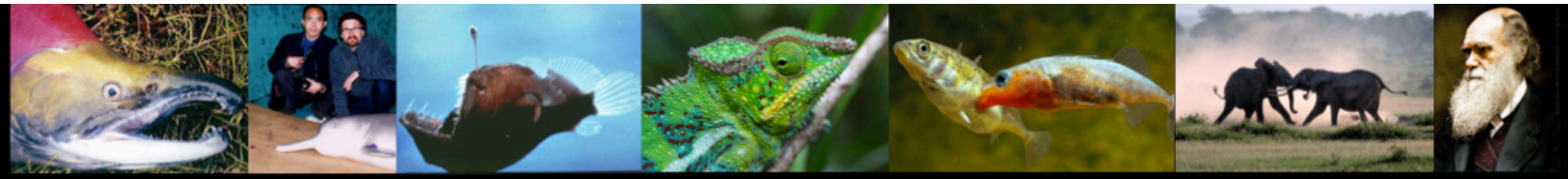

JOIN AN EXPEDITION IN GENOME DISCOVERY !!!

- How many genomes have been sequenced & what do they look like?
- What do genomes tell us about human health, ecology & evolution?
- How much genotype goes into a phenotype?
- MyGenome.com : who legally owns your DNA sequence?
- How can you improve *your* research in the era of genomics?

BIOL502 / EVSS695 Vertebrate Genome Biology Tu & Th 1215-130pm SSMB 140

BIOL502L / EVSS695L Vertebrate Genome Biology Lab Th 530-730pm SSMB 241

BIOL650 Conservation Genetics & Genomics Fri 1130am-1230pm SSMB 221

EMAIL PROFESSOR ANDY SHEDLOCK FOR MORE INFORMATION:
SHEDLOCKAM@COFC.EDU

BIOL 502 VERTEBRATE GENOME BIOLOGY LECTURE

SPRING 2012

INSTRUCTOR: SHEDLOCK

TIME: 12:15-1:30 PM TUESDAYS & THURSDAYS

LOCATION: ROOM 138-140 School of Science and Mathematics Building (SSMB)
(formerly called NSCB; a.k.a. "New Science Center")

PROVISIONAL COURSE OUTLINE & SYLLABUS:

PART I.

Week 1 – Jan 10 & 12
- The emergence of the era of genomics
- Building genome assemblies
- High throughput genome analysis platforms

Week 2 – Jan 17 & 19
- Anatomy and origins of genome architecture
- The construction of genome theory
- Neutralist versus selectionist arguments
- Major components of genomes
- Coding vs. non-coding compartments

Week 3 – Jan 24 & 26
- The Transcriptome
- Protein coding genes
- Single copy DNA vs. multigene families
- Functionality and Clustering
- The frontier of gene regulatory networks
- Translational genome biology

Week 4 – Jan 31 & Feb 2
- Mobile DNA and genomic repeats
- The genomic molecular "fossil" record
- Class 1 RNA retrotransposons
- Class 2 DNA transposable elements
- Tandem repeats, satellites and "junk DNA"
- MicroRNAs: trash or treasure?

Week 5 – Feb 7 & 9
- Genome evolutionary dynamics
- Repeats in shaping genome structure
- Repeats in driving genomic diversification

Repeats in controlling gene expression
Repeats as genetic markers

PART II.

Week 6 – Feb 14 & 16
Comparative Vertebrate Biology and Phylogenetics
Reconstructing ancestral states
Testing hypotheses with genome scale information
Paleogenomics and the importance of fossils

Week 7 – Feb 21 & 23
Genome assemblies in the vertebrate tree of life
Living in water
Jawless fishes
Lamprey and hagfish genomes
Cartilaginous fishes
The chimera assembly
Bony fishes
Teleost assemblies and genomic diversity
The coelacanth and lungfish genomes

Week 8 – Feb 28 & Mar 1
Feb 28: Paul Anderson (Comp Sci) Guest Lecture on Computational Approaches

March 1: EXAM 1 (300 POINTS) COVERING MATERIAL WEEKS 1-7

Week 9 – Mar 4-11

SPRING BREAK

Week 10 & 11 – March 13, 15, 20, 22

Alex Feltus (Clemson U) Guest Lecture on Ecogenomics

Living on land
Amphibian genomes
The Xenopus assembly
Salamander genomes
Amniote origins and reptilian genomic diversity
The Anolis assembly
The painted and softshell turtle assemblies
The alligator assembly
The python assembly and garter snake genome
The tuatara genome

Week 12 – March 27 & 29

Endothermy and taking flight

Dinosaur genomes
The chicken and turkey assemblies
The zebrafinch assembly and cryptic neoavian genomic diversity
The emu genome

Week 13 – April 3 & 5

Mammalian adaptation and diversification

The platypus assembly
The opossum assembly
The diversity of Eutherian assemblies

Week 14 – April 10 & 12

April 10: TERM PAPER ASSIGNMENT DUE

Chris Botka (Harvard U) Guest Lecture on Medical Genomics

Primate comparative genomics

Placing the human genome in perspective
Human population genomics and public health
Personalized genomics and individual health
Forensics and the law
Who sees the data and why?

