

Callum Arnold

PHD CANDIDATE

Pennsylvania State University, State College

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Education

PhD Infectious Disease Modelling (Biology)

PENNSYLVANIA STATE UNIVERSITY

State College, USA

Aug 2020 - Jun 2025

- University Graduate Fellowship
- Homer F. Braddock Scholarship in Biology, Chemistry, and Physics (Eberly College of Science)

MSc Global Health Policy

LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE

London, UK

Sep 2017 - Jun 2020

- Distinction
- Board of Examiners' Academic Achievement Award
- Courses completed: GHM101 (Economics of Global Health) (3.67), GHM102 (Politics of Global Health) (4.00), GHM103 (Environmental Change and Global Health) (4.33), GHM104 (Issues in Global Health) (3.77), EPM101 (Fundamentals of Epidemiology) (5.0), EPM102 (Statistics for Epidemiology) (5.0), EPM302 (Modelling and the Dynamics of Infectious Diseases) (4.70), PHM218 (Applied Communicable Disease Control) (4.00)
- 4.37/5.0 cGPA (Distinction)
- Select courses (GPA/5.0): Statistics for Epidemiology (5.0), Modelling and the Dynamics of Infectious Diseases (4.70), Epidemiology and control of infectious diseases in developing countries (4.17)

MChem Chemistry

UNIVERSITY OF OXFORD

Oxford, UK

Sep 2011 - Jun 2015

Short Courses

Summer Institute in Statistics and Modeling in Infectious Diseases (SISMID)

UNIVERSITY OF WASHINGTON

Seattle, USA

Jul 2021

- 2 week course on the modelling of infectious disease through a wide variety of statistical techniques
- Awarded SISMID scholarship
- Courses completed: Simulation-Based Inference for Epidemiological Dynamics, Contact Network Epidemiology, MCMC II for Infectious Diseases

Machine Learning A-Z: Hands-On Python & R In Data Science

UDEMY

Online

Jul 2019 - Dec 2019

- Learnt regression and machine learning techniques in Python and R

Network Modelling for Epidemics

UNIVERSITY OF WASHINGTON

Seattle, USA

Aug 2018

- 5-day course on the application of stochastic agent-based network modelling techniques to complex epidemic models, building from deterministic and stochastic compartmental models

Mathematical Modelling of Communicable Diseases (CHL5425H)

UNIVERSITY OF TORONTO

Toronto, CAN

Jan 2018 - Apr 2018

- Audited graduate course on mathematical modelling of infectious diseases (course director: Prof D. Fisman)

Python for Epidemiology

EPI SKILLS

Online

Feb 2018

- Learnt to apply Python modules such as epipy, pandas, and seaborn for epidemiological purposes

Research Experience

Pennsylvania State University

PHD CANDIDATE

State College, USA

Aug 2020 - Jun 2025

- Data4Action: Characterized the heterogeneity of SARS-nCoV-2 seroprevalence among two geographically coincident populations, and identified risk factors for infection among students
- Data4Action: Performed Latent Class Analysis (LCA) on the SARS-nCoV-2 seroprevalence data, to identify the relationship between risk behavior and infection and vaccination rates among student population
- UrgEpi: Examined the role of a new laboratory on the speed of diagnosis and outbreak response decisions for measles in the ex-Katanga region of the Democratic Republic of Congo

Division of Infectious Diseases, The Hospital for Sick Children

Toronto

CLINICAL RESEARCH PROJECT COORDINATOR

Apr 2018 - Dec 2019

- Coordinated a multi-centre observational study into waning immunity in infants to measles, mumps and varicella
- Managed all data produced by the National Microbiology Laboratory and the Nova Scotia Health Authority laboratory for the waning immunity study
- Conducted data analysis on additional research studies within the Infectious Diseases division, and in collaboration with epidemiologists at Public Health Ontario
- Provided statistical expertise to HSC clinician's research

BOTNAR, OUH Trust

Oxford, UK

HONORARY CLINICAL RESEARCHER

Jun 2016 - May 2019

- Primary image analyst of a novel 4-D CT scanning technique for better hip osteoarthritis screening and management
- Contributing researcher in the large longitudinal, cross-sectional FAIM study funded by Arthritis Research UK that aims to determine whether adolescent activity levels affect hip morphology, and assists in early detection of deterioration

