

[November 2007]

## CURRICULUM VITAE

DEREK A.T. CUMMINGS

### PERSONAL DATA

*Mailing Address:* Department of International Health  
615 N. Wolfe Street / E6132  
Baltimore, MD 21205-1901  
United States

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### EDUCATION AND TRAINING

PhD	2004	Johns Hopkins University, Whiting School of Engineering Geography and Environmental Engineering
MHS	2004	Johns Hopkins University, Bloomberg School of Public Health International Health
Certificate	2003	Santa Fe Institute, Complex Systems Summer School
MS	2001	Johns Hopkins University, Whiting School of Engineering Geography and Environmental Engineering
ScB	1996	Brown University Chemistry

### PROFESSIONAL EXPERIENCE

Assistant Professor	7/2007-present	Department of Epidemiology, Bloomberg School of Public Health Johns Hopkins University
Visiting Assistant Professor	2006 - 2007	Department of Epidemiology, University of Pittsburgh Graduate School of Public Health, University of Pittsburgh
Visiting Assistant Professor	2006 - 2007	Department of Biostatistics, Bloomberg School of Public Health, Johns Hopkins University

Research Associate 2004 - 2006  
Department of International Health, Bloomberg School of Public Health, Johns Hopkins University

Program Coordinator 2003 - present  
NIH Modeling Infectious Disease Agents Study (MIDAS) Center, University of Pittsburgh/Johns Hopkins University (pre-2006)

Research Assistant 1999-2004  
Department of Geography and Environmental Engineering, GWC Whiting School of Engineering, Johns Hopkins University

Case Worker 1998  
Coalition for the Homeless, Crisis Intervention Program, NYC

Research Assistant 1996-1998  
Division of Risk Assessment and Toxicology, Sciences International, Inc.

## **PROFESSIONAL ACTIVITIES**

### *Society Membership:*

*American Society of Tropical Medicine and Hygiene*

*American Academy for the Advancement of Science*

*Society for Epidemiological Research*

*Asia Pacific Society of Medical Virology*

*American Chemical Society*

*DIMACS Special Focus on Computational and Mathematical Epidemiology*

### *Participation on Advisory Panels*

U.S. Department of Health and Human Services, Secretary's Advisory Council on Public Health Preparedness, Smallpox Modeling Working Group

## **EDITORIAL ACTIVITIES**

### *Peer Review Activities*

Served as Associate Editor for:

PLoS Computational Biology

Served as referee for:

Nature

PLoS Biology

PLoS Medicine

Epidemiologic Reviews

American Journal of Epidemiology

Biostatistics

Emerging Infectious Diseases  
Mathematical and Computer Modeling  
Biosecurity and Bioterrorism  
Journal of Theoretical Biology  
American Journal of Tropical Medicine and Hygiene  
Journal of the Royal Society Interface  
Proceedings of the Royal Society B

## HONORS AND AWARDS

### *Honors and Awards*

Burroughs Wellcome	
Career Award at the Scientific Interface	2007
UTRA Fellow, Brown University	1996
Meikeljohn Fellow, Brown University	1994
Rotary Scholarship	1992
National Merit Scholar	1992

## PUBLICATIONS

### *Journal Articles*

Vora A, Burke DS, **Cummings DAT**. The impact of a physical geographic barrier on the dynamics of measles. *Epidemiology and Infection*. 2007. Jul. 30; 1-8 [Epub ahead of print]

Lessler J, **Cummings DAT**, Fishman S, Vora A, Burke DS. Transmissibility of Swine Flu at Fort Dix, 1976. *Journal of the Royal Society Interfaces*. 2007. 4(15): 755-762.

Billings L, Schwartz IB, Shaw LB, McCrary M, Burke DS, **Cummings DAT**. Instabilities in multiserotype disease models with antibody-dependent enhancement. 2007. *Journal of Theoretical Biology*. 246(1):18-27.

Longini, IM, Halloran ME, Nizam A, Yang Y, Xu S, Burke DS, **Cummings DAT**, Epstein JM. Containing a Large Bioterrorist Smallpox Attack: A Computer Simulation. 2007. *International Journal of Infectious Diseases*. 11(2)98-108.

