

Clarissa R. Coveney, DPhil

NIAMS K99/R00 Postdoctoral Fellow

Mechanically responsive genetic and epigenetic regulation in skeletal development and disease

clarissa_coveney@fas.harvard.edu | [LinkedIn](#) | ccoveney.com

EDUCATION

- **Doctor of Philosophy in Molecular and Cellular Medicine, Green Templeton College** 2015 – 2020
Kennedy Institute of Rheumatology, University of Oxford Oxford, United Kingdom
 - Advisors: Associate Professor Angus Wann, Professor Tonia Vincent
 - Thesis: The role of the ciliary protein IFT88 in post-natal joint maturation, homeostasis and disease.
Kennedy Trust Prize Studentship: 100% of tuition, fees, and living. The scholarship has a 7% acceptance rate for graduate students.
- **Bachelor of Science, Biochemistry, Upper Second Class with Honors** 2011 – 2014
University College London London, United Kingdom

RESEARCH EXPERIENCE

- **K99/R00 Postdoctoral Fellow, Department of Human Evolutionary Biology** Harvard University, MA
2021 – Present
Use cutting-edge molecular biology techniques to identify gene regulatory and evolutionary contributors to musculoskeletal disease.
 - Epigenetic regulation of *GDF5* to elucidate impacts on disease associated variants existing within regulatory elements.
 - Identification and functional characterisation of novel and ancient gene variants that contribute to skeletal development, homeostasis, and predispose to disease using the Massively Parallel Reporter Assay.
 - Initiated cross department collaboration to investigate role of insulin as an energy allocator during adolescent growth. Awarded **\$64,000** from the Harvard Dean's Fund for research.
 - Supervised two DPhil students, and 5 undergraduates including a Final Year Honor's thesis.
- **Postdoctoral Research Assistant, Kennedy Institute of Rheumatology** University of Oxford, UK
2020 – 2021
 - Continuation of DPhil research during Covid-19 pandemic focusing on the impacts of IFT88 deletion in growth plate cartilage maturation.
 - Supported and trained undergraduate, Masters and DPhil students, lab technicians and Post-Docs in the Versus Arthritis Research Centre.
 - Co-investigator on a University College London proof of concept grant worth **£21,500** for cryoSIM and cryoSXT imaging with Diamond Light Source.
 - Delivered undergraduate tutorials at Magdalen College, Oxford.
- **DPhil Student, Kennedy Institute of Rheumatology** University of Oxford, UK
2015 – 2020
 - Investigated the role of the primary cilium (proposed mechanosensor) in cartilage homeostasis and disease pathogenesis using both in vivo and in vitro models.
 - Approach utilised a cartilage specific inducible knockout model targeting the ciliary protein, IFT88, specifically in post natal mice.

PUBLICATIONS

13 peer reviewed articles (6 first author), 1 under review, 2 more first author articles in prep.

