

Curriculum Vitae

Nicolas Rohner, Ph.D.

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POSITIONS HELD

- 09/2015 to present Assistant Investigator at the Stowers Institute for Medical Research
Assistant Professor Department of Molecular & Integrative Physiology,
KU Medical Center
- 01/2010 – 08/2015 Postdoctoral Fellow in the Laboratory of Prof. Cliff Tabin,
Department of Genetics, Harvard Medical School
- 07/2005 – 12/2009 Doctoral student in the Laboratory of Prof. Christiane Nüsslein-Volhard
Department of Genetics, Max-Planck-Institute for Developmental Biology

EDUCATION

- 05/2010 Ph.D. Grade: “**magna cum laude**”
Thesis: “The Genetic Basis of Scale Development and its Role in Natural
Variation” Supervisor: Christiane Nüsslein-Volhard
- 05/2002 - 04/2005 M.Sc. at Friedrich-Alexander University Erlangen, Department of Genetics
Thesis: “Functional characterization of different immunotoxins targeting CD7 and
CD19” Supervisor: Georg Fey
Grade: 1.2 (1-6; 1 is best)
- 10/1999 - 05/2002 B.Sc. at Friedrich-Alexander University Erlangen, Germany
Grade: 1.2 (1-6; 1 is best)

RESEARCH INTEREST

My research interest focuses on the interface of developmental biology, genetics and evolution with a particular interest on understanding the genetic basis and molecular mechanisms of adaptation. I am mostly using the cavefish *Astyanax mexicanus* to address the question of how these fish have adapted to their nutrient poor environments and to what extent similar mechanisms are employed in our own evolutionary history, maladaptation to modern civilizations and the resulting obesity epidemic.

AWARDS AND FELLOWSHIPS

- EMBO Travel and Meeting bursary to attend the FEBS EMBO 2014 Meeting (2014)

- Young Investigator Travel Award for the SMBE (Society for Molecular Biology & Evolution) Meeting in Puerto Rico (2014)
- Selected Speaker Prize at the Harvard Medical School Department of Genetics Retreat (2014)
- Two year Postdoctoral Fellowship from the German Government (Deutsche Forschungsgemeinschaft-DFG) (2011-2013)
- Postdoc Research Day Poster Award at Harvard Medical School in recognition of outstanding poster presentation (2012)
- Nominated and Elected for the AAAS Program for Excellence in Science (2012)
- Stipend from the GSO (German Scholars Organization) for “Building Bridges” an undertaking to attract scientists from abroad back to Germany (2011)
- Max-Planck PhD Fellowship (2005-2008)
- Student award for the best poster presentation at the 1st European Meeting of Evolution and Development, Prague (2006)

INVITED LECTURES

- Harvard’s 17th Annual Postgraduate Nutrition Symposium, Boston, MA July 13-14, 2016
- MBL Embryology course, Woods Hole, MA June 21, 2016
- Department of Physiology, Kansas University Medical Center, Kansas City, MO October 12th, 2015
- Epigenomics & Metabolomics Symposia, Cambridge, MA August 24 -25, 2015
- Harvard-LMU Young Scientists' Forum, Cambridge, MA July 21, 2014

Selected from abstract submissions:

- “Hungry, Fat and Healthy - Cavefish as a Model for Metabolic Evolution” at the International Society for Evolution, Medicine and Public Health Meeting, Durham, June 22 -25, 2016
- “Cavefish as a Model for Metabolic Evolution” at the International conference on Subterranean Biology, Fayetteville, June 13 -17, 2016
- “Hungry, Fat and Healthy” at the ESEB Meeting, Lausanne August 9 -14, 2015
- “What changes matter? A genomic approach to human evolution” at the meeting of the Society for Molecular Biology & Evolution, San Juan June 11, 2014
- “What changes matter? A genomic approach to human evolution” at the Cell Symposia Evolution of Modern Humans, Sitges March 16-18, 2014
- “What changes matter? A genomic approach to human evolution” at the 36th meeting of the Society of Craniofacial Genetics and Developmental Biology, Boston October 24, 2013
- “HSP90 as a capacitor for the evolution of eye loss in cavefish” at the EMBL SYMPOSIUM: New model systems for linking evolution and ecology, Heidelberg May 1-4, 2013
- “HSP90 as a capacitor for the evolution of eye loss in cavefish” at the 3rd Astyanax International Meeting, Ciudad Valles March 17-21, 2013
- “Cave Fish as a Model to Elucidate the Genetic Basis of the Evolution of Behavior” at the 2nd Astyanax International Meeting, Ciudad Valles March 13-18, 2011
- “ FGFR1 AND MORPHOLOGICAL VARIATION IN EVOLUTION” at the 5th European Zebrafish Genetics and Development Meeting, Amsterdam July 12-15, 2007

