

## **Ryan S. Gray, Ph.D.**

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### **ACADEMIC BACKGROUND**

2009, Ph.D., Cellular and Molecular Biology, University of Texas at Austin

2002, Bachelor of Science, Molecular Biology, University of Southern Mississippi

### **RESEARCH EXPERIENCE**

November 2015 – current, Assistant Professor; The University of Texas at Austin, Dell Medical School at the Dell Pediatrics Research Institute, Austin, Texas

October 2010 – October 2015, post-doctoral fellow; Washington University School of Medicine, Developmental Biology, St. Louis, Missouri

- Research project: Genetics of vertebral column/spine defects using zebrafish as a model.
- Research supervisor: Lilianna Solnica-Krezel

July 2009 – October 2010, post-doctoral researcher, Johns Hopkins School of Medicine, Center for Cellular Dynamics, Baltimore, Maryland

- Research project: Morphogenesis of primary mouse mammary gland organoids.
- Research supervisor: Andrew J. Ewald

2003 – May 2009, Ph.D. student; The University of Texas at Austin, Department of Cellular and Molecular Biology, Austin, Texas

- Research project: Diversity of Dishevelled genes and PCP effector genes on ciliogenesis.
- Research supervisor: John B. Wallingford

### **PERSONAL STATEMENT**

Our research laboratory is dedicated to elucidating the critical processes that underpin the development and maintenance of the vertebral column, or spine. Utilizing state-of-the-art genomic and genome editing techniques, we explore these processes in both mouse and zebrafish model systems to uncover the molecular genetics associated with spinal disorders in humans. Our approach integrates a variety of methodologies, including i) the use of animal models and cell culture, ii) advanced imaging techniques, and other 'omics data, to deepen our understanding of the molecular genetics and pathogenesis of spine disorders. We have successfully established mouse and zebrafish models representing various musculoskeletal and spinal disorders, with relevance to human idiopathic or neuromuscular scoliosis. Through our research, we have identified crucial roles for signaling factors that regulate the homeostasis of dense cartilaginous tissues, which serve as significant contributors to idiopathic scoliosis. Additionally, we have discovered novel functions of motile cilia in the spinal canal and the Reissner fiber in the context of neuromuscular scoliosis development. In our commitment to advancing the global scientific community, we have developed innovative transgenic tools, including precision-edited genetic mutations, fluorescently tagged protein alleles, and enhancer-reporter lines that label specific cellular and tissue structures resources that have been actively requested and distributed worldwide. Moving forward, we will maintain our multi-tiered approach by combining zebrafish, mouse, and cell culture models, while drawing insights from human genomic studies. Our goal is to enhance the early diagnosis of pediatric and musculoskeletal diseases and to establish foundational knowledge of the genes and pathways involved in spine and musculoskeletal homeostasis.

## **AWARDS, HONORS, AND FELLOWSHIPS**

2026	President of the International Consortium for Spinal Genetics, Development, and Disease.
2025	Vice President of the International Consortium for Spinal Genetics, Development, and Disease.
2022	<i>Developmental Biology</i> - 2021 Outstanding Paper Award
2017	ORS Spine Section Early Investigator Podium Award
2013-2015	Standard Investigator Grant, Scoliosis Research Society
2015	14th International Phillip Zorab Symposium Best Poster Award, British Scoliosis Society
2012-2015	NRSA F32 Grant - 1F32AR063001-01
2011-13	Postdoctoral Fellowship Grant from the Children's Discovery Institute - MD-F-2011-143
2009	Best Talk Award – University of Texas at Austin Cell and Molecular Biology Retreat
2007, 2009	Society of Developmental Biology Travel Award
2006-2008	University of Texas at Austin Travel Award
2004	Joint Steering Committee for Public Policy Capitol Hill Day Travel
2002	Graduated with Honors University of Southern Mississippi
2001-2002	Dean's List University of Southern Mississippi
2001-2003	Beta Beta Beta Biological Honor Society

## **INSTITUTIONAL SERVICE ACTIVITIES**

### **University of Texas at Austin**

University Committees: Institutional Biosafety Committee (IBC) (Fall 2016 - current); Chair of UT Austin (2023- current); IBC Animal Resources Advisory Committee (Fall 2016 - current); Faculty Council Representative – C3 undergraduate Curriculum Changes Committee (2022-current).

Pediatrics Committees: Pediatric Research Committee (Fall 2016 - current); Pediatric Faculty Recruitment Committee (2017 - 2018).

Nutritional Sciences Committees: Assistant Graduate Student Adviser (2021-current); Nutritional Sciences Faculty Recruitment Committee (2019-2020).

Cell and Molecular Biology Qualifying Exam Committee (Q15): (2019-2022).

## **EXTERNAL SERVICE ACTIVITIES**

### **Ad-hoc Reviewer - Grants**

- Lawrence Family Bone Disease Program of Texas Grant Review Panel (2025-26).
- NIH Fellowship Review Panel F08-L (20) (2025/10) (July 2025).
- 2026 Stryker Women's Research Fellowship
- NIH Fellowship Review Panel F08-L (20) (2025/10) (July 2025).
- Special Emphasis Panel/Scientific Review Group 2025/01 ZRG1 CDB-W (Dec. 2024).
- NIH Developmental-2 (DEV-2) Study Section *ad hoc* reviewer (June 2024)
- Fellowships: Genes, Genomes, and Genetics (ZRG1 F08-L (20) 2024/05) (Feb/March 2024).
- NIH Developmental-2 (DEV-2) Study Section *ad hoc* reviewer (June 2023)
- External Reviewer Medical Research Council grant proposal MR/W02702X/1 “An integrated in vivo approach to advance genetic and therapeutic discoveries in bone diseases.” (November 2021).
- External Thesis Examiner for University of Otago “Insights into spinal cord biology and its contributions to adolescent idiopathic scoliosis: From GWAS to animal models.” (July 2021)
- NIH Special Emphasis Panel/Scientific Review Group 2021 Skeletal Biology Structure and Regeneration (SBSR) *ad hoc* reviewer (June 2021).
- NIH Special Emphasis Panel/Scientific Review Group 2020 Skeletal Biology Structure and Regeneration (SBSR) *ad hoc* reviewer (June 2020).
- Dutch Research Council (NWO) | Domain Applied and Engineering Sciences (AES) *ad hoc* reviewer (2020).