John Radcliffe Hospital, OUH Trust

Oxford, UK

HONORARY CLINICAL RESEARCHER

May 2016 - Apr 2017

- Conducted with a Thoracic Consultant a retrospective review of VATS Parathyroidectomies that was presented at the national cardiothoracic conference

University of Oxford

Oxford, UK

MCHEM PROJECT

Sep 2014 - Jun 2015

- Performed ab initio and DFT calculations, and semi-empirical computational methods, to ascertain the mechanism of an atropselective aromatic nucleophilic substitution in biaryl derivatives
- Utilised and wrote Python and Bash scripts to extract relevant data from files generated by the computational chemistry software Gaussian
- Potential Energy Surfaces were created that indicated that SN2 transition states are observed for thiophenolate addition to dichloro- and difluoropyrimidines
- Estimated values for rotational barriers correlated with literature values, indicating the barrier to thermal racemization was too high to explain the enantioselectivity
- Natural Bond Orbital analysis, and Monte-Carlo conformational searching, highlight a chiral pocket in ammonium thiolate-catalyst pair indicating computed pathways may explain the enantioselectivity observed in experiments
- Modelled potential energy surfaces to investigate potential reaction pathways and transition states
- Employed Natural Bond Orbital analysis and Monte-Carlo conformational searching to highlight a chiral pocket in ammonium thiolate-catalyst pair, validating computed pathways with empirical results

Teaching Experience

Greene's Tutorial Company

Oxford, UK

TUTOR

Sep 2015 - Jul 2017

- Tutored GCSE and A-Level students in mathematics and the sciences to assist them in achieving their academic goals for their CIE/Edexcel/AQA exams, and for Oxford University interviews and admission tests
- Designed and organised students' tutorial plans, and continually tested them to monitor their progress
- Summarised student performance after every tutorial in reports to the student and their Director of Study
- Invigilated internal and external exams, from GCSE through to University-level

d'Overbroeck's

Oxford, UK

MATHEMATICS TEACHER

Nov 2016 - Jul 2017

- Responsible for the teaching of the A-level maths syllabus, including introductory statistics and mechanics
- Compiled termly reports to evaluate performance and assist in appropriate target-setting
- Sole teacher, for one term, of a gifted year-8 student covering 1st and 2nd-year University-level maths and statistics
- Regularly tested students to assist in tracking progress
- Assisted in the teaching of KS3 maths
- Assisted in teaching A-level physics students, and helped prepare them for assessed practical exams

Kumon Oxford

Oxford, UK

TUTOR

Sep 2015 - Nov 2015

- Tutored secondary school students in Maths ranging from basic algebra to extensive further maths that broached first year University-level topics

Kingsbridge Community College

Kingsbridge, UK

TUTOR

Mar 2010 - Jul 2010

- Tutored GCSE and A-Level Maths students to assist them in achieving their target grades
- Collaborated with the teachers organizing the program to ensure my students were benefiting as much as they could from each lesson

Athletic Experience

Keble College, Oxford

Oxford, UK

ASSISTANT ROWING COACH

Sep 2015 - Jul 2017

- Assembled the entire men's timetable to create a balance between academic and training responsibilities, alongside the Head Coach
- Supported the Head Coach in preparing novice through senior crews on the water and on the ergometers
- Implemented changes to the program founded in current research to optimise athlete performance
- Fostered the ability to empathise and connect with athletes and coaches gaining their trust, resulting in a greater commitment to the changes I enacted, ultimately making these decisions more effective
- Organised athletes' data to ensure useful metrics are produced, allowing constructive analysis of performance via a KPI dashboard that summarised an athlete's physiological profile on one page
- Encouraged the athletes in non-training procedures that will benefit their performance, such as screen filters applications to improve their quality of sleep

Oxford University Boat Club

Oxford, UK

SHADOWING COACHES

Jun 2015 - Jul 2017

- Assisted in the recording of information during physiological testing days for both 2016 Summer Development squad, and the full 2016 Boat Race squad. The latter involved the analysis of blood lactate values during step-testing
- Conversated with Andy about technique, tailoring a program to optimise an individual's performance, and the balance of physiology and technique, exemplifying the need to carefully integrate all aspects of rowing

Oxford University Lightweight Rowing Club

Oxford, UK

ROWING COACH

Jun 2015 - Jul 2016

- Constructed and carried out a program for the OULRC summer development squad
- Created a summer training plan to help prepare the athletes for the upcoming season

