

# Genomics & Bioinformatics

## Gen711/811

<http://gen711.readthedocs.org>

# ANNOUNCEMENTS

- Email: [Matthew.MacManes@unh.edu](mailto:Matthew.MacManes@unh.edu)
- Office hours:
  - Tuesday/Friday 8-10am in 189 Rudman, or by appt.
  - Schedule at <http://genomebio.org/office-hours/>

# ANNOUNCEMENTS

- Lecture: (you've figured this out)
- Lab: Friday 310-500pm Hewitt 301
- Blackboard: Grades and other unimportant things
- Website: <http://gen711.readthedocs.org>

# GOALS OF THE CLASS

- Cloud Computing
- UNIX
- Don't be afraid of the command line
- Assemble genomes and transcriptomes
- Map billions of sequence reads
- Annotate genomes
- Learn some biology
- Have fun!

# **SYLLABUS**

- <http://gen711.readthedocs.org/>





# **Intro to Bioinformatics**

**Lecture 1  
Aug 31, 2015**

# **GENOMICS**

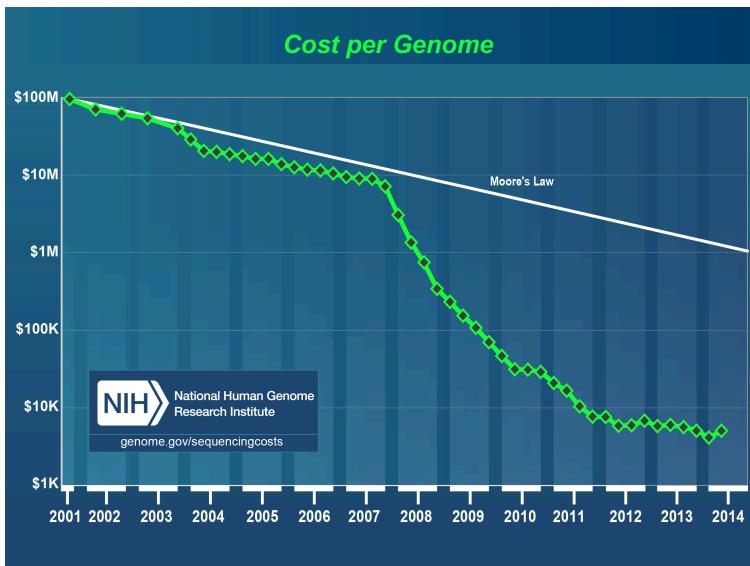
- What is genomics?

# **GENOMICS**

- What is bioinformatics?

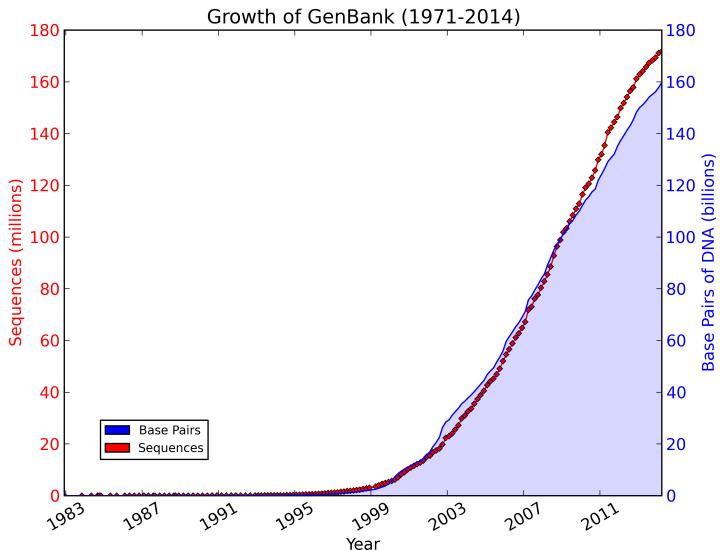
# BIOINFORMATICS

- Why now??



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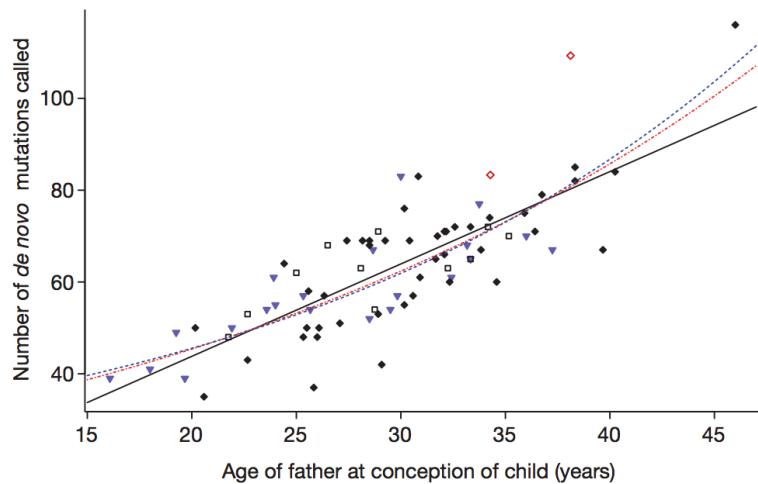
# BIOINFORMATICS

- Why now??



