

Charles A. Coomer

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Educational Background:

University of Oxford, Magdalen College, Oxford, United Kingdom (2017-2021, expected)

- Doctor of Philosophy candidate via the NIH Oxford-Cambridge Scholars Program

University of Kentucky College of Medicine, Lexington, Kentucky (2015-2022, expected)

- MD/PhD student, M3
- Promoted each year within the first quartile
- Completed M1 with High Distinction and M2 with Distinction

University College London, London, United Kingdom (2014-2015)

- MSc Infection and Immunity
- Graduated with Distinction

Western Kentucky University, Bowling Green, KY, United States (2010-2014)

- Bachelor Degrees in Biology and Chemistry
 - Minor: Violin Performance
 - GPA: 4.0
 - Student of the Western Kentucky University Mahurin Honors College
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Career Goals:

M.D/Ph.D in virology; conduct research dealing with both the therapeutic and pathogenic effects of viruses, teach collegiate cellular/molecular courses, practice medicine.

Research Experience:

Wellcome Trust Centre Human Genetics and National Cancer Institute, August 2017-present

- Worked as a DPhil student under Dr. Sergi Padilla-Parra (Oxford) and Alex Compton (NCI).
- Characterized the influence of host cell metabolism on successful retroviral fusion, infection, and cell-intrinsic immunity using FRET-FLIM approaches.
- Determined how retroviral fusion and infection modulates host cell metabolism in cell lines and primary cells.
- Developed novel assays which multiplex viral fusion detection, host cell metabolism, and apoptosis.

University College London's Division of Infection and Immunity, August 2014-June 2015

- Worked as a MSc student under Dr. Katherine Sutherland.
- Phenotyped protease inhibitor (PI) susceptibility of patient-derived, *gag-protease*-containing pseudoviruses and identified unreported mutations in *gag* to investigate the role of full-length *gag* in determining PI susceptibility of HIV.
- Characterized the inter-clone variability in *gag*, each harbouring over 70 mutations when compared to HXB2.

National Cancer Institute's HIV Drug Resistance Program, June 2014- August 2014

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- Worked as a fellow under Dr. Mary Kearney and Frank Maldarelli.
- Compared two methods of sample preparation for Illumina sequencing to determine which gives the best, unbiased distribution of templates.
- Developed methods to decrease PCR while ensuring the sensitivity of detecting drug resistance in patients is $\geq 0.1\%$ of the viral population.

National Cancer Institute's HIV Drug Resistance Program, June 2013- August 2013

- Worked as a fellow under Dr. Mary Kearney and Frank Maldarelli.
- Continued to analyze the genetics of HIV and RT-SHIV populations in the cells of infected people and rhesus macaques to characterize the persistent HIV reservoir during treatment.
- Evaluated HIV populations using Illumina and PacBio next generation sequencing.

Dr. Rodney King's Lab, Western Kentucky University, August 2011 – present

- Contributed to the characterization and classification of several Mycobacterium phages via PCR analysis, suggesting an alternative to TV complete genome sequencing.
- Mentored other undergraduate student on Mycobacterium phage projects.
- Assisted in the ongoing development of a novel method to eradicate contaminating microbes in bioethanol reactors via bacteriophage targeting.

National Cancer Institute's HIV Drug Resistance Program, May 2012- July 2012

- Worked in Dr. Mary Kearney's Laboratory at the National Cancer Institute.
- Analyzed the genetics of HIV and RT-SHIV populations in the cells of infected people and animals.
- Characterized the dynamics of the HIV reservoir during treatment with antiretroviral therapy.
- Used nested-PCR, single genome sequencing, and phylogenetic analyses to evaluate HIV divergence in suppressed patients partaking in combination antiretroviral therapy.

HHMI Genome Discovery and Exploration Course, Western Kentucky University August 2010 – May 2011

- Isolated, characterized, retrieved DNA from the novel bacteriophage *Woof* from the environment and submitted for archiving.
- Collaborated with classmates to annotate the genomic sequences of two novel mycobacterium phages Gemini and BarrellRoll.

Presentations and Peer-Reviewed Publications:

Publications:

C. Coomer, et al (2018). Looking beyond the Second Dimension: Utilising Organoids and Live-Imaging Techniques to Directly Visualise HIV-1 Entry. *In preparation for Frontiers in Physics*.

M. Iliopoulou, R. Nolan, Y. Watanabe, C. Coomer, et al (2018). A dynamic three step mechanism drives the HIV-1 perfusion reaction. *Submitted to Nature*.