- External Reviewer for the Research Grants Council (RGC) of Hong Kong (2017, 2019).
- External review committee for the Washington University School of Medicine Musculoskeletal Research Center Pilot & Feasibility grants (2018).

### **Science Meeting Organizer**

- Planning committee for International Consortium for Spinal Genetics Development and Disease (2024, 2026).
- Organizer of the Southwest Society of Developmental Biology Regional Meeting (2022).
- Session co-chair Concurrent Session I: Muscular Skeletal and Connective Tissue The 16th International Zebrafish Conference 2021 Online.
- Planning committee for International Consortium for Spinal Genetics Development and Disease (2020).
- Organizing committee Southwest Society of Developmental Biology Regional Meeting 2021 Online.
- Session chair 9<sup>th</sup> Adhesion GPCR Workshop, Portland, OR (2018).
- Co-Organizer 2019 Orthopedic Research Society Annual Meeting Workshop on Zebrafish: An Emerging Model for Orthopedic Research.

### **Ad-hoc Reviewer - Manuscripts**

Nature, Science, Current Biology, Nature Genetics, Nature Communications, Human Molecular Genetics, Plos Genetics, ELife, Developmental Biology, Developmental Dynamics, Human Mutation, PlosONE, Biological Review, Bone, Differentiation, Science Bulletin, Connective Tissue Research, Journal of Medical Genetics, Genetics, Journal of Bone Mineral Research, Human Genome Variation, Scientific Reports, European Spine Journal, Journal of Human Genetics, Disease Models and Mechanisms, Brain, Biological Reviews, Open Biology, iScience, Zebrafish, Frontiers in Endocrinology, Postgraduate Medical Journal, Genome Research, American Journal of Respiratory Cell and Molecular Biology, and Journal of Orthopedic Research.

### **PROFESSIONAL SOCIETIES**

2018-current, Adhesion-GPCR Consortium

2018- current, International Zebrafish Society

2016-current, Orthopedics Research Society, Spine Section (ORS)

2005-current, Society of Developmental Biology (SDB)

2013-current, International Consortium for Spine Genetics, Development, and Disease (ICSGDD).

2022-current, American Society of Bone and Mineral Research (ASBMR)

### **MISC. POSITIONS**

2001-2001, Field Research USGS, Alagnak River Basin, AK, Julie Meka, Native Trout Program Coordinator

2001-2003, Microbiology Lab Assistant, Microbiology lab, University of Southern Mississippi, Delia Anderson, Professor

2002-2003, Undergraduate Research, University of Southern Mississippi, George Santangelo, Professor

### **TEACHING EXPERIENCE**

- Microbiology Laboratory - The University of Southern Mississippi
- Clinical Microbiology Laboratory - The University of Texas at Austin
- Developmental Biology - The University of Texas at Austin
- Nutritional Sciences Lab (NTR 126L) - Fall 2019; Spring/Fall 2020, Spring/Fall 2021 - The University of Texas at Austin
- Nutritional Education: Evidence synthesis and communications (NTR392.7) – Fall 2022 - The University of Texas at Austin
- Graduate Seminars in Nutritional Science (NTR394) – Spring 2024, 2025 - The University of Texas at Austin

- Molecular Nutrition - NTR390.6 (graduate level) Fall 2024, Spring 2026; NTR365 (UG level) Fall 2025  
- The University of Texas at Austin