Discovery Surf School

Bigbury, UK

SURF INSTRUCTOR

Dec 2010 - Sep 2015

- Lead and organised on-day logistics for work with young adults and children with learning difficulties
- Lead and supervised beginner groups of 90+ students and 10 instructors, ensuring quality in each group

Athletic Experience

PERSONAL

- Competed in the 2017 Half-Ironman World Championships after winning my age-group slot at the qualifying race
- Won 'Blades' during both Torpids and Summer Vllls Oxford rowing regattas, and the Henley Boat Races

Volunteer Experience

Tortoise Club (Oriol College Boat Club Alumni Society)

Oxford, UK

SECRETARY AND TREASURER

Feb 2016 - Nov 2018

- Council member responsible for the documentation and running of the 550-member alumni club, and principle sponsor, of Oriol College Boat Club
- Lead the structural changes to the club, including introducing a constitution, club protocol, organisation of AGMs, and reconnecting with the 400 disconnected eligible members
- Instrumental in the introduction of women to the club after 30 years of exclusion
- Introduced and lead the initiative to provide the Oriol College Boat Club with long-term financial stability through a Direct Debit scheme that was successful in reaching its first-year fundraising target of 20,000 GBP in annual donations, increasing affordability and accessibility to all students

Oriol College Boat Club

Oxford, UK

CAPTAIN OF BOATS

Jul 2014 - Jul 2015

- Ran the College club which had an annual turnover of 60,000 GBP
- Coordinated with senior members and the Head of the College to organise alumni events and oversee the club budget
- Headed the search and hiring of a new Head Coach, then designed and carried out training plans that were effective in ensuring all crews performed well on race day
- Engaged with alumni to create an appointed-board governance structure within the alumni society, which would become the platform for the fundraising initiative
- Carefully monitored the progression of the top two men's crews throughout the year via ergometer scores coupled with video analysis of on the water performance
- Periodically discussed with the coaches the abilities of the lower boat athletes to ensure all rowers could succeed come racing in February and May
- Organised and assisted in the running of learn-to-row sessions for the OxBridge Academic Programs in the summers of 2014 and 2015
- Ran talks and tours for external companies, including the Said Business School
- Organised the University-wide 2014 Oriol Regatta with members of the University's rowing Committee
- Through a hands-on approach of designing each crew's training program and routine conversations about their relative strengths and areas for improvement, each boat outperformed their competition during the racing season, including winning the Summer Vllls regatta, and becoming the first Oxford College to win the Henley Boat Races

Rux Burton Associates

TELEPHONE CAMPAIGNER

- Fundraised for Oriel College, contributing to a total of 278,848 GBP for College bursaries
- Developed skills in telephone marketing and quickly establishing familiarity with potential donors

Oxford, UK

Mar 2014 - Mar 2014

The Grassroots Project

PERSONAL FUNDRAISING

- Fundraised, by running 5 marathons in 5 days, for the DC-based charity that works to reduce HIV/AIDs rates in at-risk youth populations in Washington through non-traditional health educators (athletes) in schools

Washington DC, USA

Sep 2013 - Sep 2013

Royal National Lifeboat Institute

BEACH LIFEGUARD

- Trained in First Aid and administered care to those in need
- Assessed water conditions and advised members of the public in the safe practice of their activities
- Participated in beach patrols and on-water rescues to ensure the safety of all beach users
- Assisted in missing-person cases

Bantham, UK

Jul 2010 - Aug 2010

Skills & Software

R: ggplot2 & tidyverse, targets, Rmarkdown, bookdown, blogdown, deSolve

Python: pandas, Jupyter notebooks & kernels, seaborn, matplotlib, plotly, scikit-learn

Others: Git, STATA, Berkeley Madonna, REDCap, basic LaTeX, basic Bash shell, MS Office Suite, Gantt Charts

Publications

MASTER'S THESIS

1. Arnold, C. (2015). *Mechanism and Atropselectivity in Nucleophilic Aromatic Substitutions of Dichloropyrimidines* [MChem]. Oxford.

