

Justice Studies Department
San Jose State University
Spring 2007
Class hours MW 1330-1445
Laboratory hours : M 1500-1630
Room: MH 520

Instructor: Dr. Steven Lee
Office Hrs: W 1445-1645
set by appointment via email
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JS 196e Forensic Molecular Biology

Course Description:

This course covers history, scientific concepts, methods, practices, instrumentation, interpretation, statistics and court issues of forensic DNA analysis via lectures, hands-on activities/laboratories, and videos. Collection, documentation and preservation of biological evidence, bioethics, QA, validation, admissibility and training will also be covered.

Course Text and materials:

Required Texts:

Forensic DNA Typing: Biology and Technology Behind STR Markers John Butler PhD. **2005**. ISBN: 0-12-147952-8, 688pp. Academic Press

Forensic DNA Analysis. Rudin, N. and K. Inman. 2nd Edition. **2001**. ISBN: 0849302331 Publisher: CRC Press; 2nd edition (December 21, 2001) 312 pp.

Forensic Biology Laboratory Protocols. Steven Lee. Crime laboratory protocols (publicly available). Protocols will be handed out and utilized for laboratory and hands-on exercises.

Required reading and Internet materials:

Journal articles and other readings will be accessible at the SJSU library, on reserve or will be accessible on line. Citations and URLs for on line materials will be provided in assignments and on the greensheet. These will include:

Molecular Biology Resource Page: <http://www.horizonpress.com/gateway/molbiol.html>

Protocol Page: <http://www.horizonpress.com/gateway/protocols-jump-station.html>

Excellent On-Line Course at Rhodes College in Molecular Biology

<http://www.rhodes.edu/biology/glindquaster/molbiol/aboutcourse.html>

<http://www.rhodes.edu/biology/glindquaster/molbiol/lectureschedule.html>

Several pages within the course will be assigned as additional reading

Harvard DNA project: www.dnapolicy.net

President's DNA Initiative: www.dna.gov

M.A. Jobling, and P. Gill. 2004. Encoded Evidence: DNA in Forensic Analysis. Nature Reviews. 5:739-751. 2004.

Kaye, DH and ME. Smith, 2003, Wisc Law Rev - 3:414-459

http://www.dnapolicy.net/depository/dhk_pubs_dna_identification_databases_2003_wisconsin_law_review.pdf

NIST STRBase: <http://www.cstl.nist.gov/div831/strbase/index.htm>

NCJRS publications - <http://www.ncjrs.org/forensic/publications.html>

DOJ links: http://www.ojp.usdoj.gov/nij/sciencetech/dna_pub.htm :

Human Genome Project Links-

http://www.ornl.gov/sci/techresources/Human_Genome/elsi/forensics.shtml: and others

http://www.forensic.to/links/pages/Forensic_Sciences/Field_of_expertise/DNA/ :

<http://www.mass.gov/cpcs/links/>, and

Genetic Witness: Forensic Uses of DNA Testing, Office of Technology Assessment;

<http://www.wws.princeton.edu/~ota/disk2/1990/9021/9021.PDF>

Supplementary Texts (Optional)- Course material may include citations from the following:

Review Readings from:

Molecular Biology of the Gene, 5th Ed., Watson, et al., Pearson/Benjamin Cummings, 2004.

Self-paced Review Material

- DNA as the Genetic Material C2
- Nature of Chemical Bonds- C3, 4
- Protein Structure C 5
- Structure of DNA and RNA C 6

(See Rhodes college page for review of topics on line)

The Evaluation of Forensic DNA Evidence Committee on DNA Forensic Science: An Update, National Research Council 272 pages, 6 x 9, 1996, ISBN 0-309-05395-1 National Academies Press- Available on-line for free- <http://books.nap.edu/catalog/5141.html>

Criminalistics: An Introduction to Forensic Science (College Version), 9/E, Copyright 2007, ISBN-0132216558, RE. Saferstein, Ph.D, Prentice Hall, 672pp.

<http://vig.prenhall.com/catalog/academic/product/0,1144,0132216558,00.html>

Techniques of Crime Scene Investigation, Seventh Edition. 2004 Barry Fisher. ISBN084931691X, 544 pages. CRC Press

Course Format:

The course will include **lectures by the instructor and guest lectures** including scientists from crime laboratories, **hands-on laboratories** and activities, **discussions, videos, and small-group hands-on activities**. If possible, on-line chats and a visit to a crime lab will be scheduled (TBA).