## **PUBLICATIONS (reverse chronological)**

45. Voigt B, Atayeter E, Sistrunk R, **Gray RS**. Protocol for quantifying vertebral column morphology for the statistical analysis of scoliosis severity in zebrafish. *STAR Protoc.* 2026 Mar 20;7(1):104389. doi: 10.1016/j.xpro.2026.104389. Epub 2026 Feb 24. PMID: 41742410
44. Zeosky M, Kun E, Reddy S, Pandey D, Xu L, Wang JY, Li C, **Gray RS**, Wise CA, Otomo N, Narasimhan VM. Deep learning-based precision phenotyping of spine curvature identifies novel genetic risk loci for scoliosis in the UK Biobank. *NPJ Digit Med.* 2026 Mar 26. doi: 10.1038/s41746-026-02540-6. PMID: 41882318.
43. Nevarez L, Ismaili TK, Zieba J, Martin J, Wachtell D, Diaz D, Ramirez JA, Aceves V, Ito J, **Gray RS**, Goldstein D, Sahdeo S, Krakow D, Cohn DH. Small molecule inhibition rescues the skeletal dysplasia phenotype of Trpv4 mutant mice. *JCI Insight.* 2026 Jan 23;11(2):e182439. doi: 10.1172/jci.insight.182439. eCollection 2026 Jan 23. PMID: 41574606
42. Wu N, Hadley-Miller N, **Gray R**, Schauer S, Redding G, Cheng T, Chen Z, Yang J, Blecher R, Gerdhem P, Wise CA. Perspectives from the 2024 International Consortium for Spinal Genetics, Development and Disease (ICSGDD). *Genetics in Medicine Open.* doi:10.1016/j.gimo.2025.103466.
41. Buffington JD, Kuo HC, Hu K, Chang YC, Javanmardi K, Voigt B, Li YR, Little ME, Devanathan SK, Xhemalçe B, **Gray RS**, Finkelstein IJ. Discovery and engineering of retrons for precise genome editing. *Nat Biotechnol.* 2025 Oct 23. doi: 10.1038/s41587-025-02879-3. PMID: 41131151
40. Timoshenko AB, Ghasemkhani A, Kim C, Cordova DJ, Potes MA, Aceves V, Mitra I, Bird JE, **Gray RS**, Seidlits SK, Elder BD, Tilton M. Visible Light Induced DLP-Printed Oxygen-Releasing TPMS Scaffolds Mitigate Early Hypoxia in Bone Defects. *Adv Healthc Mater.* 2026 Jan;15(3):e02735. doi: 10.1002/adhm.202502735. Epub 2025 Sep 23. PMID: 40985752
38. Voigt B, Frazier K, Yazdi D, Klein J, Gontarz P, Zhang B, Sepich DS, Mo J, Smeeton J, Solnica-Krezel L, **Gray RS**. Cell expansion for notochord mechanics and endochondral bone lengthening in zebrafish depends on the 5'-inositol phosphatase Inpp11a. *Curr Biol.* 2025 Apr 7:S0960-9822(25)00307-0. doi: 10.1016/j.cub.2025.03.022. PMID: 40209709
37. Wang L, Liu Z, Zhao S, Xu K, Aceves V, Qiu C, Feng HC, Bian F, He J, Song CJ, Troutwine B, Liu L, Ma S, Niu Y, Wang S, Yuan S, Li X, Zhao L, Liu X, Qiu G, Wu Z, Zhang TJ, **Gray RS**, Wu N. Variants in the SOX9 transactivation middle domain induce axial skeleton dysplasia and scoliosis. *Proc Natl Acad Sci.* 2025 Jan 28;122(4):e2313978121. doi: 10.1073/pnas.2313978121. PubMed PMID: 39854231.
36. The G protein-coupled receptor ADGRG6 maintains mouse growth plate homeostasis through IHH Signaling. Bian F, Hansen V, Feng HC, He J, Chen Y, Feng K, Ebrahimi B, **Gray RS**, Chai Y, Wu CL, Liu Z. *J Bone Miner Res.* 2024 Sep 5:zjae144. doi: 10.1093/jbmr/zjae144. PMID: 39236220.
35. Takagishi M, Yue Y, **Gray RS**, Verhey KJ, Wallingford JB. Kif6 regulates cilia motility and polarity in brain ependymal cells. *Dis Model Mech.* 2024 Jan 18:dmm.050137. doi: 10.1242/dmm.050137. Online ahead of print. PMID: 38235522
34. Bellegarda C, Zavard G, Moisan L, Brochard-Wyart F, Joanny JF, **Gray RS**, Cantaut-Belarif Y, Wyart C. The Reissner fiber under tension in vivo shows dynamic interaction with ciliated cells contacting the cerebrospinal fluid. *Elife.* 2023 Sep 29;12:e86175. doi: 10.7554/eLife.86175. PMID: 37772792.

33. Jamison Leid, **Ryan S. Gray**, Peter Rakita, Andrew L. Koenig, James A.J. Fitzpatrick, Charles Kaufman, Lilianna Solnica-Krezel, Kory J. Lavine. Deletion of *tafl* and *taf5* in Zebrafish Capitulate Cardiac and Craniofacial Abnormalities Associated with TAFopathies through Perturbations in Metabolism. *Biol Open* 15 July 2023; 12 (7): bio059905.
32. Voigt, B., Minowa, R., **Gray, RS**. Screening Sperm for the Rapid Isolation of Germline Edits in Zebrafish. *J. Vis. Exp.* (192), e64686, doi:10.3791/64686 (2023).
31. Konjikusic MJ, Lee C, Yue Y, Shrestha BD, Nguimitsop AM, Horani A, Brody S, Prakash VN, **Gray RS**, Verhey KJ, Wallingford JB. Kif9 is an active kinesin motor required for ciliary beating and proximodistal patterning of motile axonemes. *J Cell Sci.* 2022 May 9. PMID: 35531639.
30. Wang Y, Troutwine BR, Zhang H, **Gray RS**. The axonemal dynein heavy chain 10 gene is essential for monocilia motility and spine alignment in zebrafish. *Dev Biol.* 2022 Feb;482:82-90. Epub 2021 Dec 13. PMID: 34915022
29. Liu Z, Hussien AA, Wang Y, Heckmann T, Gonzalez R, Karner CM, Snedeker JG, **Gray RS**. A G protein-coupled receptor is required in cartilaginous and dense connective tissues to maintain spine alignment. *Elife.* 2021 Jul 28;10:e67781. doi: 10.7554/eLife.67781. PMID: 34318745
28. Terhune EA, Cuevas MT, Monley AM, Wethey CI, Chen X, Cattel MV, Bayrak MN, Bland MR, Sutphin B, Devon Trahan G, Taylor MRG, Niswander LA, Jones KL, Baschal EE, Antunes L, Dobbs M, Gurnett C, Appel B, **Gray R**, Miller NH. Mutations in KIF7 Implicated in Idiopathic Scoliosis in Humans and Axial Curvatures in Zebrafish. *Hum Mutat.* 2020 Dec 31. doi: 10.1002/humu.24162. PMID: 33382518.
27. **Gray RS**, Gonzalez R, Ackerman SD, Minowa R, Griest JF, Bayrak MN, Troutwine B, Canter S, Monk KR, Sepich DS, Solnica-Krezel L. Postembryonic screen for mutations affecting spine development in zebrafish. *Dev Biol.* 2020 Dec 5:S0012-1606(20)30307-9. doi: 10.1016/j.ydbio.2020.11.009. PMID: 33290818
26. Wang Y, Liu Z, Yang G, Gao Q, Xiao L, Li J, Guo C, Troutwine BR, **Gray RS**, Xie L, Zhang H. Coding variants coupled with rapid modeling in zebrafish implicate dynein genes, dnaaf1 and zmynd10, as adolescent idiopathic scoliosis candidate genes. *Frontiers in Cell and Developmental Biology.* 2020 Nov 4;8:582255. doi:10.3389/fcell.2020.582255.
25. Makki N, Zhao J, Liu Z, Eckalbar WL, Ushiki A, Khanshour AM, Wu J, Rios J, **Gray RS**, Wise CA, Ahituv N. Genomic characterization of the adolescent idiopathic scoliosis associated transcriptome and regulome. *Hum Mol Genet.* 2020 Nov 12. PMID: 33179741.
24. Troutwine BR, Gontarz P, Konjikusic MJ, Minowa R, Monstad-Rios A, Sepich DS, Kwon RY, Solnica-Krezel L, **Gray RS**. The Reissner Fiber Is Highly Dynamic In Vivo and Controls Morphogenesis of the Spine. *Curr Biol.* 2020 Jun 22;30(12):2353-2362.e3. PMID: 32386529.
23. Roberson EC, Tran NK, Konjikusic MJ, Fitch RD, **Gray RS**, Wallingford JB. A Comparative Study of the Turnover of Multiciliated Cells in the Mouse Trachea Oviduct and Brain. *Dev Dyn.* 2020 Mar 5. PMID: 32133718.
22. Liu Z, Ramachandran J, Vokes SA, **Gray RS**. Regulation of terminal hypertrophic chondrocyte differentiation in *Prmt5* mutant mice modeling infantile idiopathic scoliosis. *Dis Model Mech.* 2019 Dec 17;12(12). PMID: 31848143.
21. Liu Z, Easson GWD, Zhao J, Makki N, Ahituv N, Hilton MJ, Tang SY, **Gray RS**. Dysregulation of STAT3 signaling is associated with endplate-oriented herniations of the intervertebral disc in *Adgrg6* mutant mice. *PLoS Genet.* 2019 Oct;15(10). PMID: 31652254.
20. Ramachandran J, Liu Z, **Gray RS**, Vokes SA. PRMT5 is necessary to form distinct cartilage identities in the knee and long bone. *Developmental Biology.* 2019. Aug 20. PMID: 31442442.