Pope, W.H., et al (2015). Whole genome comparison of a large collection of mycobacteriophages reveals a continuum of phage genetic diversity. *eLife*; 4: e06416

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M.F. Kearney, E.M. Anderson, C. Coomer, et al (2015). Well-Mixed Plasma and Tissue Viral Populations in RT-SHIV-Infected Macaques Implies a Lack of Viral Replication in the Tissues During Antiretroviral Therapy. *Retrovirology*; 12:93.

M.F. Kearney; L. Smith; C. Coomer; G.J. Besson; J. Spindler; E.M. Anderson; W. Shao; T. Tanzosh; C. Rehm; J.W. Mellors; J.M. Coffin; F. Maldarelli. No Evidence for Evolution of Plasma HIV-1 RNA or PBMC HIV-1 DNA During Long-Term Suppressive Antiretroviral Therapy. In preparation for PLoS Pathogens.

C. Coomer, K. Sutherland (2015). Genotypic and Phenotypic Analyses of Patient-Derived, Non-Subtype B Gag-Pro HIV Clones: Insights into Gag-Mediated Protease Inhibitor Resistance. *Infection and Immunity MSc Thesis Projects*.

C. Coomer, R. King, "Identification and Characterization of Microbial Contaminants and Associated Bacterial Viruses in Bioethanol Production Facilities to Suggest a Potential Alternative to Antibiotic Treatment" (2014). *Honors College Capstone Experience/Thesis Projects*. Paper 441.

Hatfull, G.F., et al (2012). Complete Genome Sequences of 138 Mycobacteriophages. *Journal of Virology*. 86: 2382-2388

Poster and Paper Presentations:

C. Coomer, K. Sutherland, R. Gupta, "Genotypic and Phenotypic Analyses of Patient-Derived, Non-Subtype B Gag-Pro HIV Clones—Insights into Gag-Mediated Protease Inhibitor Resistance" (2015) Oral Presentation at the University College London Infection and Immunity Research Symposium. London, England

C. Coomer, K. Sutherland, R. Gupta, "Evolution associated with ritonavir-boosted-protease-inhibitor-failure at the whole viral genome level," (2015) Oral Presentation at the US-UK Fulbright Forum. Stirling, Scotland

V.F. Boltz, J. Rausch, W. Shao, C. Coomer, J.W. Mellors, M. Kearney, J.M. Coffin, "Analysis of Resistance Haplotypes Using Primer IDs and Next Gen Sequencing of HIV RNA," (2015) Poster Presented at the Conference on Retroviruses and Opportunistic Infections. Boston, Massachusetts

C. Coomer, E.M. Anderson, C. Kline, L. Smith, D. Kordella, W. Shao, J. Spindler, J.M. Coffin, J.W. Mellors, Z. Ambrose, and M.F. Kearney, "Pol Versus Env Genetics in SHIV-Infected Macaques Highlights Importance of Phylogenetic Signal," (2014). Poster Presented at the Conference on Retroviruses and Opportunistic Infections in Boston, Massachusetts.

M.F. Kearney, L. Smith, J. Spindler, C. Coomer, G.L Besson, E.M. Anderson, W. Shao, J.M. Coffin, J.W. Mellors, F. Maldarelli, "Massive Expansion of HIV Infected Cells with Identical Proviruses in Patients On Suppressive ART," (2014). Poster Presented at the Conference on Retroviruses and Opportunistic Infections in Boston, Massachusetts.

C. Coomer, E.M. Anderson, C. Kline, L. Smith, D. Kordella, W. Shao, J. Spindler, J.M. Coffin, J.W. Mellors, M.F. Kearney and Z. Ambrose, "Virus Populations in Plasma and Tissues are Well-Mixed in RT-SHIV-Infected Macaques," (2013). Paper presented at the NCI Summer Student Poster Day 2013.

C. Coomer, E.M. Anderson, C. Kline, L. Smith, D. Kordella, W. Shao, J. Spindler, J.M. Coffin, J.W. Mellors, M.F. Kearney and Z. Ambrose, "Virus Populations in Plasma and Tissues are Well-Mixed in RT-SHIV-Infected Macaques," (2013). Paper presented at the NIH Summer Research Program Poster Day 2013.

Coomer, C.A., King, R.A. "Identification of Bacterial Contaminates and Evidence for Temperate Phages in Beerwell Samples From a Bioethanol Production Facility," (2013). Poster presented at the WKU Student Research Conference.

- Awarded "Best Undergraduate Poster in the Natural Sciences, Session 5"LP

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Coomer, C.A.; King, R.A. "Rapid Classification of Newly Discovered Mycobacteriophages using Polymerase Chain Reactions," (2012). Paper presented at the Annual American Society for Microbiology, KY-TN Branch.