Course requirements:

Exams-350 points: Three exams will be given in this course. Exams will be cumulative and will include all material covered up to the date of the exam. Exams may include multiple choice, matching, true/false, short answer, diagrams, drawings and sketches, short essay and/or long essay. The final will be comprehensive. Exam 1 and exam 2 are both worth 100 points. The final is worth 150points

Exam 1: 03/05/07 Exam 2: 04/09/07 Final: 05/21/07 1215-1430

See: <http://info.sjsu.edu/web-dbgen/narr/soc-spring/rec-592.html>

For all final exam schedules

Quizzes and Small Group Activities-100 points

Quizzes on assigned readings, small group activities and other assigned materials will be given during the semester. These will generally be multiple choice, matching, true/false and short answer but may also include essay questions.

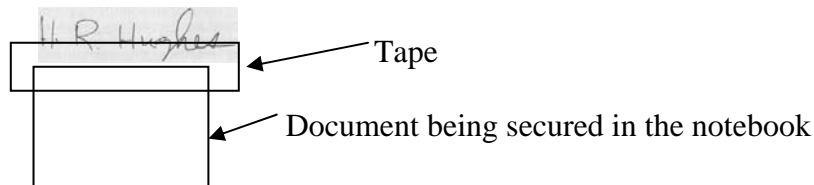
Hands-on Laboratory Assignments/Reports - 40 points

Laboratories will be held throughout the semester. These will include: Measurements and Error, Proper collection methods, Microscopy/Presumptive tests, DNA Extractions, Quantification of DNA, multiplex PCR amplification of STRs (autosomal and Y), PAGE vs CE, computer STR data analysis, Mt DNA amplification and sequence analysis, and moot court testimony. Written reports for each of the activities will be required (see general guidelines for reports below). During the semester, at least 1 report from

each team will be collected and reviewed. At the end of the semester all laboratory reports entered in notebooks will be collected. Participation will also be considered in the grades.

Guidelines for Laboratory Reports: All reports must contain the following sections: Abstract, Introduction, Materials and Methods, Results, Discussion with Conclusions, References, and Appendices with raw data. In general, documentation of all the activities should be complete enough so that an independent scientist could repeat all of the steps and understand the critical reasoning and analytical interpretation of the data and conclusions of your reports.

All **pages must be numbered, initialed and dated**. All materials must be firmly secured in the notebooks using a tape seal that has been initialed and dated over the seal and onto the paper (see the example).



Report Grading: Reports will be graded using both administrative and technical criteria. Details of format and grading of the reports will be provided at the first laboratory.

Grading in general includes the following considerations

- ***Administrative Criteria- Approximately 1 point each per crime scene report***
 - Is the notebook bound (not spiral and no pages removed/loose) and are all crime scenes included?
 - Is the chain of custody completed for any evidence transfers and documented appropriately? Are proper citations and acknowledgements documented for other individual's work (e.g. citations/references/teammates whole names)? Is the evidence, properly sealed and stored where indicated?
 - Is the documentation complete? Do the reports include notes, sketches and photographs? Are all pages numbered, dated and initialed? Is all data properly and securely inserted into the notebooks?
 - Where assigned, do the reports address the questions provided?
 - Are the reports organized with all sections? Is the writing clear and legible?
- ***Technical and Scientific Criteria- Approximately 1 point each per lab report***
 - Are data tabulated/summarized and analyzed accurately?
 - Does the data support the statements in the reports?
 - Are the statements within the report and between team members consistent? If not, are discrepancies explained?
 - Is the technical detail provided sufficient for court and would the CSI be able to reconstruct the "crime scene" years from now, based on the documentation?
 - Are additional external references/citations utilized (those not provided in the class)?

Participation point grading- 10 points

For in class and laboratory participation, you will be able to earn 10 points. You will be graded on your participation. For "outstanding" participation, you will be awarded 9-10 points. These will be awarded to students who participate fully each week including being on time, completing all assigned work, actively participating in group activities, providing

several comments and questions during the activity/laboratory and on occasion, bringing to light additional information and references relevant to the topic.

For “good” participation, you will be awarded 6-8 points. This level will be achieved by those that are on time most of the time, completing nearly all assigned work, participating some in group activities and providing some comments and questions during the activities. “Fair” participation (some assigned work completed, a few comments or questions made, or students who participate considerably but arrive more than 15 minutes late or leave more than 15 minutes early or those missing 2-3 laboratory sessions) will be awarded 3-5 points. Minimal participation (very little completed work, almost no comments, consistently late arrival or early to leave) will be awarded 1-2 points. Students who are completely silent or are absent more than 4 times from laboratories will receive no participation points.