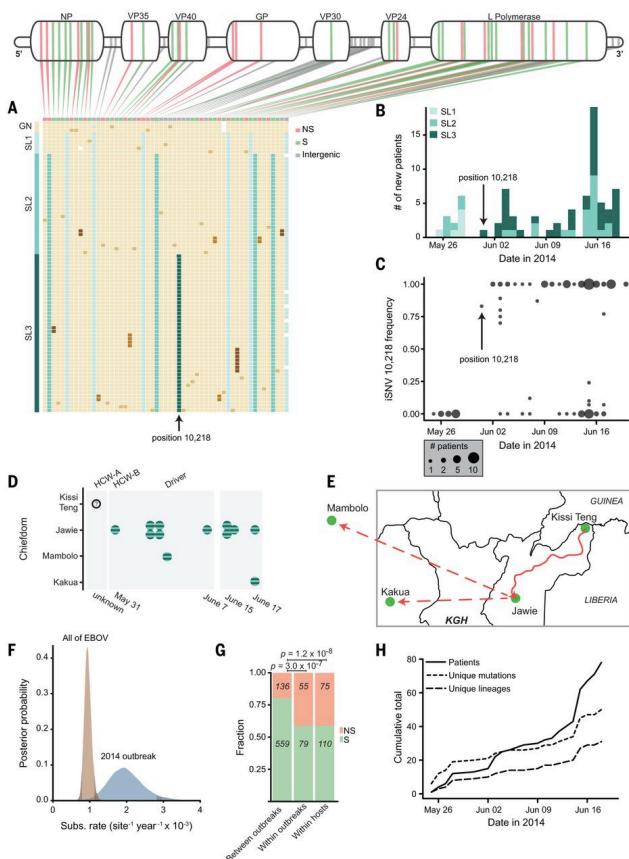
# Rate of *de novo* mutations and the importance of father's age to disease risk

Augustine Kong<sup>1</sup>, Michael L. Frigge<sup>1</sup>, Gisli Masson<sup>1</sup>, Soren Besenbacher<sup>1,2</sup>, Patrick Sulem<sup>1</sup>, Gisli Magnusson<sup>1</sup>, Sigurjon A. Gudjonsson<sup>1</sup>, Asgeir Sigurdsson<sup>1</sup>, Aslaug Jonasdottir<sup>1</sup>, Adalbjorg Jonasdottir<sup>1</sup>, Wendy S. W. Wong<sup>3</sup>, Gunnar Sigurdsson<sup>1</sup>, G. Bragi Walters<sup>1</sup>, Stacy Steinberg<sup>1</sup>, Hannes Helgason<sup>1</sup>, Gudmar Thorleifsson<sup>1</sup>, Daniel F. Gudbjartsson<sup>1</sup>, Agnar Helgason<sup>1,4</sup>, Olafur Th. Magnusson<sup>1</sup>, Unnur Thorsteinsdottir<sup>1,5</sup> & Kari Stefansson<sup>1,5</sup>



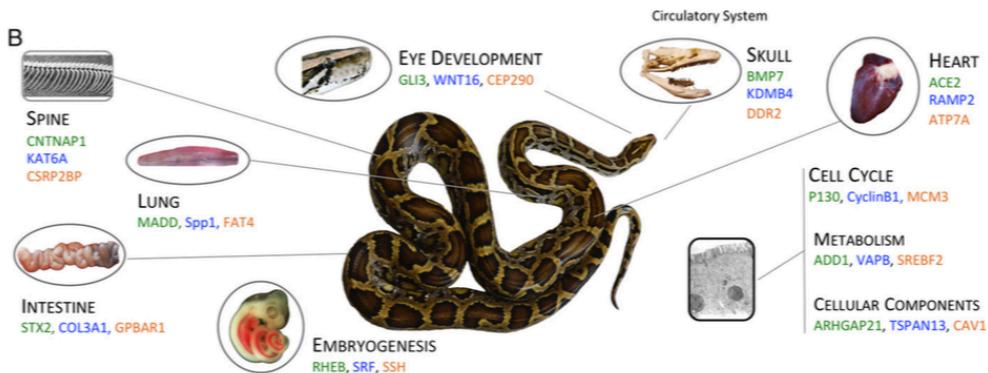
# Genomic surveillance elucidates Ebola virus origin and transmission during the 2014 outbreak