19. Morgan RK, Anderson GR, Araç D, Aust G, Balenga N, Boucard A, Bridges JP, Engel FB, Formstone CJ, Glitsch MD, **Gray RS**, Hall RA, Hsiao CC, Kim HY, Knierim AB, Kusuluri DK, Leon K, Liebscher I, Piao X, Prömel S, Scholz N, Srivastava S, Thor D, Tolias KF, Ushkaryov YA, Vallon M, Van Meir EG, Vanhollebeke B, Wolfrum U, Wright KM, Monk KR, Mogha A. The expanding functional roles and signaling mechanisms of adhesion G protein-coupled receptors. *Ann. NY Acad. Sci.* 2019. Jun 6. PMID: 31168816.
18. Konjikusic MJ, Yeetong P, Boswell CW, Lee C, Roberson EC, Ittiwut R, Suphapeetiporn K, Ciruna B, Gurnett CA, Wallingford JB, Shotelersuk V, **Gray RS**. Mutations in Kinesin family member 6 reveal specific role in ependymal cell ciliogenesis and human neurological development. *PLoS Genet.* 2018 Nov 26;14(11):e1007817. PMID: 30475797.
17. Haller G, McCall K, Jenkitkasemwong S, Sadler B, Antunes L, Nikolov M, Whittle J, Upshaw Z, Shin J, Baschal E, Cruchaga C, Harms M, Raggio C, Morcuende JA, Giampietro P, Miller NH, Wise C, **Gray RS**, Solnica-Krezel L, Knutson M, Dobbs MB, Gurnett CA. A missense variant in SLC39A8 is associated with severe idiopathic scoliosis. *Nat Commun.* 2018 Oct 9;9(1):4171. PMID: 30301978.
16. Kim DH, Ewald AJ, Park J, Kshitiz, Kwak M, **Gray RS**, Su CY, Seo J, An SS, Levchenko A. Biomechanical interplay between anisotropic re-organization of cells and the surrounding matrix underlies transition to invasive cancer spread. *Sci Rep.* 2018 Sep 21;8(1):14210. PMID:30242256.
15. Giampietro PF, Pourquie O, Raggio C, Ikegawa S, Turnpenny PD, **Gray RS**, Dunwoodie SL, Gurnett CA, Alman B, Cheung K, Kusumi K, Hadley-Miller N, and Wise CA. Summary of the first inaugural joint meeting of the International Consortium for scoliosis genetics and the International Consortium for vertebral anomalies and scoliosis, March 16–18, 2017, Dallas, *Texas Am J Med Genet. Part A.* 21 Nov 2017. PMID: 29159998.
14. Herbert AL, Fu M, Drerup CM, **Gray RS**, Harty BL, Ackerman SL, O'Reilly-Pol T, Johnson SL, Nechiporuk AV, Barres BA, and Monk KR. Dynein/dynactin is necessary for anterograde transport of Mbp mRNA in oligodendrocytes and for myelination in vivo. *Proc Natl Acad Sci.* 2017 Oct 24;114(43):E9153-E9162. PMID: 2907311.
13. Sanchez NE, Harty BL, O'Reilly-Pol T, Ackerman SD, Herbert AL, Holmgren M, Johnson SL, **Gray RS**, Monk KR. Whole Genome Sequencing-Based Mapping and Candidate Identification of Mutations from Fixed Zebrafish Tissue. *G3.* 2017. PMID:28855284.
12. Karner CM, Long F, Solnica-Krezel L, Monk KR, **Gray RS**. *Gpr126/Adgrg6* deletion in cartilage models idiopathic scoliosis and pectus excavatum in mice. *Human Molecular Genetics.* 2015; 24(15):4365-73. PMID: 25954032.
11. Buchan JG, **Gray RS**, Gansner JM, Alvarado DM, Burgert L, Gitlin JD, Gurnett CA, Goldsmith MI. Kinesin family member 6 (*kif6*) is necessary for spine development in zebrafish. *Developmental Dynamics.* 2014; 243(12):1646-57. PMID: 25283277.
10. Chen Q, Zhang N, **Gray RS**, Li H, Ewald AJ, Zahnow CA, Pan D. A temporal requirement for Hippo signaling in mammary gland differentiation, growth, and tumorigenesis. *Genes & Development.* 2014; 28(5):432-7. PMID:24589775.
9. **Gray RS**, Wilm TP, Smith J, Bagnat M, Dale RM, Topczewski J, Johnson SL, Solnica-Krezel L. Loss of *col8a1a* function during zebrafish embryogenesis results in congenital vertebral malformations. *Developmental Biology.* 2014; 386(1):72-85. PMID: 24333517.
8. Nguyen-Ngoc KV, Cheung KJ, Brenot A, Shamir ER, **Gray RS**, Hines WC, Yaswen P, Werb Z, Ewald AJ. ECM microenvironment regulates collective migration and local dissemination in normal and malignant mammary epithelium. *Proceedings of the National Academy of Sciences.* 2012; 109(39). PMID: 22923691.
7. Bhise NS, **Gray RS**, Sunshine JC, Htet S, Ewald AJ, Green JJ. The relationship between terminal functionalization and molecular weight of a gene delivery polymer and transfection efficacy in mammary epithelial 2-D cultures and 3-D organotypic cultures. *Biomaterials.* 2010; 31(31):8088-96. PMID: 20674001.