Coomer, C.A.; King, R.A. "Classification of Bacteriophages using Polymerase Chain Reaction: An Alternative to Complete Genome Sequencing," (2012). Paper presented at the 98th Annual Meeting of the Kentucky Academy of Science.

- Awarded "3rd Best Undergraduate Paper Presentation in Cellular and Molecular Biology", KAS Annual Meeting, 2012.

Kearney M.F., Kline C., Anderson E.M., Kordella D., Smith L, Coomer C., Lifson J.D., Mellors J.W., Coffin J.C., and Ambrose Z. "Plasma Virus Populations in RT-SHIV-Infected Macaques Are Derived from Multiple Tissues," (2012). Paper presented at the 20th Conference on Retroviruses and Opportunistic Infections in Atlanta, Georgia.

Kearney, M.F, et al. "No Evidence for Evolution of Plasma HIV-1 RNA or PBMC HIV-1 DNA During Long-term Suppressive Antiretroviral Therapy," (2012). Poster presented at the International Workshop on HIV & Hepatitis Virus Drug Resistance and Curative Strategies Conference in Stiges, Spain

Coomer, C.A.; King, R.A. "Bacteriophage Classification Via PCR Analysis: An Alternative to Complete Genome Sequencing," (2012). Poster presented at the WKU Student Research Conference.

- Awarded "Best Undergraduate Poster in the Natural Sciences, Session 10".

Coomer, C.A., King, R.A., Rinehart, C.A. "A Novel Bacterial Virus Isolated from Middletown, Kentucky," (2011). Poster presented at the WKU Student Research Conference.

Honors, Scholarships, & Awards:

National Institutes of Health Oxford-Cambridge Scholars Program, 2017-present

- Awarded to future doctoral students and physician-scientists to pursue their PhD studies at either Oxford or Cambridge, partnering with a National Institutes of Health laboratory, valued at \$400,000.
- Awarded scholarship at the national level.

MD/PhD Scholarship at University of Kentucky School of Medicine, 2015-present

- Awarded to MD/PhD students at the University of Kentucky School of Medicine based on application and interview, valued at \$460,000

Dean's Research Prize Finalist of University College London, 2015

- Awarded to one postgraduate from each MSc course at the University and selected by the Masters Program's Management Committee

Ogden Foundation Scholar, 2014

- Awarded to one top graduating student from WKU, valued at \$1000
- Selection based on application and interview

Fulbright University College London Award, 2014

- Awarded to undergraduates to increase mutual understanding between the United States and the United Kingdom through educational exchange of people, knowledge, and skills, valued at \$60,000.
- Awarded scholarship at the national level.

National Institutes of Health Oxford-Cambridge Scholars Program, 2014

- Awarded to future doctoral students and physician-scientists to pursue their PhD studies at either Oxford or Cambridge, partnering with a National Institutes of Health laboratory, valued at \$400,000.
- Awarded scholarship at the national level.

Goldwater Scholar, 2012

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- Awarded to undergraduates majoring in science or mathematics and planning to pursue careers in research, valued at \$15,000 over two years for undergraduate expenses.
- Awarded scholarship at the national level.

Jarve Scholar, 2012

- Awarded to roughly 15 WKU Honors College students per year to support study abroad, research, and other scholarly endeavors, valued at \$1000.

Honors College Parents Advisory Council Scholarship, 2012

- Awarded to students that will be used to fund study abroad experiences or research and professional development efforts, valued at \$500.

Blanche and Austin Duckett Scholarship, 2011 and 2012

- Awarded to an outstanding string musician (by audition), valued at \$1,500.

President's List, 2010-2011, 2011-2012

- Awarded each semester to students with a 3.8 – 4.0 GPA for the previous semester.

Assistant Concertmaster of the Bowling Green Western Symphony Orchestra (Spring 2011)

- Awarded to one violinist every year by audition.

Baker Professorship Scholarship, 2010

- Awarded to outstanding an outstanding string musician (by audition), valued at \$1,500.

WKU Biology and Chemistry Departmental Awards, 2013

- Dr. Dan Skean Award for Outstanding Microbiology Student
- Outstanding Biotechnology Center Student
- Undergraduate Award in Organic Chemistry

American Chemical Society National Exams-

- Scored in the 99th percentile- First-Term General Chemistry Exam and the General Chemistry Exam.
- Scored in the 94th percentile- Organic Chemistry Exam

Governor's Scholar Scholarship, 2010-2014

- Awarded to participants in the Kentucky's Governor's Scholars Program, valued at \$32,000.

KEES Scholarship, 2010-2014

- Awarded to Kentucky high school students pursuing their undergraduate degrees inside the Commonwealth, valued at \$9,700.

