center for LINCS-BD2K	National Institutes of Health (Mount Sinai Hospital)	U54 HL127624	09/29/2014 - 04/30/2019	\$27,180
Peter S. White	NBSTRN: Newborn Screening Translational Research Network	National Institutes of Health (American College of Medical Genetics Fdn)	HHSN275201300011C:00	06/01/2014 - 09/25/2018	\$594,137
Nathan Salomonis, PhD	Identifying Therapeutic Targets for RNA Splicing-Related Cardiomyopathy	National Institutes of Health (The J. David Gladstone Institute)	R01 HL130533	12/14/2015 - 11/30/2019	\$156,886
Bruce Aronow, PhD	Cell-of-Origin Effects on Development of Colon Cancer	National Institutes of Health (Vanderbilt University Medical Center)	R01 CA151566	05/10/2016 - 04/30/2017	\$46,800
Keith Marsolo, PhD	MEDTAPP Neonatal Abstinence Syndrome (NAS) - State - Renewal 1	Ohio Department of Medicaid (ODM) (Ohio State University)	G-1617-05-0003	07/01/2015 - 06/30/2018	\$6,015
Keith Marsolo, PhD	MEDTAPP Neonatal Abstinence Syndrome (NAS) - Federal - Renewal 1	Ohio Department of Medicaid (ODM) (Ohio State University)	ODM201636	07/01/2015 - 06/30/2018	\$13,980
Keith Marsolo, PhD	Implementation of the BEACON Federal Quality Improvement Data Infrastructure - Renewal 1	Ohio Depart of Jobs and Family Services (Ohio State University)	G-1617-05-0003	07/01/2015 - 06/30/2018	\$257,168
Keith Marsolo, PhD	Implementation of the BEACON State Quality Improvement Data Infrastructure - Renewal 1	Ohio Department of Health (Ohio State University)	G-1617-05-0003	09/05/2015 - 06/30/2018	\$147,819
Anil Goud Jegga, DVM	Discovery and Characterization of	National Institutes of Health	R21 HL135368	01/01/2017 -	\$117,000

	Candidate Therapeutics for Drug-induced Pulmonary Disease				12/31/2018	
Keith Marsolo, PhD	Distributed Research Network Operations Center - PCORnet Phase II	Patient-Centered Outcome Research Inst. (Duke University)	Duke;PCORI	04/01/2016	\$109,565	- 11/30/2018
Bruce Aronow, PhD	NCRCRG Web Portal for Integrated Data Aggregation, Analysis, and Datamining	National Institutes of Health (Stanford University)	U19 MH104172	08/01/2016	\$296,400	- 07/31/2019
Long Lu, PhD	A Network-based Approach to Associate HDL Subspeciation with Function	National Institutes of Health	R01 HL111829	07/01/2016	\$522,273	- 06/30/2018
Keith Marsolo, PhD	Leveraging the EHR to enable Data Collection at Scale through the Use of Standards and Technology	Department of Health and Human Services	90AX001001-00	09/16/2016	\$87,883	- 09/15/2017
Anil Goud Jegga, DVM	Autologous Cardiomyocytes from Masseter Muscles to Repair Myocardial Infarction	National Institutes of Health (University of Cincinnati)	R01 HL136025	02/06/2017	\$13,633	- 01/31/2022
Keith Marsolo, PhD	University of Pittsburgh Clinical and Translational Science Institute (CTSI) ACT Administrative Supplement	Natl. Ctr for Advancing Translational Sc (University of Pittsburgh)	UL1 TR001857	10/01/2016	\$39,000	- 05/31/2021
Michal Kouril, PhD	Data Coordination and Integration Center for LINCS-BD2K	National Institutes of Health (Icahn School of Medicine @ Mt Sinai)	U54 HL127624	05/01/2017	\$27,178	- 04/30/2019
Eileen King, PhD Peter S White	Administrative Coordinating Center: Cardiovascular Development and Pediatric Cardiac Genomics Consortia	National Institutes of Health	U01 HL131003	01/01/2016	\$3,252,500	- 12/31/2020
Satish K Madala, PhD Anil Goud Jegga, DVM	Integrative Analysis of Multi-omics Data to Target Fibroblast Activation in IPF	National Institutes of Health	R21 HL133539	07/05/2016	\$63,929.50	- 06/30/2018

Total Annual Grant Award Dollars

\$6,007,114.50