6. Kim SK, Shindo A, Park TJ, Oh EC, Ghosh S, **Gray RS**, Lewis RA, Johnson CA, Attie-Bittach T, Katsanis N, Wallingford JB. Planar cell polarity acts through septins to control collective cell movement and ciliogenesis. *Science*. 2010; 329(5997):1337-40. PMID:20671153.
5. Kieserman EK, Lee C, **Gray RS**, Park TJ, Wallingford JB. High-magnification in vivo imaging of *Xenopus* embryos for cell and developmental biology. *Cold Spring Harbor Protocols*. 2010; 2010(5):pdb.prot5427. PMID: 20439414.
4. **Gray RS**, Abitua PB, Wlodarczyk BJ, Szabo-Rogers HL, Blanchard O, Lee I, Weiss GS, Liu KJ, Marcotte EM, Wallingford JB, Finnell RH. The planar cell polarity effector Fuz is essential for targeted membrane trafficking, ciliogenesis and mouse embryonic development. *Nature Cell Biology*. 2009; 11(10):1225-32. PMID:19767740.
3. **Gray RS**, Bayly RD, Green SA, Agarwala S, Lowe CJ, Wallingford JB. Diversification of the expression patterns and developmental functions of the dishevelled gene family during chordate evolution. *Developmental Dynamics*. 2009; 238(8):2044-57. PMID: 19618470.
2. Lee C, Kieserman E, **Gray RS**, Park TJ, Wallingford J. Whole-mount fluorescence immunocytochemistry on *Xenopus* embryos. *CSH Protocols*. 2008. PMID: 21356778.
1. Park TJ, **Gray RS**, Sato A, Habas R, Wallingford JB. Subcellular localization and signaling properties of dishevelled in developing vertebrate embryos. *Current Biology*. CB. 2005; 15(11):1039-44. PMID: 15936275.

Complete List of Published Work in MyBibliography:

<https://www.ncbi.nlm.nih.gov/myncbi/ryan.gray.1/bibliography/public/>

<https://orcid.org/0000-0001-9668-6497>

## PUBLICATIONS IN REVIEW

- Genetic interaction between *Adgrg6* and *Sox9* reveals a feedforward mechanism for postnatal spinal stability. Valeria Aceves, Ziyi Xu, Cheng-Hai Zhang, Jongkil Kim, Joshua Ito, Kylie Mathers, Andrew B. Lassar, Zhaoyang Liu, **Ryan S. Gray**. bioRxiv 2026.04.06.716681; <https://doi.org/10.64898/2026.04.06.716681>
- VerteBrain reveals novel neural and non-neural protein assemblies conserved across vertebrate evolution. Dang V, Voigt B, Yang D, Hoogerbrugge G, Lee M, Cox RM, Papoulas O, McWhite CD, Pradeep R, Leggere JC, Neely BA, **Gray RS**, Marcotte EM. bioRxiv [Preprint]. 2025 Jul 23:2025.05.26.656196. doi: 10.1101/2025.05.26.656196. PMID: 40501792
- Cilia.io: Computer vision and machine learning reveal spatial patterns of cilia beating dynamics in the spinal cord. Atayeter E, Ho J, Blottin TG, Joe IB, Sistrunk RS, Zhang B, Solnica-Krezel L, Gerstlauer A, Wallingford JB, **Gray RS**. bioRxiv [Preprint]. 2025 Dec 13:2025.12.10.693099. doi: 10.64898/2025.12.10.693099. PMID: 41415440
- ADGRG6 promotes adipogenesis and is involved in gender-specific fat distribution. Hai P. Nguyen, Aki Ushiki, Rory Sheng, Cassidy Biellak, Kelly An, Helene Choquet, Tom Hoffman, **Ryan S. Gray**, Nadav Ahituv. Preprint: bioRxiv 2022.06.24.497411;doi.org/10.1101/2022.06.24.497411.

## REVIEWS

8. Sepich DS, **Gray RS**, Ahituv N, Gurnett CA, Rios JJ, Solnica-Krezel L, Wise CA. The importance of imperfect pre-clinical models in adolescent idiopathic scoliosis. *Dis Model Mech*. 2025 Aug 1;18(8). doi: 10.1242/dmm.052438. Review. PubMed PMID: 40888060.
7. Terhune EA, Monley AM, Cuevas MT, Wetthey CI, **Gray RS**, Hadley-Miller N. Genetic animal modeling for idiopathic scoliosis research: history and considerations. *Spine Deform*. 2022 Sep;10(5):1003-1016. doi: 10.1007/s43390-022-00488-7. Epub 2022 Apr 16. PMID: 35430722
6. Bagnat M, **Gray RS**. Development of a straight vertebrate body axis.