OTHER PRESENTATIONS (poster)

- “Hungry, Fat and Healthy. Cavefish as a natural model for insulin resistance and fatty liver disease” at the Evolutionary Systems Biology Meeting, Hinxton, UK March 2 – 4, 2016
- “Loss of function mutations in MC4R drive adaptation of *Astyanax mexicanus* through hyperphagia.” at the Ecological and Evolutionary Genomics Gordon Conference, Biddeford, Maine July 12 – 17, 2015
- “What changes matter? A genomic approach to human evolution” at the EMBO-FEBS Meeting, Paris August 30 – September 4, 2014
- “HSP90 as a capacitor for the evolution of eye loss in cavefish” at the Biological Mechanism in Evolution - Gordon conference, Easton, MA June 2-7, 2013
- “What changes matter? A genomic approach to human evolution” at the EMBO-Meeting, Nice September 22-25, 2012
- “What changes matter? A genomic approach to human evolution” at the First Joint Congress on Evolutionary Biology, Ottawa July 6-10, 2012
- “Elucidating the genetic basis of scale loss in fish” at the 16th International Society of Developmental Biologists Congress, Edinburgh September 6-10, 2009 (Abstract published in Mechanisms of Development: Volume 126, p261)
- “Fibroblast growth factor signaling in skeletal evolution” at the 67th Annual Meeting of the Society for Developmental Biology, Philadelphia July 26-30, 2008 (Abstract published in Developmental Biology: Volume 319, p.499)
- “Genetic Basis of Scale Development and Variation” at the 1st European Meeting of Evolution and Development, Prague August 17-19, 2006

TEACHING EXPERIENCE & OUTREACH

- Lunch and Learn Lecture, Stowers Institute for Medical Research, April 28, 2016
- Evo-Devo Lectures for the Stowers Graduate School Program, September 8-11, 2015
- Guest Lecture for undergraduate students at the Human Evolutionary Biology Department, Peabody Museum Cambridge, March 6th 2014
- Teaching Assistant position at Boston College for the Fall course: „Investigations in Molecular Cell Biology“ (Sep 2012-Dec 2012)
- Two day teaching training and workshop at Boston College about Bloom’s Taxonomy of educational objectives (2012)
- Mentoring in the Four Directions Summer Research Program at Harvard Medical School and Brigham and Women’s Hospital for undergraduate students with a commitment to the health of Native American communities for the years 2011-2014 (Students: Zack MacDonald, Clifford Jacobs, Jennifer Meylor, and Sean Gay)
- Mentor Simmons College student program (mentoring Tam Luong 2011-2013)
- Co-teaching „Entwicklungsgenetik der Tiere (Developmental Genetics of Animals)“ with Prof Dr. Reuter, University of Tuebingen (2009)
- Lectures for High School students in the Max-Planck-Institute (2007-2009)

PROFESSIONAL SERVICE & ACTIVITIES

- Organization of the 5th cavefish meeting in March 2017, Queretaro Mexico

- Implementation and maintenance of the community cavefish website: cavefin.org
- Invited Peer-Reviews
 - Development
 - eLife (3)
 - Proceedings B
 - Current Biology
 - Evolution and Development
 - Molecular Biology and Evolution (2)
 - Genome Biology and Evolution
 - Integrative Zoology (3)
 - Science Advances
 - BMC Biology
 - Developmental Biology
 - Ad-hoc grant reviewer for the German science foundation (DFG) (2)

PROFESSIONAL MEMBERSHIPS

- Member of the Society for Molecular Biology and Evolution
- Member of the European Society for Evolutionary Biology
- Member of the Society for the Study of Evolution
- Member of the International Society for Evolution, Medicine & Public Health
- Member of the Genetics Society of America
- Member of the Society for Developmental Biology

FIELD TRIPS

- Caving trip to Caballo Morro, May 2016, Sierra del Abra Mexico
- Caving trip to Micos, March 2013, Sierra del Abra Mexico
- Caving trip to Tinaja, March 2011, Sierra del Abra Mexico
- Field trip to collect *Phoxinellus* species, June 2007, Croatia and Bosnia Herzegovina