Grading

Quizzes/Activities	100 points
Exam 1	100 points
Exam 2	100 points
Laboratory notebooks	40 points
Participation	10 points
Final exam	150 points
Total required	500 points

Extra Credit A total of 10 points may be granted for additional extra credit small group assignments and other assignments during the semester. Each assignment will be worth 1-2 points each. These extra credit points may be used to augment your final point total.

Grading Policies

Make-up exams will not generally be permitted. However, under extraordinary circumstances, with proper documentation and approval by the instructor, a 15 page single-spaced term paper of an instructor assigned topic, may substitute for 1 exam.

	From	To
A+	483.5	500
A	467	483.4
A-	450	466.9
B+	433.5	449.9
B	417	433.4
B-	400	416.9

C+	383.5	399.9
C	367	383.4
C-	350	366.9
D+	333.5	349.9
D+	317	333.4
D-	300	316.9
F	<300	

Instructor

Professor Lee holds an MS from NYU and PhD from University of California, Berkeley in Molecular Biology. Lee holds several concurrent positions including a consulting position as Director of R&D at MiraiBio Inc. a small biotech company in Alameda, CA, Visiting Scholar at UC Berkeley, and holds adjunct professor appointments in Biological Sciences at San Francisco State University and Chemistry at Florida International University. He was formerly the Director of R&D at CA Dept of Justice DNA Laboratory from 1994-2000 where he served as an expert witness in DNA and conducted DNA training courses. He is a full member of the American Association for the Advancement of Science, American Academy of Forensic Sciences, the California Association of Criminalists, and is an American Society of Crime Laboratory Directors Laboratory Accreditation Board certified inspector. He also served on the FBI Technical Working Group on DNA Analysis Methods group from 1994-2000. He has taught courses in molecular biology at SFSU (1996-1998), Forensic genetics at UC Davis (1997), and most recently forensic DNA Typing of STRs at FIU (2003).

Academic Integrity

Academic integrity statement (from the Office of Student Conduct and Ethical Development):

“Your own commitment to learning, as evidenced by your enrollment at San José State University, and the University’s Academic Integrity Policy requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the Office of Student Conduct and Ethical Development. The policy on academic integrity can be found at http://sa.sjsu.edu/student_conduct.”

Additional information on Academic Integrity

Academic integrity is essential to the mission of San José State University. As such, students are expected to perform their own work (except when collaboration is expressly permitted by the course instructor) without the use of any outside resources. Students are not permitted to use old tests, quizzes when preparing for exams, nor may they consult with students who have already taken the exam. When practiced, academic integrity ensures that all students are fairly graded. Violations to the Academic Integrity Policy undermine the educational process and will not be tolerated. It also demonstrates a lack of respect for oneself, fellow students and the course instructor and can ruin the university’s reputation and the value of the degrees it offers. We all share the obligation to maintain an environment which practices academic integrity. ***Violators of the Academic Integrity Policy will be subject to failing this course and being reported to the Office of Judicial Affairs for disciplinary action which could result in suspension or expulsion from San José State University.*** The policy on academic integrity can be found at: http://sa.sjsu.edu/judicial_affairs/students/academic_integrity.html.

CHEATING:

At SJSU, cheating is the act of obtaining or attempting to obtain credit for academic work through the use of any dishonest, deceptive, or fraudulent means. Cheating at SJSU includes but is not limited to: Copying in part or in whole, from another’s test or other evaluation instrument; Submitting work previously graded in another course unless this has been approved by the course instructor or by departmental policy. Submitting work simultaneously presented in two courses, unless this has been approved by both course instructors or by departmental policy. Altering or interfering with grading or grading instructions; Sitting for an examination by a surrogate, or as a surrogate; any other act committed by a student in the course of his or her academic work which defrauds or misrepresents, including aiding or abetting in any of the actions defined above.

PLAGIARISM:

At SJSU plagiarism is the act of representing the work of another as one’s own (without giving appropriate credit) regardless of how that work was obtained, and submitting it to fulfill academic requirements. See Office of Student Conduct and Ethical Development at http://sa.sjsu.edu/student_conduct.

Plagiarism at SJSU includes but is not limited to: The act of incorporating the ideas, words, sentences, paragraphs, or parts thereof, or the specific substances of another’s work, without giving appropriate credit, and representing the product as one’s own work; and representing another’s artistic/scholarly works such as musical compositions, computer programs, photographs, painting, drawing, sculptures, or similar works as one’s own. All students are required to take the on-line tutorial and quiz on plagiarism: Go to: <http://tutorials.sjlibrary.org/plagiarism/index.htm> Take the quiz and print out your results You must complete this tutorial and print out your report at the end to hand in to the instructor.