Burke DS, Epstein JM, **Cummings DAT**, Parker JI, Cline KC, Singa RM, Chakravarty S. Individual-based computational modeling of smallpox epidemic control strategies. 2006. *Academic Emergency Medicine*. 13(11):1142-1149.

Ferguson NM, **Cummings DAT**, Fraser C, Cajka JC, Cooley PC, Burke DS. Strategies for mitigating an influenza pandemic. 2006. *Nature*. 442(7101)448-452.

**Cummings DAT**, Moss WJ, Long K, Muluh T, Wiysonge CS, Muluh TJ, Kollo B, Nomo E, Wolfe ND and Burke DS. Improved measles surveillance in Cameroon reveals

two major dynamic patterns of incidence. *International Journal of Infectious Diseases*. 2006. 10(2);148-155.

Schwartz IB, Shaw LB, **Cummings DAT**, Billings L, McCrary M, and Burke DS. Chaotic desynchronization of multistrain diseases. 2005. *Physical Review E*. 72, 066201.

**Cummings DAT**, Schwartz IB, Billings L, Shaw LB, Burke DS. Dynamic effects of antibody-dependent enhancement on the fitness of viruses. *Proceedings of the National Academy of Sciences*. 2005. 102(42):15259-64.

Ferguson NM, **Cummings DAT**, Cauchemez S, Fraser C, Riley S, Meeyai A, Iamsrithaworn S, Burke DS. Strategies for containing an emerging influenza pandemic in Southeast Asia. *Nature*. 2005. 437(7056):209-214.

Longini IM, Jr., Nizam A, Xu S, Ungchusak K, Hanshaoworakul W, **Cummings DAT**, Halloran ME. Containing pandemic influenza at the source. *Science*. 2005. 309; (5737):1083-7.

**Cummings DAT**, Irizarry RA, Huang NE, Endy TP, Nisalak A, Ungchusak K, Burke DS (2004) Travelling waves in the occurrence of dengue haemorrhagic fever in Thailand. *Nature* 427 (6972): 344-347.

Epstein JM, **Cummings DAT**, Chakravarthy S, Singa RM, Burke DS (2004) Toward a containment strategy for smallpox bioterror: An individual based computational approach. *Brookings Monographs*.

**Cummings DA**, McMaster J, Rieger AL, Rieger PH (1997) EPR spectroscopic and theoretical study chromium(I) carbonyl phosphine and phosphonite complexes. *Organometallics*. 16: 4362-4368.

*Articles and Editorials not peer reviewed*

Epstein, J.M., Parker J., **Cummings, D.A.T.**, Hammond, R. (2007) Coupled Contagion Dynamics of Fear and Disease: Mathematical and Computational Explorations. Brookings Institution Center on Social and Economic Dynamics, Working Paper 50.

Bhandari A, Schaefer A, **Cummings DAT**. (2007) Comment on “Simple models of influenza progression with a heterogeneous population” by Richard Larson. *Operations Research Forum*. 55:3.

Epstein JM, **Cummings DA**, Chakravarthy S, Singa RM, Burke DS (2002) Toward a containment strategy for smallpox bioterror: an individual-based computational approach. Brookings Institution Center on Social and Economic Dynamics, Working Paper 31.

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## CURRICULUM VITAE

DEREK A.T. CUMMINGS

### PART II

#### TEACHING

*Instructor* 2004-2005, 2005-2006  
*Department of International Health*  
*Bloomberg School of Public Health*  
*Johns Hopkins University*  
Infectious Disease Dynamics: Theoretical and Computational Approaches

*Guest Lecture* 2007  
*University of Pittsburgh Graduate School of Public Health*  
*Department of Epidemiology*  
Infectious Disease Epidemiology

*Guest Lecturer* 2006  
*United States Uniformed Services University*  
*Bethesda, MD*  
Infectious Disease Epidemiology

*Instructor* 2006  
*Field Epidemiology Training Program*  
*Thailand Ministry of Public Health*  
*Bangkok, Thailand*  
Infectious Disease Dynamics

*Guest Lecturer* 2005-2006, 2006-2007  
*Department of Epidemiology*  
*Bloomberg School of Public Health*  
*Johns Hopkins University*  
Infectious Disease Epidemiology

*Guest Lecturer* 2003-2004  
*Department of Earth and Planetary Sciences*  
*Zanvyl Krieger School of Arts and Sciences*  
*Johns Hopkins University*  
Climate Change and Global Health