JOURNAL ARTICLES

1. Arnold, C. R. K., Srinivasan, S., Rodriguez, S., Rydzak, N., Herzog, C. M., Gontu, A., Bharti, N., Small, M., Rogers, C. J., Schade, M. M., Kuchipudi, S. V., Kapur, V., Read, A. F., & Ferrari, M. J. (2022). A longitudinal study of the impact of university student return to campus on the SARS-CoV-2 seroprevalence among the community members. *Scientific Reports*, 12(1), 8586. <https://doi.org/10.1038/s41598-022-12499-5>
2. Arnold, C., Srinivasan, S., Herzog, C. M., Gontu, A., Bharti, N., Small, M., Rogers, C. J., Schade, M. M., Kuchipudi, S. V., Kapur, V., Andrew, R., & Ferrari, M. J. (2021). SARS-CoV-2 Seroprevalence in a University Community: A Longitudinal Study of the Impact of Student Return to Campus on Infection Risk Among Community Members. *medRxiv*, 2021.02.17.21251942. <https://doi.org/10.1101/2021.02.17.21251942>
3. Fernquest, S., Palmer, A., Pereira, C., Arnold, C., Hirons, E., Broomfield, J., Newman, S., & Glyn-Jones, S. (2020). The Response of Hip Joint Cartilage to Exercise in Children: An MRI Study Using T2-Mapping. *CARTILAGE*, 1947603520931182. <https://doi.org/10.1177/1947603520931182>
4. Han, M. A., Storman, D., Al-Rammahy, H., Tang, S., Hao, Q., Leung, G., Kandi, M., Moradi, R., Bartoszko, J. J., Arnold, C., Rehman, N., & Guyatt, G. (2020). Impact of maternal reproductive factors on cancer risks of offspring: A systematic review and meta-analysis of cohort studies. *PLOS ONE*, 15(3), e0230721. <https://doi.org/10.1371/journal.pone.0230721>
5. Piché-Renaud, P.-P., Groves, H., Kitano, T., Arnold, C., Thomas, A., Streitenberger, L., Alexander, L., Morris, S. K., & Science, M. (2020). Healthcare workers' perception of a global outbreak of novel coronavirus (COVID-19) and personal protective equipment: Survey of a pediatric tertiary care hospital. *Infection Control & Hospital Epidemiology*, 1-25. <https://doi.org/10.1017/ice.2020.415>
6. Science, M., Savage, R., Severini, A., McLachlan, E., Hughes, S. L., Arnold, C., Richardson, S., Crowcroft, N., Deeks, S., Halperin, S., Brown, K., Hatchette, T., Gubbay, J., Mazzulli, T., & Bolotin, S. (2019). Measles Antibody Levels in Young Infants. *Pediatrics*, e20190630. <https://doi.org/10.1542/peds.2019-0630>
7. Craig, R., Kunkel, E., Crowcroft, N. S., Fitzpatrick, M. C., de Melker, H., Althouse, B. M., Merkel, T., Scarpino, S. V., Koelle, K., Friedman, L., Arnold, C., & Bolotin, S. (2019). Asymptomatic Infection and Transmission of Pertussis in Households: A Systematic Review. *Clinical Infectious Diseases*. <https://doi.org/10.1093/cid/ciz531>

8. Fernquest, S., Arnold, C., Palmer, A., Broomfield, J., Denton, J., Taylor, A., & Glyn-Jones, S. (2017). Osseous impingement occurs early in flexion in cam-type femoroacetabular impingement. *The Bone & Joint Journal*, 99-B, 41–48. <https://doi.org/10.1302/0301-620X.99B4.BJJ-2016-1274.R1>