Stephen K. Gire,<sup>1,2\*</sup> Augustine Goba,<sup>3\*†</sup> Kristian G. Andersen,<sup>1,2\*†</sup> Rachel S. G. Sealton,<sup>2,4\*</sup> Daniel J. Park,<sup>2\*</sup> Lansana Kanneh,<sup>3</sup> Simbirie Jalloh,<sup>3</sup> Mambu Momoh,<sup>3,5</sup> Mohamed Fullah,<sup>3,5‡</sup> Gytis Dudas,<sup>6</sup> Shirlee Wohl,<sup>1,2,7</sup> Lina M. Moses,<sup>8</sup> Nathan L. Yozwiak,<sup>1,2</sup> Sarah Winnicki,<sup>1,2</sup> Christian B. Matranga,<sup>2</sup> Christine M. Malboeuf,<sup>2</sup> James Qu,<sup>2</sup> Adrienne D. Gladden,<sup>2</sup> Stephen F. Schaffner,<sup>1,2</sup> Xiao Yang,<sup>2</sup> Pan-Pan Jiang,<sup>1,2</sup> Mahan Nekouei,<sup>1,2</sup> Andres Colubri,<sup>1</sup> Moinya Ruth Coomber,<sup>3</sup> Mbalu Fomnie,<sup>3,‡</sup> Alex Moigboi,<sup>3,‡</sup> Michael Gbakie,<sup>3</sup> Fatima K. Kamara,<sup>3</sup> Veronica Tucker,<sup>3</sup> Edwin Konuwa,<sup>3</sup> Sidiki Saffa,<sup>3,‡</sup> Josephine Sellu,<sup>3</sup> Abdul Azziz Jalloh,<sup>3</sup> Alice Kovoma,<sup>3,‡</sup> James Koninga,<sup>3</sup> Ibrahim Mustapha,<sup>3</sup> Kandeh Kargbo,<sup>3</sup> Momoh Foday,<sup>3</sup> Mohamed Yillah,<sup>3</sup> Franklyn Kanneh,<sup>3</sup> Willie Robert,<sup>3</sup> James L. B. Massally,<sup>3</sup> Sinéad B. Chapman,<sup>2</sup> James Bochicchio,<sup>2</sup> Cheryl Murphy,<sup>2</sup> Chad Nusbaum,<sup>2</sup> Sarah Young,<sup>2</sup> Bruce W. Birren,<sup>2</sup> Donald S. Grant,<sup>3</sup> John S. Scheiffelin,<sup>8</sup> Eric S. Lander,<sup>2,7,9</sup> Christian Happi,<sup>10</sup> Sahr M. Gevao,<sup>11</sup> Andreas Gnirke,<sup>2§</sup> Andrew Rambaut,<sup>6,12,13§</sup> Robert F. Garry,<sup>8§</sup> S. Humarr Khan,<sup>3,‡§</sup> Pardis C. Sabeti<sup>1,2,†§</sup>



# The Burmese python genome reveals the molecular basis for extreme adaptation in snakes

Todd A. Castoe<sup>a,b</sup>, A. P. Jason de Koning<sup>a,c</sup>, Kathryn T. Hall<sup>a</sup>, Daren C. Card<sup>b</sup>, Drew R. Schield<sup>b</sup>, Matthew K. Fujita<sup>b</sup>, Robert P. Ruggiero<sup>a</sup>, Jack F. Degner<sup>d</sup>, Juan M. Daza<sup>e</sup>, Wanjun Gu<sup>f</sup>, Jacobo Reyes-Velasco<sup>b</sup>, Kyle J. Shaney<sup>b</sup>, Jill M. Castoe<sup>a,b</sup>, Samuel E. Fox<sup>g</sup>, Alex W. Poole<sup>a</sup>, Daniel Polanco<sup>a</sup>, Jason Dobry<sup>h</sup>, Michael W. Vandewege<sup>i</sup>, Qing Li<sup>j</sup>, Ryan K. Schott<sup>k</sup>, Aurélie Kapusta<sup>j</sup>, Patrick Minx<sup>l</sup>, Cédric Feschotte<sup>j</sup>, Peter Uetz<sup>m</sup>, David A. Ray<sup>i,n</sup>, Federico G. Hoffmann<sup>i,n</sup>, Robert Bogden<sup>h</sup>, Eric N. Smith<sup>b</sup>, Belinda S. W. Chang<sup>k</sup>, Freek J. Vonk<sup>o,p,q</sup>, Nicholas R. Casewell<sup>q,r</sup>, Christiaan V. Henkel<sup>p,s</sup>, Michael K. Richardson<sup>p</sup>, Stephen P. Mackessy<sup>t</sup>, Anne M. Bronikowski<sup>u</sup>, Mark Yandell<sup>j</sup>, Wesley C. Warren<sup>l</sup>, Stephen M. Secor<sup>v</sup>, and David D. Pollock<sup>a,1</sup>



- Discover other stuff, too
  - Genes
  - Expression levels
  - Repetitive regions
  - Community composition
  - Methylation
  - ...