List of Publications

1. Aspiras A, Riddle M, Borowsky R, Martineau B, Tabin CJ, **Rohner N**. *Mutations in the Insulin signalling pathway provide an adaptation to nutrient poor conditions. In preparation.*

In this study we show that cavefish are inherently insulin resistant due to a coding mutation in the insulin receptor (the same mutation that causes insulin resistance in humans). In cavefish it serves as a strategy to acquire high body fat levels, which in turn allow the cavefish to survive longer starvation periods. Given that cavefish are insulin resistant without obvious effects on their health we hypothesize that cavefish have co-evolved strategies to circumvent the negative effects of insulin resistance. This study will be submitted in Fall 2016.

2. **Kamberov Y, Rohner N***, Zody M, Hawkins MB, Reich D, McCarroll S, Lieberman DE, Tschopp P, Tabin CJ. *Genomic deletions in the human genome are contributing to the evolution of the human skull. In preparation.*

* contributed equally

In this study we have used a whole genome approach, aligning primate and mammal genomes to unravel the genetic basis of human specific regulatory function by focusing on deletions unique to the human genome. This work has led to the identification of cis-regulatory elements underlying human specific craniofacial characteristics (smaller skull and teeth). This work has been started five years ago and involves multiple transgenic and knockout animals. This long-term study will be finished in 2017.

3. Daane JM, **Rohner N**, Konstantinidis P, Djuranovic S, Harris MP. *Phylogenomic evidence for epistasis between fgfr1 and fgf20 in skeletal evolution. Mol Biol Evol.* 2016 Jan;33(1):162-73.

4. Aspiras A*, **Rohner N***, Martineau B, Borowsky R, Tabin CJ. *Loss of function mutations in MC4R drive adaptation of Astyanax mexicanus through hyperphagia. PNAS* 2015 Aug 4;112(31):9668-73

* contributed equally

Featured in National Geographic, Featured on BBC Radio, Featured in the New York Times, Harvard Press Release

5. McGaugh SE, Gross JB, Aken B, Blin M, Borowsky RL, Chalopin D, Hinaux H, Jeffery WR, Keene AC, Ma L, Minx P, Murphy D, O'Quin KE, Rétaux S, **Rohner N**, Searle SMJ, Stahl B, Tabin C, Volff JN, Yoshizawa M, Warren WC. *The cavefish genome reveals candidate genes for eye loss. Nature Communications* 2014 Oct 20;5:5307

6. **Rohner N**, Tschopp P, Tabin CJ. *Facial Makeup Enhancing our Looks. Current Biology* 2014 Jan 6;24(1):R36-8

7. **Rohner N**, Jarosz DF, Kowalko JE, Yoshizawa M, Jeffery WR, Borowsky RL, Lindquist S, Tabin CJ. *Cryptic Variation in Morphological Evolution: HSP90 as a Capacitor for the Adaptive Loss of Eyes in Cavefish. Science* 2013 Dec 13;342(6164):1372-5

Editors choice Science, Editors choice Nature Genetics, Featured in National Geographic, Featured in Scientific American, Harvard Press Release and Whitehead-Institute Press release