- Development.** 2020 Oct 6;147(21):dev175794. doi: 10.1242/dev.175794. PMID: 33023886.
5. Konjikusic MJ, **Gray RS**, Wallingford JB. The developmental biology of kinesins. *Dev Biol.* 2020 Sep 19;S0012-1606(20)30257-8. doi: 10.1016/j.ydbio.2020.09.009. Online ahead of print. PMID: 32961118
  4. Wise CA, Sepich D, Ushiki A, Khanshour AM, Kidane YH, Makki N, Gurnett CA, **Gray RS**, Rios JJ, Ahituv N, Solnica-Krezel L. The cartilage matrisome in adolescent idiopathic scoliosis. *Bone Research.* 2020, 8:13. PMID: 32195011.
  3. Busse B, Galloway JL, **Gray RS**, Harris MP, Kwon RY. Zebrafish: An emerging model for orthopaedic research. *J Orthop Res.* 2019 Nov 26. PMID:31773769
  2. **Gray RS**, Roszko I, Solnica-Krezel L. Planar Cell Polarity: coordinating morphogenetic cell behaviors with embryonic polarity. *Developmental Cell.* 2011 Jul 19;21(1):120-33.
  1. **Gray RS**, Cheung KJ, Ewald AJ. Cellular Mechanisms Regulating Epithelial Morphogenesis and Cancer Invasion. *Current Opinions in Cell Biology.* 2010 Oct;22(5):640-50. PMID: 20832275.

## **BOOK CHAPTERS**

Liu Z., **Gray RS** (2018) Animal Models of Idiopathic Scoliosis. In: Kusumi K., Dunwoodie S. (eds) *The Genetics and Development of Scoliosis*. Springer, Cham.

## **INVITED PRESENTATIONS**

2025, Department of Molecular and Cellular Biology at Baylor College of Medicine. Houston, TX. “*Animal models of scoliosis reveal polygenetic regulation of tissue hypertrophy and homeostasis*”.

2024, ICSGDD Annual Meeting, Aurora, CO. “*A conserved regulation of cell expansion underlies notochord mechanics, spine morphogenesis, and endochondral bone lengthening*”.

2024, ASBMR-RBDA Symposium on Rare Bone Diseases, Toronto, Canada. “*Session 2: Tackling Rare Disease Pathogenesis - Zebrafish to uncover pathogenesis of adolescent idiopathic scoliosis*”.

2024, 10th Strategic Conference of Zebrafish Investigators (SCZI). “*Inpp1a regulates notochord turgor pressure and endochondral bone length.*” Asilomar, Pacific Grove, CA.

2022, Orthopedic Research Society/ Philadelphia Spine Research Society - 6th International Spine Research Symposium, Skytop, PA. “*Activation of CREB signaling controls a feedback loop required for the homeostasis of connective tissues of the spine*”.

2022, Aquatic Models for Human Disease Conference 2022 at Marine Biological Laboratories, Woods Hole, MA. “*Genetics and Pathogenesis of Distinct Spine Disorders in Zebrafish*”.

2022, 81<sup>st</sup> Annual Society of Developmental Biology Annual Meeting, Vancouver, BC. “*Activation of CREB signaling controls a feedback loop required for the homeostasis of connective tissues of the spine*”.

2022, Zebrafish Disease Models Society, Musculoskeletal I RIG, “*Multigenic thoracic scoliosis in zebrafish*”. (online).

2021, Department of Nutritional Sciences Seminar Series, Austin, TX, “*Defining the Molecular Genetics and Pathogenesis of Idiopathic Scoliosis*”. (online).

2021, Dell Pediatrics Research Institute Symposium. Austin, TX, “*Mutations in Kinesin family member 6 reveal specific roles in ependymal cell ciliogenesis and human neurological development*”.

2021, Baylor College of Medicine Department of Molecular Physiology and Biophysics Seminar Series. “*Defining the Molecular Genetics and Pathogenesis of Idiopathic Scoliosis.*” (online).

2021, Hydrocephalus Association Network for Discovery Science (HANDS) Webinar Series: Congenital Genetic Animal Models. “*Mutations in Kinesin family member 6 reveal specific roles in ependymal cell ciliogenesis and human neurological development*” (online).

2021, The Company of Biologists Journal Meeting: Developmental Disorders: From Mechanism to Treatment Virtual Meeting. “*cAMP/CREB signaling regulates biomechanical properties of cartilaginous and dense connective tissue vital for spine alignment*” (online).

2021, European Calcified Tissue Society Annual Meeting, Fishbone Workshop - Session 2: Growth and the Musculoskeletal System: Ontogeny, Regeneration and Cancer “*Understanding genetic and mechanical changes in spine development*” (online).

2020, Dell Children’s Pediatrics Research Seminar “*Defining the Molecular Genetics and Pathogenesis of Idiopathic Scoliosis*” - CME accredited.

2020, The Allied Genetics Conference 2020, “The Reissner Fiber is Highly Dynamic in vivo and Controls Morphogenesis of the Spine” Selected speaker (online meeting due to COVID).

2019, The Company of Biologists workshop on Understanding Human Birth Defects in the Genomic Age, West Sussex, UK, “*Mediators of spine stability using the zebrafish model system: from fibers to flow*”.

2019, University of North Carolina Orthopedics Department Seminar, Chapel Hill, NC, “*The pathogenesis of idiopathic scoliosis: effectors of the intervertebral disc and endochondral ossification*”.

2019, Duke University School of Medicine, Department of Orthopedics, Durham, NC, “*The pathogenesis of idiopathic scoliosis: effectors of the intervertebral disc and endochondral ossification*”.

2019, Syracuse University Biology Department Seminar Series Fall 2019, “*Mediators of spine stability using the zebrafish model system: from fibers to flow*”.