*Tutorial Instructor* 2001  
*GEOMED 2001*

*Université Pierre et Marie Curie, Paris*  
Time-Series Analysis, Pre-conference Tutorial

*Teaching Assistant*  
Inorganic Chemistry, Brown University

1996

## **RESEARCH GRANT PARTICIPATION**

### **Active Research Support**

BURROUGHS WELLCOME

Derek Cummings (PI)

7/01/07-6/31/12

Career Award at the Scientific Interface

Natural and vaccine-induced immunity and spatial-temporal dynamics of epidemic dengue

Role: Principal Investigator

NIH-NIGMS

Don Burke (PI)

04/01/04 – 04/01/09

Computational models of infectious disease threats

Integrate the most advanced and powerful techniques of epidemiological data analysis with those of computer simulation to produce a unified computational epidemiology.

Role: Program Coordinator and Investigator

NIH-Fogarty International Center

Don Burke (PI)

09/14/05 – 03/31/10

Planning for Avian Influenza Outbreaks and Potential Pandemics

Develop capacity among epidemiologists at the Thai Ministry of Public Health to utilize new theoretical and computational tools in concert with traditional epidemiologic approaches to address issues surrounding avian influenza and potential influenza pandemics.

CDC

Don Burke (PI)

10/01/2006-9/31/2008

Pittsburgh Influenza Prevention Program

Study the transmission dynamics of influenza in Pittsburgh elementary schools and conduct trials of non-pharmaceutical interventions targeting influenza transmission.

### **Recently Completed Research Support**

NOAA

Don Burke (PI)

07/01/04 - 06/31/07

Harmonic decomposition and compartmental models in the analysis of epidemiologic and climatic data: An analysis of dengue in Southeast Asia

Apply methods developed under previous funding cycle to data from Southeast Asia on dengue hemorrhagic fever.

Role: Investigator

Rockefeller Foundation 04/01/06 - 10/01/06

Ruth Faden and Ruth Karron (co-PI's)

Ethical issues in influenza pandemic preparedness and response

Identify current and potential responses to the threat of pandemic influenza that profoundly affect the world's disadvantaged and to undertake concrete action to prevent or at least to mitigate those responses that are the most unjust. Simulate the impact of pandemic mitigation responses in resource poor settings.

Alfred P. Sloan Foundation

Joshua Epstein (PI)

08/01/02 - 07/31/04

Computational Modeling of Vaccination Strategies against Smallpox

Develop computer simulations of the introduction and spread of a bio-terrorist agent such as smallpox in human populations, and evaluate possible response strategies.

Role: Investigator

FIC / NIH / DHHS

Don Burke (PI)

12/01/02 – 05/31/04

Research to guide allocation of public resources in the event of an intentional Introduction of smallpox

Develop, evaluate, and utilize computational models of smallpox introduction into the USA, and of public health strategies to contain smallpox epidemics.

Role: Investigator

NOAA Don Burke (PI)

08/01/02 – 07/31/03

Harmonic Deconstruction in the Analysis of Epidemiologic and Climatic Data.

Develop and evaluate new computational methods for correlating dengue epidemiologic data and weather data, such as wavelet transforms and Empiric Mode Decomposition.

Role: Investigator

## **ACADEMIC SERVICE**

Steering Committee

Department of International Health

The Johns Hopkins Bloomberg School of Public Health

Elected to steering committee by faculty peers in Nov., 2005

Department of International Health Student Group, Johns Hopkins Bloomberg School of Public Health

Co-led working group to develop a web-based resource to facilitate interaction between on-site and off-site students.

## **PRESENTATIONS**

*Scientific Meetings*

Strategies for looking for pattern in spatio-temporal data. *DIMACS Workshop on Spatio-temporal and network models of disease spread*. 2007. Edinburgh, Scotland.

Modeling new vaccines for measles. *DIMACS Workshop on Facing the Challenge of Infectious Diseases in Africa: The Role of Mathematical Modeling*. 2006. Johannesburg, South Africa.

Spatial coherence and association of temperature, rainfall and the incidence of dengue hemorrhagic fever in Thailand. *DIMACS Workshop on Facing the Challenge of Infectious Diseases in Africa: The Role of Mathematical Modeling*. 2006. Johannesburg, South Africa.