POSTERS

1. Arnold, C., Srinivasan, S., Herzog, C. M., Gontu, A., Bharti, N., Small, M., Rogers, C. J., Schade, M. M., Kuchipudi, S. V., Kapur, V., Andrew, R., & Ferrari, M. J. (2021, June 14–17). *SARS-CoV-2 Seroprevalence in a University Community: A Longitudinal Study of the Impact of Student Return to Campus on Infection Risk Among Community Members*. EEID 2021, Montpellier, France. <https://www.eeidconference2021.org/posters-full/>
2. Khan, S., Science, M., Tsang, K., Arnold, C., Hawes, J., Lee, K.-S., El Helou, S., Sanchez, P., Mertz, D., Kaufman, D., & Team, G. T. (2019, October 3). *Provider Perspectives on Non-sterile Glove Use in the NICU*. Infectious Diseases Society of America IDWeek, Washington, D.C.
3. Science, M., Khan, S., Arnold, C., Bacchini, J., Lee, K.-S., Hawes, J., Sanchez, P., Kaufman, D., & Team, G. T. (2019, October 3). *Parent Perspectives on Infection Prevention and Control in the NICU*. Infectious Diseases Society of America IDWeek, Washington, D.C.
4. Timberlake, K., Al-Dubisi, F., Arnold, C., Roofi Badie, S., Friedman, J., & Science, M. (2019, May 30). *Acute Non-Severe Respiratory Syndromes; Benchmarking for Resource Stewardship*. International Pediatric Antimicrobial Stewardship Conference, St Louis, Missouri, USA.
5. Al-Dubisi, F., Timberlake, K., Arnold, C., Roofi Badie, S., Friedman, J., & Science, M. (2019, May 29). *Acute Non-Severe Respiratory Syndromes; Benchmarking for Resource Stewardship*. University of Toronto Department of Pediatrics and Faculty of Medicine Research Day, Toronto, Canada.
6. Leps, C., Arnold, C., Benipal, S., & Persuad, N. (2019, April 5). *A realist synthesis of food provision and children's health – policy implications and areas of focus*. University of Toronto Department of Family and Community Medicine (DFCM) Conference, Toronto, Canada.
7. Garcia-Ascaso, M. T., Timberlake, K., Arnold, C., Ostrow, O., & Science, M. (2019, March 9). *Appropriateness of broad spectrum antibiotics in a Pediatric Emergency Department*. Pediatric Infectious Diseases Society, Memphis, Tennessee.
8. Science, M., Timberlake, K., Arnold, C., Fung, J., Moninhas, S., & Read, S. (2018, May 5). *Impact of Mandatory Prior Authorization and Automatic Stop Orders on Prolonged Broad Spectrum Antimicrobial Therapy*. Pediatric Academic Societies Meeting, Toronto, Canada.
9. Arnold, C., Mihai, R., Pigott, D., Sadler, G., & Belcher, E. (2017, March 12). *Feasibility of Video-Assisted Thorascopic Surgery (VATS) Parathyroidectomy in Management of Intrathoracic Parathyroid Adenoma*. SCTS Annual Meeting and Cardiothoracic Forum, Belfast, Northern Ireland.

MANUSCRIPTS IN PREPARATION

1. Al-Dubisi, F., Timberlake, K., Arnold, C., Roofi Badie, S., Friedman, J., & Science, M. (n.d.). *Acute Non-Severe Respiratory Syndromes; Benchmarking for Resource Stewardship*.
2. Bolotin, S., Hughes, S. L., Savage, R., Severini, A., McLachlan, E., Richardson, S., Crowcroft, N. S., Deeks, S. L., Halperin, S. A., Hatchette, T. H., Arnold, C., Gubbay, J. B., Mazzulli, T., & Science, M. (n.d.). *Varicella Antibody Levels in Children Less than 1 Year: Assessment of Waning Immunity*.
3. Garcia-Ascaso, M. T., Timberlake, K., Arnold, C., Ostrow, O., & Science, M. (n.d.). *Appropriateness of broad spectrum antibiotics in a Pediatric Emergency Department*.
4. Kazmi, K., Arnold, C., Friedman, J., Vallipuram, J., Koyle, M., & Science, M. (n.d.). *Intravenous and Oral Antimicrobial Treatment Duration for Urinary Tract infections in Infants < 60 days: National Survey of Paediatricians, Paediatric Infectious Disease Physicians and Neonatologists*.
5. Khan, S., Science, M., Arnold, C., Hawes, J., Lee, K.-S., El Helou, S., Sanchez, P., Mertz, D., Kaufman, D., & Team, G. T. (n.d.). *Provider Perspectives on Non-sterile Glove Use in the NICU*.
6. Leps, C., Arnold, C., Benipal, S., & Persuad, N. (n.d.). *A realist synthesis of food provision and children's health*.
7. Science, M., Arnold, C., Clarke, M., Lewis, J., Tomlinson, C., & Richardson, S. (n.d.). *Clostridium difficile colonization in Infants in a Neonatal Intensive Care Unit*.

8. Science, M., Khan, S., Arnold, C., Bacchini, J., Lee, K.-S., Hawes, J., Sanchez, P., Kaufman, D., & Team, G. T. (n.d.). *Parent Perspectives on Infection Prevention and Control in the NICU*.

POSTERS IN PREPARATION