1. **In prep, target Science: Coveney CR**, Ganapathee DS, Sosa D, Okamoto AS, Muthuirulan P, Amani MA, Jagoda E, Richard D, Jung M, Ebsim R, Saunders F, Hashim A, Gregory J, Aspden R, Lindner C, Cootes T, Kemp JP, Tobias JH, Faber BG, Capellini TD. The Functional Legacy of Neandertal Introgression Across Human Tissues
2. **BioRxiv, target Nature Metabolism, Corresponding author: Coveney CR**, Maridas D, Kaushik D, Sarkar A, Ibata N, McKeever A, Shoman J, Kistner T, Rubin G, Schell L, Venable E, Allen-Bevins C, Ganapathee DS, Okamoto AS, Lieberman D, Carmody R, Capellini TD. Evolutionary trade-offs between growth and reproduction under obesogenic conditions: sex-biased skeletal and gonadal maturation in mice. *BioRxiv* <https://doi.org/10.64898/2026.07.16.738527>
3. **Under review, Nature Communications: Jung M**, Alomar F, **Coveney CR**, Chen S, Orr S, Mimpfen J, Nikolic M, Flynn KA, Zhang Y, Ebsim R, Saunders FR, Gregory JS, Aspden RM, Harvey NC, Lindner C, Abram SGF, Hammond C, Smith GD, Zeggini E, Snelling S, Capellini TD, Rice S, Kemp JP, Tobias JH, Cootes T, Faber BG. Dissecting the genetic architecture of knee alignment reveals its contribution to osteoarthritis risk.
4. Okamoto AS, **Coveney CR**, Ganapathee DS, Capellini TD. Massively parallel functional screen identifies thousands of regulatory differences in human versus chimpanzee postcranial skeletal development. *Genome Biology and Evolution*, Volume 18, Issue 5, May 2026, evag121, <https://doi.org/10.1093/gbe/evag121>
5. Masson AO, Devine J, Das N, **Coveney CR**, Hallgrimsson B, Liu Z, Capellini TD, Biernaskie JA, Edwards WB, Krawetz RJ. Femur Shape Changes in Prg4-Deficient Mice: Morphological Insights Into Joint Well-Being. *FASEB J*. 2025 Aug 31;39(16):e70974. doi: 10.1096/fj.202501775R. PMID: 40844376.
6. **Corresponding author. Coveney CR**, Capellini TD. Mechanoepigenetics in Musculoskeletal Disease. *Osteoarthritis Cartilage*. 2025 Jun 4:S1063-4584(25)01034-9. doi: 10.1016/j.joca.2025.05.012. Epub ahead of print. PMID: 40480604.
7. **Cover art and journal highlight. Coveney CR**, Maridas D, Chen H, Muthuirulan P, Liu Z, Jagoda E, Yarlagadda S, Movahhedi M, Proffen B, Rosen V, Kiapour AM, Capellini TD. Complex regulatory interactions at GDF5 shape joint morphology and osteoarthritis disease risk. *Arthritis Rheumatol*. 2025 May 12. doi: 10.1002/art.43231. Epub ahead of print. PMID: 40356240.
8. Meng H, Thompson CL, **Coveney CR**, Wann AK, Knight MM. Techniques for Visualization and Quantification of Primary Cilia in Chondrocytes. *Methods Mol Biol*. 2023;2598:157-176. doi: 10.1007/978-1-0716-2839-3_12. PMID: 36355291, 2023.
9. **Coveney CR**, Samvelyan HJ, Miotla-Zarebska J, Carnegie J, Chang E, Corrin CJ, Coveney T, Stott B, Parisi I, Duarte C, Vincent TL, Staines KA, and Wann AK (2022) Ciliary IFT88 Protects Coordinated Adolescent Growth Plate Ossification From Disruptive Physiological Mechanical Forces. *Journal of bone and mineral research : the official journal of the American Society for Bone and Mineral Research*. doi: 10.1002/jbmr.4502, 2022.
10. **Cover art. Coveney CR**, Zhu L, Miotla-Zarebska J, Stott B, Parisi I, Batchelor V, Duarte C, Chang E, McSorley E, Vincent TL, Wann AK. The ciliary protein IFT88 controls post-natal cartilage thickness and influences development of osteoarthritis. *Arthritis Rheumatol*. 2021 Jun 8. doi: 10.1002/art.41894. Epub ahead of print. PMID: 34105311, 2021.
11. McFie M, Koneva L, Collins I, **Coveney CR**, Clube AM, Chanalaris A, Vincent TL, Bezbradica JS, Sansom SN, Wann AKT (2020). Ciliary proteins specify the cell inflammatory response by tuning NFkB signaling, independently of primary cilia. *J Cell Sci.[published online ahead of print, 2020 Jun 5]*. *J Cell Sci*. 2020;jcs.239871. doi:10.1242/jcs.239871, 2020.
12. Singer D, Thamm K, Zhuang H, Karbanov 'a J, Gao Y, Walker JV, Jin H, WuX, **Coveney CR**, Marangoni P, Lu D, Grayson PRC, Gulsen T, Liu KJ, Ardu S, Wann AK, Luo S, Zambon AC, Jetten AM, Tredwin C, Klein OD, Attanasio M, Carmeliet P, Huttner WB, Corbeil D, Hu B, (2019). Prominin-1 controls stem cell activation by orchestrating ciliary dynamics. *EMBO J*. 2019 Jan 15;38(2):e99845. doi: 10.15252/embj.201899845, 2019
13. **Coveney CR**, Tellier M, Lu F, Maleki-Toyserkani S, Jones R, Bart VMT, Pring E, Alrubayyi A, Richter FC, Scourfield DO, Rehwinkel J, Rodrigues PRS, Davies LC, Gea-Mallorqu 'ı E, and Consortium, T. O.-C. C. L. (2020) Innate immunology in COVID-19—a living review. Part I: viral entry, sensing and evasion. *Oxford Open Immunology* 1 2020
14. Rodrigues PRS, Alrubayyi A, Pring E, Bart VMT, Jones R, **Coveney CR**, Lu F, Tellier M, Maleki-Toyserkani S, Richter FC, Scourfield DO, Gea-Mallorqu 'ı E, Davies LC, and Consortium, T. O.-C. C. L. (2020) Innate immunology in COVID-19—a living review. Part II: dysregulated inflammation drives immunopathology. *Oxford Open Immunology* 1 2020
15. **Coveney CR**, Collins I, McFie M, Chanalaris A, Yamamoto K, Wann AKT, (2018). Cilia protein IFT88 regulates extracellular protease activity by optimizing LRP-1 mediated endocytosis. *FASEB J*. 2018 Jun 19;32(12):3334-3344. PMID: 3000334
16. Scott F, Gonzalez Malagon SG, O'Brien BA, Fennema D, Veeravalli S, **Coveney CR**, Phillips IR, Shephard EA, (2017) Identification of Flavin-Containing Monooxygenase 5 (FMO5) as a Regulator of Glucose Homeostasis and a Potential Sensor of Gut Bacteria. *Drug Metab Dispos*. 2017 Sep;45(9):982-989. doi:10.1124/dmd.117.076612. 2018