Time-series decomposition methods for infectious disease epidemiology. *North American Congress of Epidemiology*. 2006. Seattle, WA.

Dynamic effects of antibody-dependent enhancement on the fitness of dengue viruses. *National Institutes of Allergy and Infectious Disease Modeling Immunity for Biodefense Annual Meeting*. 2006. Boston, MA.

Simulation of the Population Effects of Dengue Vaccination. *First Asian Regional Dengue Research Network Meeting*. 2004. Bangkok, Thailand.

Spatial coherence and association of temperature, rainfall and the incidence of dengue hemorrhagic fever in Thailand. *53<sup>rd</sup> Annual Meeting of the American Society of Tropical Medicine and Hygiene*. 2004. Miami, FL.

Traveling waves in dengue hemorrhagic fever incidence in Thailand. *6<sup>th</sup> Asia Pacific Congress of Medical Virology*. 2003. Kuala Lumpur.

Periodic traveling waves in dengue hemorrhagic fever incidence in Thailand. *52<sup>nd</sup> Annual Meeting of the American Society of Tropical Medicine and Hygiene*. 2003. Philadelphia, PA.

Spatial Synchrony and Phase Coherency of Seasonal Variation in Temperature, Rainfall and Dengue in Thailand. *GEOMED*. 2003. Baltimore, MD.

Computational methods for predicting heats of formation of halogenated methyl and ethyl radicals. *National Meeting of the American Chemical Society*. San Francisco. 2000.

### ***Invited Seminars***

Shifts in the epidemiology of dengue in Thailand. *University of Pittsburgh. Department of Epidemiology*. 2007. Pittsburgh, PA.



Dengue viruses: periodic traveling waves and serotype cycling in Thailand. *Five decades of discovery: A symposium to honor the contributions of Monto Ho*. 2006. Pittsburgh, PA.

Containing Pandemic Influenza. *Infectious Disease Informatics. Surveillance, Modeling and Response*. National Center for Supercomputing Applications. Urbana-Champaign, IL. 2006.

Dengue dynamics in Thailand over the last 20 years. *Thailand Centers for Disease Control*. Bangkok, Thailand.

Containing Pandemic Influenza. *Pandemic Influenza Preparedness Training*. Johns Hopkins Center for Preparedness. 2006. Cumberland, MD.

Simulating Pandemic Influenza. *Global Pandemic Initiative*. IBM Industry Solutions Laboratory. 2005. Hawthorne, NY.

Strategies for containing an emerging influenza pandemic in Southeast Asia. *Modeling Working Group*. Johns Hopkins Department of Biostatistics. 2005. Baltimore, MD.

Dynamic effects of antibody dependent enhancement on the fitness of dengue viruses. *Center for Infectious Disease Dynamics*. Penn State University. 2005. State College, PA.

Can pandemic influenza be contained with antivirals? *Consultation on epidemiologic applications of emerging infectious disease modeling*. Global Emerging Infections Surveillance and Response System. U.S. Department of Defense. 2005. Linthicum, MD.

Spatial synchrony of the waves of incidence of influenza in 1918. *Influenza Modeling Workshop*. Global Health Security Action Group. G8. 2005. London, UK.

Dynamic effects of antibody dependent enhancement on the fitness of dengue viruses. *Fogarty International Center*. US National Institutes of Health 2005. Washington, DC.

Processes impacting the incidence of dengue hemorrhagic fever on multiple temporal and spatial scales. *53<sup>rd</sup> Annual Meeting of the American Society of Tropical Medicine and Hygiene*. 2004. Miami, FL.

Periodic Traveling Waves in Dengue Hemorrhagic Fever Incidence in Thailand. *Virginia Bioinformatics Institute*. 2004. Blacksburg, VA.

Spatial patterns of dengue hemorrhagic fever in Thailand. *Department of Geography, University of Maryland*. 2004. College Park, MD.

Modeling outbreaks for public health response. *Emerging Respiratory Infections Conference*. 2004. Delaware Health and Social Services. Dover, DE.

Recurring spatial temporal traveling waves in dengue hemorrhagic fever incidence in Thailand, *Capitol Area Dengue Research Meeting, 2004, Silver Spring, MD.*