

PHG/BIOST 302: Forensic Genetics}

Introduces the field of forensic genetics through discussion of genetic and statistical issues emerging since the introduction of DNA profiling. Students develop the skills to interpret the evidence of matching genetic profiles, to perform calculations relevant for parentage determination and the identification of remains, and to consider the implications of familial searching of DNA databases. Offered: W.

Class Description

In this course, offered by the Institute for Public Health Genetics and the Department of Biostatistics, we will be learning and discussing how advances in genetic profiling have affected forensic science. Although DNA profiling has had an enormous impact on forensic science over the past 25 years, by determining whether a person either matches or does not match biological evidence associated with a crime, the use of genetic information in parentage testing goes back much further. Those activities, along with the identification of remains and settling of immigration disputes, rest on the principles of genetics and statistics. There is parallel activity in wildlife forensics and plant variety protection. As genomic technology develops, the possibility of implicating or excluding a person, or their relatives, with a crime has increased. This increases the need for care in interpreting results and it raises issues of privacy. The course will develop students' ability to perform calculations for matching genetic profiles, or for profiles from sets of putative relatives. We will pay attention to the wording of forensic genetic reports in order to avoid common fallacies. We will augment the course with readings and discussions of noteworthy cases.

Student Learning Goals

Define and interpret genetic profiles from blood groups, Short Tandem Repeat markers and Single Nucleotide Polymorphisms.

Calculate likelihood ratios for matching genetic profiles, with allowances for population structure and relatedness.

Calculate paternity indexes.

Identify risks and benefits of using genetic profiles for human identification.

Detect instances of the "prosecutor's fallacy" in trial transcripts and court rulings.

Critically analyze media presentations that present forensic genetic science and its applications.

Recommended Reading

Goodwin, Linacre, and Hadi (2010) *An Introduction to Forensic Genetics*, 2nd Edition, Wiley [Paperback]

Butler, J.M. (2005) *Forensic DNA Typing*, 2nd Edition, Elsevier.

Syllabus

The genetic nature of forensic profiles: blood groups, STRs, SNPs.

The elements of probability theory. The birthday problem.

Presenting scientific evidence. Likelihood ratios. Common fallacies.

Profile matching and partial matching within and between populations.

Lineage markers: Y-STR and mtDNA profiles.

Parentage calculations.

Relatedness. Remains identification.

Cold hits. Familial searching.

Wildlife forensics.

Ethical issues.