ORAL PRESENTATIONS (SELECTED)

-
- | | |
|---|-------------|
| • OARSI World Congress, Plenary, Young Investigator Award for Highest Rated Abstract
<i>MPRA Identifies Ancient, Evolutionarily Important Variants Pertinent To Musculoskeletal Traits And Disease</i> | Apr 2026 |
| • International BMP Conference, Oral presentation, Philadelphia, USA
<i>Interactions of OA and DDH GWAS risk variants impact joint morphology, GDF5 expression, and chondrogenesis</i> | May 2025 |
| • Center for Skeletal Research Symposium, Oral presentation, Cambridge, USA
<i>Functional assessment of 54,478 introgressed Neanderthal variants in musculoskeletal biology</i> | Apr 2025 |
| • Epigenetics of OA, Best Postdoc Presentation Award, Toronto, Canada
<i>Interactions of regulatory elements at GDF5 impact joint morphology and disease risk</i> | Sep 2024 |
| • OARSI World Congress, Plenary, Young Investigator Award for Highest Rated Abstract
<i>The ciliary protein intraflagellar transport 88 is required for the maturation, homeostasis and mechanoadaptation of articular cartilage</i> | Apr 2021 |
| • OARSI World Congress, Oral presentation, Cancelled due to coronavirus pandemic
<i>The ciliary protein intraflagellar transport 88 is required for the maturation, homeostasis and mechanoadaptation of articular cartilage</i> | April 2020 |
| • OARSI World Congress, Oral presentation, Cancelled due to coronavirus pandemic
<i>Disruption of adolescent growth plate dynamics following removal of a putative chondrocyte mechanostat</i> | April 2020 |
| • FASEB Cilia Conference, Oral presentation, Travel Award Winner, Colorado, USA
<i>The ciliary protein IFT88 is influential through joint maturation, adult life, and disease as a mechanoeffector of cartilage</i> | August 2019 |
| • Cutting Edge Osteoarthritis, Oral presentation, Best presentation prize, University of Oxford, UK
<i>The ciliary protein IFT88 is influential through joint maturation, adult life, and disease as a mechanoeffector of cartilage</i> | July 2019 |
| • Cutting Edge Osteoarthritis, University of Oxford, UK
<i>The ciliome in adult joint homeostasis and disease</i> | July 2017 |

INVITED GUEST SPEAKER

-
- | | |
|--|------|
| • Blizard Institute, Queen Mary University of London, UK
<i>Mechanoepigenetics in joint development, morphology, and disease</i> | 2026 |
| • The Institute of Genetics and Cancer, University of Edinburgh, UK
<i>Mechanoepigenetics in joint development, morphology, and disease</i> | 2026 |
| • Department of Molecular Genetics and Genome Sciences, University of Oklahoma, USA
<i>Mechanoepigenetics in joint development, morphology, and disease</i> | 2025 |
| • School of Physiology, Pharmacology and Neuroscience, University of Bristol, UK
<i>The regulation of joint shape and disease</i> | 2025 |
| • School of Biological Sciences, University of Southampton, UK
<i>Ancient selection and complex regulatory interactions at the GDF5 locus shape joint morphology and osteoarthritic disease risk</i> | 2025 |
| • Kennedy Institute of Rheumatology, University of Oxford, UK
<i>Regulation of Gdf5 and its impact on joint morphology and cartilage health</i> | 2024 |
| • Department of Orthopaedics, Washington University St. Louis, USA
<i>Regulation of Gdf5 and its impact on joint morphology and cartilage health</i> | 2023 |
| • Thurston Arthritis Research Centre, University of North Carolina, USA
<i>The role of the ciliary protein IFT88 in joint maturation, homeostasis and disease</i> | 2019 |
| • Department of Biochemistry and Biophysics, UCSE, USA
<i>The role of the ciliary protein IFT88 in joint maturation, homeostasis and disease</i> | 2019 |
| • Institute of Metabolic Science, University of Cambridge, UK
<i>The role of the ciliary protein IFT88 in joint maturation, homeostasis and disease</i> | 2018 |
| • Royal Veterinary College, University of London, UK
<i>The role of the ciliary protein IFT88 in joint maturation, homeostasis and disease</i> | 2018 |