2019, University of Colorado Denver Orthopedics Mack Clayton Visiting Scientist Lecturer, “*The Pathogenesis of Idiopathic Scoliosis: Effectors of the Intervertebral Disc and Endochondral Ossification*”.

2019, The 14<sup>th</sup> International Zebrafish Conference, Suzhou, China, “*Identification of genetic factors contributing to spine stability and ventricular homeostasis in zebrafish*”.

2019, The Orthopedics Research Society 2019 Annual Meeting, Austin, TX, “Zebrafish as an Emerging Model for Orthopaedic Research Workshop: *Discovering the mediators of spine stability using the zebrafish model system*”.

2019, The Orthopedics Research Society 2019 Annual Meeting, Austin, TX, “*PRMT5 Is a Novel Regulator for Spine Stability and Intervertebral Disc Homeostasis in Mouse*”. Selected speaker.

2019, 8th Strategic Conference of Zebrafish Investigators – January 12-15, 2019 at the Asilomar Conference Grounds, Pacific Grove, Monterey, California, “*Identification of genetic factors contributing to spine stability and ventricular homeostasis in zebrafish*”. Selected speaker.

2018, 9th Adhesion GPCR Workshop, Portland, OR, “*ADGRG6 is essential for homeostasis of the intervertebral disc in mouse*”. Selected speaker.

2018, The International Consortium for Spinal Genetics Development and Disease Conference, Hong Kong University-Shenzen Hospital, Shenzhen, China, "*Defining the Pathogenesis of Idiopathic Scoliosis: A case for cartilage*".

2018, Institute of Developmental Biology & Molecular Medicine, Fudan University, Shanghai, China, "*Defining the Pathogenesis of Idiopathic Scoliosis: A case for cartilage and cilia*".

2018, 4th Annual MBS Retreat, Lady Bird Johnson Wildflower Center, Austin, TX, "*Defining the Pathogenesis of Idiopathic Scoliosis*".

2017, ORS PSRS 4th International Spine Research Symposium, Lake Harmony, PA, "*Conditional Loss of Gpr126 Causes Scoliosis and Disc Degeneration in Mouse*". Selected speaker.

2017, International Conference on Neural Tube Defects, Austin, TX, "*Conservation of Kinesin Family Member 6 (KIF6) Function in Structural Brain Development*". Selected speaker.

2017, Institute for Cellular and Molecular Biology Annual Retreat, Horseshoe Bay, TX "*Gpr126 is required for homeostasis of the intervertebral disc and spine*". Selected speaker.

2017, Royal Microscopy Society, Tomography for Scientific Advancement, Austin, TX, "*Using Iodine-Contrasted  $\mu$ CT to Facilitate Imaging of Structural Brain Defects*". Selected speaker.

2017, Southern Biosafety Association Spring Symposium, Tulane University, New Orleans, LA, "*Gene editing systems*".

2017, 11<sup>th</sup> Structural Birth Defects Meeting, Bethesda, MD, "Conservation of KIF6 function in brain development".

2017, 1st inaugural joint meeting of the International Consortium for scoliosis genetics and the International Consortium for vertebral anomalies and scoliosis: Genomic Approaches to Understanding and Treatment of Scoliosis, Dallas, TX, "*Animal Models of Scoliosis*".

2017, New Frontiers in Pediatric Medicine: DPRI Seminar Series, Austin, TX, “*G-protein Coupled Receptor 126 Signaling for Spine Development and Disease*”. Selected speaker.

2016, Symposium on Zebrafish Models of Spine Development and Scoliosis, Durham, NC, "*Forward genetic screen in zebrafish to identify spine mutants*".

2016, 43rd Annual Meeting Texas Genetics Society, Houston, TX, “*Understanding spine development and disease: Animal models of idiopathic scoliosis*”.

2015, 14th International Phillip Zorab Symposium, Edinburgh, UK, “*A forward genetic screen in zebrafish identifies multiple loci important for normal spine development*”. Selected speaker.

2014, 7th Aquatic Animal Models of Human Disease Meeting, Bastrop, TX, “*Zebrafish models of Scoliosis*”.

2013, British Scoliosis Research Foundation International Phillip Zorab Symposium, London, UK, “*The Druk insertional mutant zebrafish, a model for adolescent idiopathic scoliosis*”. Selected speaker.

2013, British Scoliosis Research Foundation International Phillip Zorab Symposium, London, UK, “*Early loss of col8a1 function in zebrafish results in the dysmorphogenesis of vertebral bodies and scoliosis*”. Selected speaker.

2012, Molecular Pathways in Organ Development & Disease, Cold Spring Harbor, NY, “*The Druk Insertional Mutant Zebrafish, a Model for Adolescent Idiopathic Scoliosis*”. Selected speaker.

2010, Society of Developmental Biology Mid-Atlantic Meeting, Baltimore, MD, “*Dynamic regulation of cell motility and adhesion during mammary branching morphogenesis*”. Selected speaker.

### **POSTER PRESENTATIONS**

2022, American Society of Bone and Mineral Research 2022 Annual Meeting. Austin, TX. “*Dysregulation of SOX9 Function in the Pathogenesis of Adolescent Idiopathic Scoliosis*”.

2019, 78<sup>th</sup> Annual Society of Developmental Biology Meeting. Boston, MA. “*Regulation of terminal hypertrophic chondrocyte differentiation in Prmt5 mutant mice modeling infantile idiopathic scoliosis*”.

2107, Inaugural Musculoskeletal Regenerative Medicine and Biology: From Development to Regeneration, St. Louis, MO, “*GPR126 is Required for Homeostasis of the Intervertebral Discs and Synovial Joints in Mouse*”.

2015, 14th International Phillip Zorab Symposium, Edinburgh, UK, “*Specific loss of Gpr126 in osteochondroprogenitor cells of the mouse models’ adolescent idiopathic scoliosis and pectus excavatum*”.