Week 15 – April 17 & 19

April 17: EXAM 2 (300 POINTS) COVERING MATERIAL FROM WEEK 10 ON
April 19: End of class business; Future challenges and opportunities

Grading based on 1000 points:

Midterm Exams (600)
Term Paper Assignment (300)
Participation (100)

Overview of Term Paper Assignment (Due Tuesday April 10 in class)

Write a review paper selecting a vertebrate taxon of interest to you, selected from the species-level to any higher-level natural grouping. Format your paper as 5 minimum to 8 maximum pages, double spaced, 1-inch margins text and single spaced bibliography, using 12-point Times New Roman font throughout. Your paper must include the following basic elements:

- An introduction including why the genomics of this group is important (such as evolutionarily or medically or ecologically or economically, etc.).

• A review of the current state of the genetic and genomic knowledge surrounding this taxon using correct reference citations from printed or electronic sources of the peer-reviewed scientific literature.

• What important questions remain about the taxon and what data would you need to generate to answer these questions.

• A hypothesis and the nature of results that would either confirm or reject that hypothesis. State explicitly what results would support the hypothesis and what results would force you to reject your hypothesis.

• A summary of your argument and concluding statement.

• A proper, accurate and consistently formatted bibliography in the style of the scientific journal *Genome Research*.

Online References:

Original articles for published genome assemblies available via the Entrez-NCBI searchable database for Genome Project Resources: http://www.ncbi.nlm.nih.gov/genomes/leuks.cgi

Texts Placed on Reserve at Addlestone and Marine Resources Libraries:

Brown, T. A. 2006. *Genomes 3*. Garland Science, New York, NY.

Caetano-Anollés, G. (Ed.) 2010. *Evolutionary Genomics and Systems Biology*. Wiley-Blackwell, Hoboken, NJ.

Dittmar, L. and D. Liberlies (Eds.) 2010. *Evolution After Gene Duplication*. Wiley-Blackwell, Hoboken, NJ.

Murphy, W. (Ed.) 2007. *Phylogenomics*. Methods in Molecular Biology Series, Humana Press, Totowa, NJ.

Lynch, M. 2007. *The Origins of Genome Architecture*. Sinauer Associates, Inc., Sunderland, MA.

Pough, F.H., Janis C.M., and J.B. Heiser. 2008. *Vertebrate Life*, 8th ed., Prentice Hall, NJ.

Van Straalen, N. M. and D. Roelofs. 2012. Ecological Genomics, 2nd ed., Oxford University Press, New York, NY.

BIOL 502L LABORATORY IN VERTEBRATE GENOME BIOLOGY

SPRING 2012

INSTRUCTOR: SHEDLOCK
(Computer labs to be co-taught w/ P. ANDERSON, CofC Dept. of Computer Science)

TIME: 5:30-7:30 PM THURSDAYS

LOCATION: ROOM 239 School of Science and Mathematics Building (SSMB)
(formerly called NSCB; a.k.a. "New Science Center")

PROVISIONAL COURSE OUTLINE & SYLLABUS:

Weeks 1-3
Module 1: Individual Project Formation
- Identify testable hypotheses
- Develop rationale and justification for proposed research
- Select taxonomic scope
- Design genomic sampling
- Submit outline and justification for grading **(Due January 26: 100 points)**

Weeks 4-8
Module 2: Project Implementation
- Compile data from online or proprietary resources
- Select and test relevant computational tools
- Construct primary data set
- Analyze primary data set

Weeks 9-11
Module 3: Project Synthesis
- Prioritization of pilot results
- Interpretation of statistical significance and trends
- Graphical summary of most relevant comparisons
- Interpretation and discussion of evidence
- Synthesis of arguments for proposed funding
- Submit proposal draft for grading **(Due Thursday 29 March; 200 points)**

Weeks 12-14
Module 4: Written and Oral Communication
- Selection of final bibliographic resources
- Written construction of graded pilot proposal
- Preparation of oral presentation of research
- Oral presentation at student-run symposium **(Thursday April 19; 200 points)**
- Submit full written proposal **(Due by 5 p.m. Monday April 23; 400 points)**

Grading based on 1000 points:

Outline and justification (100)
Proposal draft (200)
Full Proposal with pilot results and bibliography (400)
Oral Presentation (200)
Participation (100)