GRANTS AND AWARDS

-
- K99/R00 Awardee: Mechanoepigenetic regulation of joint anatomy and disease. Awarded September 2026.
 - Developed and initiated cross-department collaboration on role of insulin in adolescent growth; awarded **\$64,000** Harvard Competitive Dean's Award.
 - Successfully applied for and delivered on multiple grants: Center for Skeletal Research Mini Grant – **\$10,000** (Apr 2024), BMCRC Pilot Fund – **\$25,000** (Jul 2023).
 - Co-investigator on proof-of-concept grant for cryoSIM and cryoSXT imaging (**£21,500**) to visualize primary cilia in primary cells (2020).
 - Awarded Kennedy Trust Prize Studentship: 100% of tuition, fees, and living (**£170,000**). The scholarship has a 7% acceptance rate for graduate students.
 - Awarded competitive ITInnovations Oxford grant - **£15,000** (2018), to develop a mental fitness and performance digital platform alongside Oxford University Boat Race athletes (Wattson Blue).
 - Secured **>£4,000** in over 15 competitive bursaries and travel awards from University and charity funding bodies.

CONFERENCES AND SYMPOSIA (SELECTED)

- **Over 20 international conferences and symposia attended since 2016**
Selection below:
- **Selected Awards**
OARSI 2026, 2021 and 2020, CSR 2025, Epigenetics of OA 2024, CSR 2024, FASEB 2019, Cutting Edge OA 2019, STEM4Britain competition 2019.
- **OARSI World Congress on Osteoarthritis, Highest Rated Abstract Award (oral), West Palm Beach, USA, 2026**
Massively Parallel Reporter Assay (MPRA) Identifies Ancient, Evolutionarily Important Variants Pertinent To Musculoskeletal Traits And Disease.
- **Northeastern University, Boston, MA, 2025**
New England Future Faculty Workshop
- **International BMP Conference, Philadelphia, PA, 2025**
Interactions of OA and DDH GWAS leading risk variants impact joint morphology, GDF5 expression, and chondrogenic potential
- **Center for Skeletal Research Symposium, MA, 2025**
Functional testing of 54,478 introgressed Neanderthal variants in musculoskeletal tissues
- **Orthopaedic Research Society Conference, Phoenix, AZ, 2025**
Interactions Of OA GWAS Risk Variants Impact Joint Morphology, GDF5 Expression, And Chondrogenic Potential
- **Orthopaedic Research Society Conference, Phoenix, AZ, 2025**
Interaction Of Regulatory Elements At The GDF5 Locus Act To Drive, Restrict, Or Repress Expression, Impacting Joint Morphology
- **Orthopaedic Research Society Conference, Phoenix, AZ, 2025**
Functional Testing of 54,478 Introgressed Neanderthal Variants In Musculoskeletal Tissues Shows Differential Activity Related to OA
- **Epigenetics of OA, Oral presentation, 2024**
Interaction of regulatory elements at the GDF5 locus act to drive, restrict or repress expression, impacting joint morphology, and disease risk.
- **Center for Skeletal Research Symposium, Best Poster Prize, 2024**
Joint morphology, osteoarthritis, and synergistic activity of GDF5 regulatory regions.
- **Variant to Function Symposium, Broad Institute, Boston, 2024**
Joint morphology, osteoarthritis, and synergistic activity of GDF5 regulatory regions.
- **Cartilage Biology and Pathology Gordon Research Conference, Tuscany, Italy, 2023**
Synergistic activity of regulatory regions within the GDF5 locus.
- **OARSI World Congress on Osteoarthritis, Oral presentation, Highest Rated Abstract Award, Virtual Meeting 2021**
The ciliary protein intraflagellar transport 88 is required for the maturation, homeostasis and mechanoadaptation of articular cartilage.
- **FASEB Cilia Conference, Oral presentation Snow Mass Village, Colorado, USA, 2019 Travel Award Winner**
The ciliary protein IFT88 is influential through joint maturation, adult life, and disease as a mechanoeffector of cartilage