2013, Aquatic Animal Models for Human Disease and Midwest Zebrafish, Milwaukee, WI, “*Investigations of early and late onset scoliotic curvatures in zebrafish*”.

2011, Society of Developmental Biology 70th Annual Meeting, Chicago, IL, “*Investigations of early and late onset scoliotic curvatures in zebrafish*”.

2009, Society of Developmental Biology, 68th Annual Meeting, San Francisco, CA, “*The PCP effector protein Fuzzy is essential for targeted membrane trafficking, ciliogenesis, and mouse embryonic development.*”

2008, Society of Developmental Biology. Southwest-Gulf Regional Meeting, Houston, TX, “*Distinct expression patterns and developmental functions of Dishevelled in Xenopus.*”

2007, Society of Developmental Biology, 66th Annual Meeting/1st Pan American Cong Dev Biol, Cancun, Mexico, “*Distinct expression patterns and developmental functions of Dishevelled in Xenopus.*”

2006, Society of Developmental Biology. 65th Annual Meeting Meeting, Ann Arbor, MI, “*Subcellular localization and signaling properties of Dishevelled during Xenopus development.*”

2002, Yeast Genetics and Molecular Biology Meeting, Madison, WI, “*The effects of glucose concentration on Saccharomyces cerevisiae in ΔGcr1 and ΔGcr2 backgrounds*”

### **PRE- and POST-DOCTORAL TRAINEES**

Ziyi Xu – 2023 – current – Nutritional Sciences.

Brittany Voigt – 2021- current - Cell and Molecular Biology/ILS.

Ece Atatyeter – 2022 – current – Cell and Molecular Biology/ILS.

Ganga Tandukar – 2021 – 2022 – Masters in Nutritional Sciences.

Valeria Aceves – 2021 – current – Nutritional Sciences.

*2021 CNS Dean's Strategic Fellowship*

Zhaoyang Liu (postdoc, 2016-2022)

*F32 NRSA awardee (AR073648)*

*K99 awardee (AR077090).*

Currently – Asst. Professor – Univ. of Southern California.

Mia Konjikusic (UT-Austin, MBS graduate student, 2017-2021)

Currently – Post-doc Jeremy Reiter lab UCSF Spring 2022

Ben Troutwine (postdoc, 2017-2020)

Currently – Senior Research Associate at University of Kansas Medical Center

Yunjia Wang (UT-Austin, China Scholarship Council Fellow, 2019-2021).

Currently – Surgical resident - Department of Spine Surgery and Orthopedics, Xiangya Hospital, Central South University, Changsha, China.

### **UNDERGRADUATES MENTORED**

Joshua Ito – 2023-2026 - *Dean's Honored Graduate for the 2025-2026*

Nicholas Newbury – 2025- current

Talon Blottin – 2023-2026

Kylie Mathers – 2023- 2026

Katherine Frazier – 2023-2025

Ilyena Brianne Joe – 2021-2025

Sweccha Guntamukkala – 2021-2024 - currently Medical School - UT Southwestern Medical School.

Melisa N. Bayrak – 2020-2022 - currently Medical School - University of Texas Health Science Center.

Holden S. Archer – 2018-2020 - currently Medical School - UT Southwestern Medical School.

Siyu Xiao – 2018-2019 - currently Graduate Studies - University of Houston

Roberto Gonzalez – 2015-2017 - currently Medical School - UT Southwestern Medical School.

### **STUDENT DISSERTATION COMMITTEES**

Percival D'Gama - Nathalie Jurisch-Yaksi Lab - Norwegian University of Science and Technology – (2023).

Ece Atayeter – Gray/Wallingford labs - The University of Texas (2022-current).

Brittney Voigt– Gray/Marcotte labs - The University of Texas (2021-current).

Valeria Aceves – Gray lab (2021-current).

Cristina Raya-Vaca – Wallingford Lab (2019 – current).

Eric Andrew Cardona – Pierce Lab (2020 - current).

Tim Kuka - Eberhart lab - The University of Texas (2017-2021).

Mia Konjikusic - Gray/Wallingford labs - The University of Texas (2018-2021).

Janani Ramachandran - Vokes lab - The University of Texas (2018-2021).

Scott K. Tucker – Eberhart lab – The University of Texas (2021).

## **GRANT SUPPORT**

### **Ongoing:**

- NIH/NIAMS, 2R01 AR072009-06, PI Gray, "Investigations of the molecular genetics and pathogenesis of scoliosis." (Submitted March 2022) \$2,615,000 (5-year budget).
- NIH/NICHD, 2P01-13433299, Multi-PI Wise, Ahituv, and Solnica-Krezel with Subaward to Gray "Developmental Mechanisms of Human Idiopathic Scoliosis." (Pending council, scored 23<sup>rd</sup> percentile) \$125,000 to Gray (5-year budget).
- NIH/NIAMS, 3R01AR072009-07S1, PI Gray, "Expanding expertise to define map protein complexes and signaling essential for skeletal structure and growth." \$477,000 (2-year budget).

### **Submitted/Pending Review:**

- NIH/NIAMS, 1R01DE036328, MPI Craft, Gray, Marcotte. "Insights into Craniofacial Defects and Skeletal Dysplasia: Focus on tissue hypertrophy." (Submitted Dec 2025) \$3,269,648 (5-year budget).

### **Completed:**

- UT Austin CNS Catalyst Grant Program, Vokes and Gray, "PRMT5-dependent Regulation of Articular Cartilage Homeostasis and Osteoarthritis." \$50,000.
- NIH/NIAMS, R01AR068292-05, PI Hadley-Miller, Sub-PI, Gray, "Familial idiopathic scoliosis: gene discovery and functional studies" \$1,720,500
- NIH/NIAMS, R01 AR072009-01, PI Gray, "Towards a Mechanistic Understanding of Adolescent Idiopathic Scoliosis." (Impact Score:14, Percentile:1) \$1,721,500 (5-year budget).