8. Kowalko JE, **Rohner N**, Linden TA, Rompani SB, Warren WC, Borowsky R, Tabin CJ, Jeffery WR, Yoshizawa M. *Convergence in feeding posture occurs through different genetic loci in independently evolved cave populations of *Astyanax mexicanus**. **PNAS** 2013 Oct 15;110(42):16933-8
9. Kowalko JE, **Rohner N**, Rompani SB, Peterson BK, Linden TA, Yoshizawa M, Kay EH, Weber J, Hoekstra HE, Jeffery WR, Borowsky R, Tabin CJ. *Loss of Schooling Behavior in Cavefish through Sight-Dependent and Sight-Independent Mechanisms*. **Current Biology** 2013 Oct 7; 23(19): 1874-83
10. Amemiya CT, Alföldi J, Lee AP, Fan S, Philippe H, Maccallum I, Braasch I, Manousaki T, Schneider I, **Rohner N**, Organ C, Chalopin D, Smith JJ, Robinson M, Dorrington RA, Gerdol M, Aken B, Biscotti MA, Barucca M, Baurain D, Berlin AM, Blatch GL, Buonocore F, Burmester T, Campbell MS, Canapa A, Cannon JP, Christoffels A, De Moro G, Edkins AL, Fan L, Fausto AM, Feiner N, Forconi M, Gamielien J, Gnerre S, Gnrirke A, Goldstone JV, Haerty W, Hahn ME, Hesse U, Hoffmann S, Johnson J, Karchner SI, Kuraku S, Lara M, Levin JZ, Litman GW, Mauceli E, Miyake T, Mueller MG, Nelson DR, Nitsche A, Olmo E, Ota T, Pallavicini A, Panji S, Picone B, Ponting CP, Prohaska SJ, Przybylski D, Saha NR, Ravi V, Ribeiro FJ, Sauka-Spengler T, Scapigliati G, Searle SM, Sharpe T, Simakov O, Stadler PF, Stegeman JJ, Sumiyama K, Tabbaa D, Tafer H, Turner-Maier J, van Heusden P, White S, Williams L, Yandell M, Brinkmann H, Volf JN, Tabin CJ, Shubin N, Scharl M, Jaffe DB, Postlethwait JH, Venkatesh B, Di Palma F, Lander ES, Meyer A, Lindblad-Toh K. *Analysis of the African coelacanth genome sheds light on tetrapod evolution*. **Nature** 2013 Apr 18;496(7445):311-6
11. Smith JJ, Kuraku S, Holt C, Sauka-Spengler T, Jiang N, Campbell MS, Yandell MD, Manousaki T, Meyer A, Bloom OE, Morgan JR, Buxbaum JD, Sachidanandam R, Sims C, Garruss AS, Cook M, Krumlauf R, Wiedemann LM, Sower SA, Decatur WA, Hall JA, Amemiya CT, Saha NR, Buckley KM, Rast JP, Das S, Hirano M, McCurley N, Guo P, **Rohner N**, Tabin CJ, Piccinelli P, Elgar G, Ruffier M, Aken BL, Searle SM, Muffato M, Pignatelli M, Herrero J, Jones M, Brown CT, Chung-Davidson YW, Nanlohy KG, Libants SV, Yeh CY, McCauley DW, Langeland JA, Pancer Z, Fritzsche B, de Jong PJ, Zhu B, Fulton LL, Theising B, Flicek P, Bronner ME, Warren WC, Clifton SW, Wilson RK, Li W. *Sequencing of the sea lamprey (*Petromyzon marinus*) genome provides insights into vertebrate evolution*. **Nature Genetics** 2013 Apr;45(4):415-21, 421e1-2
12. Norton WH, Stumpfenhorst K, Fauss-Kessler T, Folchert A, **Rohner N**, Harris MP, Callebert J, and Bally-Cuif L. *Fgf signalling in the brain reveals a genetic basis for an aggression-boldness syndrome*. **Journal of Neuroscience** 2011 Sep 28;31(39):13796-807
13. **Rohner N**, Perathoner S, Frohnhöfer HG, Harris MP. *Enhancing the efficiency of N-ethyl-N-nitrosourea-induced mutagenesis in the zebrafish*. **Zebrafish** 2011 Sep 28;31(39):13796-807
14. **Rohner N**, Bercseny M, Orban L, Kolanczyk ME, Linke D, Brand M, Nüsslein-Volhard C, and Harris MP. *Duplication of fgfr1 Permits Fgf Signaling to Serve as a Target for Selection during Domestication*. **Current Biology** 2009 Oct 13;19(19):1642-7
Recommended Faculty1000, Editors choice Science, Editors choice Nature, Dispatch Current Biology, Max-Planck-Institute Press Release, Featured on National Public Radio.
15. Harris MP, **Rohner N**, Schwarz H, Perathoner S, Konstantinidis P, and Nüsslein-Volhard C. *Zebrafish *eda* and *edar* mutants reveal conserved and ancestral roles of ectodysplasin signaling in vertebrates*. **PLoS Genetics** 2008 Oct 3;4(10):e1000206

Book chapters (peer-reviewed):

Chapter: The role of genome evolution in developmental evolution for “The Encyclopedia of Evolutionary Biology” published by Elsevier. *In press* (May 2016)

Chapter: Selection through Standing Genetic Variation in “The evolution and biology of Mexican cavefish” published by Elsevier. ISBN: 978-0-12-802148-4