HG803: Advanced Topics in Genetics -- Syllabus Winter 2016

Wednesdays, 3pm-5pm
Location: Room 5920 BUHL
Course Director: Jeff Innis (innis@umich.edu)

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<tr>
<th>Week 1 (Jan. 6, 2016): Therapy of Genetic Disease I</th>
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<td><strong>Topic:</strong> Correction of Genetic Disease by Modification of Endogenous Gene Expression</td>
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<th>Week 2 (Jan. 13): Therapy of Genetic Disease II</th>
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<td><strong>Topic:</strong> Success with Small Molecule Approaches in Seemingly Intractable Genetic Diseases</td>
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<th>Week 3 (Jan. 20): Therapy of Genetic Disease III</th>
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<td><strong>Topic:</strong> i) targeting dominant disorders with RNAi - cardiomyopathy ii) use of a suppressor screen to identify therapeutic targets – Rett syndrome iii) suppression of somatic expansion</td>
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### Week 4 (Jan. 27): Therapy of Genetic Disease IV

**Topics:** i) alteration of splicing ii) post-translational processing iii) reversal of mutant protein effects


### Week 5 (Feb. 3): Somatic Mosaicism in Human Genetic Disease

**Topics:** i) Proteus syndrome  ii) Megalencephaly syndromes iii) CLOVES syndrome


### Week 6 (Feb. 10): Genome Engineering with CRISPR/Cas9

**Topics:** i) off target effects ii) genome scale transcriptional manipulation iii) genome editing


### Week 7 (Feb. 17): Human Pluripotent Stem Cell Models for Neurologic Diseases

**Topics:** i) Neural differentiation of iPS and ES cells– ii) contribution of noncoding variants in schizophrenia iii) iPS models of coding variants in DISC1


**Week 8 (Feb. 24): Cryptic and Complex Genome Rearrangements and Heterogeneity in Autism and Neuropsychiatric Diseases**

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**Topics:**
- i) exploring the genetic basis of neuropsychiatric and autism disorders


**Week 9 (Mar. 9): New Technologies to Measure and Predict Variant Effects**

--- Kitzman

**Topic:**
- i) relative pathogenicity
- ii) insight from macromolecular interaction perturbations
- iii) single molecule interaction profiling


**Week 10 (Mar. 16): Genome Structural Variation, Genomics and Recurrence Risk**

--- Kidd

**Topic:**
- i) inversions
- ii) evolutionary toggling
- iii) risk for disease determined by structural haplotypes


**Week 11 (Mar. 23): Modeling Epigenetic Regulation Through X-Chromosome Inactivation**

--- Kalantry

**Topic:**
- i) role of Jpx and RNF12
- ii) genetic requirements for X inactivation


- Week 12 (Mar. 30): Sex Chromosomes -- Mueller
  Topics:  i) dosage sensitive regulation ii) is the whole Y chromosome required? iii) hearing loss and the Y chromosome


- Week 13 (Apr. 6): Complexity of Histone Modifications and State of the Art Methods of Characterization -- Iwase
  Topic: i) asymmetrically modified nucleosomes ii) detection of histone modifications iii) recombinant antibodies to histone post-translational modifications Finding functional human gene enhancer variants using model systems; making sense of GWAS hits; roles of chromatin modification and transcription factor binding sites in regulation


- Week 14 (Apr. 13): Computational and Functional Identification of Transcriptional Regulatory Elements Important for Human Development and Disease -- Antonellis
  Topics: i) creation of functional neurons from iPS cells ii) genetic etiologies of brain malformations iii) genome editing in stem cells


HG803 requirement:
Please complete the course evaluation for each module at the end of the course. Your input is essential for improving class organization and content! Please email Jeff Innis (innis@umich.edu) if you have any questions regarding the class.