TEACHING EXPERIENCE

- Scholarship in Oral Health (SOH) III, First year Dental Medicine Students at Harvard School of Dental Medicine.
Reviewer for grant writing component of the course, providing detailed personalised feedback for students.
- Teaching Fellow, HEB 118, Building the Human Body, Harvard University (Fall 2024).
- Teaching Fellow, GENED 1027: Human Evolution and Disease, Harvard (Spring 2023).
- Laboratory Training and Supervision, Harvard PhD (1) and undergraduate students (8, 2 Final Year Honors students) (2022–Present).
- Extracellular Matrix tutorials, Magdalen College, Oxford (2020–2021).
- Supervised MSc and medical student projects at Oxford (2019–2021).

UNIVERSITY SERVICE

- Organising committee, and Chair of Abstract Reviewing Committee for the Center for Skeletal Research Symposium, April 2025, 2026 and 2027.
- ORS abstract reviewer for ORS Conference, SF, 2027.
- ORS Advocacy Liaison: responsible for organising resources for public outreach opportunities and updates from home institutions and regions, while also helping to disseminate ORS outreach content within local communities.
- Early Stage Investigator Committee for Center for Skeletal Research: responsible for organising resources and events for early stage investigators within our Center focused on academic job applications, job opportunities and grant applications.
- Open House Committee for HEB for recruitment of grad students 2023 and 2024. This included the initiation and development of a video compiled of interviews of current grad students which I conducted. This video is now used every year to recruit students to the department.
- Diversity Inclusion and Belonging Committee, Human Evolutionary Biology, Harvard University (2022–2023).
- Initiated and organize the Postdoc and Non-Tenure Track Fellow Lunch (2022–Present).
- Department Student Committee Member, Kennedy Institute, Oxford (2017–2019).

ACADEMIC SERVICES

- Reviewer for: Nature Genetics, Osteoarthritis & Cartilage, PNAS Nexus, Arthritis Research & Therapy, Scientific Reports, Interface Focus, Cartilage, European Journal of Pharmacology, Journal of Bone and Mineral Research, Osteoarthritis Cartilage & Open, JOR Spine. I review >5 articles per year.
- Member of OARSI and ORS.

TECHNIQUES AND SKILLS

- *In vivo* genetic mouse models including inducible genetic knockout, single base replacement mouse models (CRISPR).
- *In vivo* phenotype characterisation (insulin sensitivity, glucose tolerance tests, EchoMRI) and recovery surgeries (destabilisation of the medial meniscus, and double neurectomy). Physiological loading models.
- Primary cell culture: chondrocytes including embryonic micromasses, DRGs and bone marrow derived macrophages. Immortalized cell culture: HEK293T, HEPG2, K562, CHON-002, SH-SY5Y, Tc-28a2, ORPK chondrocytes.
- Plasmid and CRISPR design (Cas9 and dCas9-KRAB) to suppress expression of genes in primary chondrocytes.
- High throughput Massively Parallel Reporter Assay testing function of hundreds of thousands of variants simultaneously.
- Imaging: Confocal, brightfield (Axioscan), cryoSXT imaging, MicroCT.
- RNA and Bioinformatics: qPCR, RNA-Seq, spatial transcriptomics (10x Genomics), RNAscope, ATAC-Seq, RNA-Seq data analysis (command-line), basic R scripting.
- Immunological assays: FACS/flow cytometry, ELISA, western blot.
- Molecular biology techniques: Plasmid and CRISPR design (Cas9 and dCas9-KRAB) for expression manipulation *in vitro*, luciferase reporter assays.
- Histopathology and immunohistochemistry
- GraphPad Prism, FlowJo, SnapGene/Geneious Prime, R, ImageJ/Fiji, Electronic lab notebooks (Benchling), Slack.

ADDITIONAL ROLES AND INTERESTS

- Marathon runner – Helsinki 2016, Edinburgh 2018, Chicago 2023.
- Coxswain at International level; Head of the Charles winner (2022), Oxford & Cambridge Boat Race (2017).
- Organizer of Oxford University Boat Club Alumni races at Head of the Charles (2024-present).
- Assisted physiological testing for Oxford Boat Race squads (2016–2020).
- Novice Rowing Coach, St Edmund Hall, Oxford (2020–2021).
- Sports digital platform Co-founder: Wattson Blue (awarded £15,000 ITInnovations grant).
- Editor at Polygeia, produced health impact work for Royal Society of Public Health (2017–2018).
- Nautilus Award for services to sport, Green Templeton College (2018).
- Choral Exhibition Scholar at Brasenose College, Oxford (2017–2019).