Honors College at WKU, 2012-2014

- Selected students become part of the WKU Honors College; based off of their ACT/SAT scores, high school GPA, essay, and letters of recommendation.

Nellie Matthew Meyer Memorial Scholarship, 2010

- Awarded to a music oriented student studying pursuing a degree in the sciences in college, valued at \$300.

Governor's Scholar, 2009

- Awarded to a select number of students through a highly competitive application process similar to that of prestigious colleges and universities. The Governors Scholars Program is an academic liberal arts program with a full co-curricular and residential life experience for high school students.

Research Grants:

Biology Summer Undergraduate Research Experience Grant (BSURE)

- Provides \$1,000 to cover research expenses for faculty-supervised research projects

Faculty-Undergraduate Student Engagement Grant (FUSE), 2012

- Awarded to students to support undergraduate intellectual development by fostering active engagement in the areas of research, creative and scholarly activities, and/or artistic performances, valued at \$2600.

Biology Department Research Grant, 2012

- Awarded to students who will be participating in research internships over summer and winter terms, valued at \$250.

Honors Development Grant, 2012

- Awarded to WKU's Honors students pursuing an activity concerning intellectual development, used to offset costs to conduct research, maximum award of \$500.

Lifetime Experience Grant, 2012

- Awarded to students who show potential to produce exceptional research or benefit from a study abroad program, valued at \$1500.

Student Government Association Research Grant, Summer 2012

- Awarded \$250 to conduct research at the Nation Cancer Institute in Frederick, Maryland.

Educational Outreach:

Shelby County Public Schools "Rocket Power"

- Participated in a program that Shelby County Public Schools hosts. This program is a 5 week summer program entitled "Rocket Power." This program's purpose is to educate young students (ages ranging from 5-12) about the sciences and different types of cultures throughout the world, and allows these students to experience different applications of the sciences through weekly experiments and a variety of field trips.

Undergraduate students shadowing laboratory work

- Taught new research undergraduates throughout the semester aseptic technique and common laboratory protocols they will encounter in graduate school or in their future lab research.

Office of Scholar Development Student Ambassador

- Promoted research development, developed activities on campus to strengthen students' scholarship applications, and made students aware how WKU students achieve locally, nationally, and internationally.

Clinical and professional experience:

2012-2014 PASS Leader, The Learning Center at Western Kentucky Univeristy, 1906
College Heights Boulevard Bowling Green, Kentucky 42101
(270) 745-0111

2010-2014 Violinist, Bowling Green Western Symphony Orchestra, 341 Fine Arts Center
Western Kentucky University, Bowling Green, KY 42101

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2010-2011	Physician Job Shadowing, Shadowing Veronica Kavorkian, M.D., Family Physician, Family Care Physicians.
June 2011-August 2011	Camp Counselor & Breakfast/Lunch Staff, Shelby County Public Schools (Summer Feeding/Day Care), 1155 West Main Street Shelbyville, KY (502)-633-2375
June 2011-July 2011	Senior Reader, Kelly Services/Measured Progress, 4500 Commerce Crossings Drive, Louisville, KY (502) 966-2303

Skills:

Languages

Familiarity with:

- French (speaking, reading, writing).
- Latin (reading, writing)

Computer Skills

Proficiency in:

- Microsoft Word, Power Point, Excel, Publisher
- Web browsers: Internet Explorer, Firefox, Google Chrome

Familiarity with:

- Geneious
- GBrowse
- Apollo-Annotation
- NCBI-BLAST
- MEGA-5
- ImageJ

Laboratory Skills

Proficiency in:

- Gel electrophoresis and gel extraction
- Single Genome Sequencing (SGS)
- Polymerase Chain Reaction (PCR)
- Quantitative PCR
- Micropipetting
- RNA Extractions
- Sanger Sequencing
- DNA isolation
- Light microscopy
- Titrations
- Gram-Staining
- Cell culturing
- Brightfield, dark field, phase contrast, confocal microscopy

Familiarity with:

- Electron microscopy (TEM/SEM) and sample preparation
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References:

Dr. Sergi Padilla-Parra- spadilla@well.ox.ac.uk

Dr. Alex Compton- alex.compton@nih.gov

Dr. Mary Kearney- kearneym@mail.nih.gov

Dr. Frank Maldarelli- fmalli@mail.nih.gov

Dr. Rodney King- rodney.king@wku.edu

Dr. Audra Jennings- audra.jennings@wku.edu

Dr. Lester Pesterfield- lester.pestterfield@wku.edu

Dr. Dana Bradley- dana.bradley@wku.edu