Campus policy in compliance with the Americans with Disabilities Act:

“If you need course adaptations or accommodations because of a disability, or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 requires that students with disabilities requesting accommodations must register with DRC to establish a record of their disability.”

Tentative Course Schedule:

<u>Dates</u>	<u>Topics</u>	<u>Butler/*Inman</u>
Week 1:	Overview of Forensic DNA typing and History of Forensic DNA C1/ C3&C5	
24 Jan 07	Handouts-Syllabus- Reading material Introductions: Your background, my background Course Description, requirements, grading etc. Set up small student groups <u>Assignment 1- Required reading:</u> Brettell, TA, Butler, JM, and R. Saferstein. Forensic Science. Anal. Chem 3839-3860. Spencer, C. 2004. Genetic Testimony: Introduction and Questions About DNA Profiling Methods. Lee, SB. 2006. Forensic DNA Typing. McGraw-Hill Yearbook of Science and Technology. McGraw-Hill In press. To be distributed. Visit the President's DNA Initiative Web site: http://www.dna.gov	Safety/report guide
	<i>Laboratory: Read Safety and laboratory format and grading handout</i>	
	<i>Optional reading:</i> <ol style="list-style-type: none">The Human Genome Project and Beyond (http://www.ornl.gov/sci/techresources/Human_Genome/publicat/primer2001/index.shtml,G.M. Church 2006. Genomes for All. Scientific American. 294: 47-54.DNA Glossaries: http://forensicdnaconsultant.com/Glossary.htm-PBS links on DNA: http://www.pbs.org/saf/1202/features/genelinks.htmhttp://www.dnalc.org/Weedn, VW- Unrealized potential of DNA testing - http://www.ncjrs.org/pdffiles/170596.pdfIntroduction to DNA http://www.deakin.edu.au/forensic/Chemical%20Detective/DNA_Type.htm	
Week 2:	Basics of Biological Physical Evidence	Butler C3/In C1-C2
01/29	Introduction to Physical Evidence Common Types of Physical Evidence. - The Significance of Physical Evidence. Locard's Exchange Principle- Class vs Individual Characteristics	
	<i>Laboratory: Measurement and Errors: Measurements Impact angle calculations</i>	
01/31	Biological Physical Evidence Different types of biological physical evidence	
	<u>Assignments- Required Reading:</u> Visit www.dna.gov - http://www.dna.gov/basics/evidence_collection Read all sub pages (all blue sub links in each of the sections): Crime Scene Integrity, Chain of Custody, Contamination of Evidence, Evidence Transportation and Storage, Sources and Locations of DNA Evidence	
Week 3	Identification of biological evidence: Intro to Detection and Screening methods	
02/05	Biochemistry of biological evidence: blood, saliva, semen Introduction to screening methods	**Jones to be handed out.

Laboratory: Evidence screening Presumptive testing of blood, saliva and semen

1. Visual and Microscopic examination
2. Enhancement reagents and imaging to screen for biological fluids
3. Sampling/Evaluation of Biological Evidence

Assignments: Required Reading

References- www.fbi.gov/programs/lab/fsc/backissu/july1999/ponce.htm

Cox, M. 1991. A Study of the Sensitivity and Specificity of Four Presumptive Tests for Blood. *Journal of Forensic Science* 36(5) 1503-1511

02/07 **Biochemistry of biological evidence continued** **Butler C2 / Inman C4**
New methods for detection of biological evidence
Introduction to fluorescence

Week 4 **Collection and preservation of Biological Evidence** **Butler C3/InmanC2**

02/12 **Review –types of biological evidence**
Collection methods for different types of evidence
Comparison of forensic biological evidence versus clinical samples.

Laboratory: Collection and preservation of biological evidence

Proper methods of collection. Special collection guidelines for Biological Evidence.
Laboratory comparison of collection methods and kits. Chain of custody and storage.

Required reading: go to <http://www.dna.gov/training/>

Take both training courses on What every law enforcement officer should know about DNA evidence- Selected pages will be assigned.

02/14 ***Laboratory: Collection and preservation of biological evidence continued***
Proper methods of collection. Special collection guidelines for Biological Evidence.
Laboratory comparison of collection methods and kits. Chain of custody and storage.

Other collection devices

Swab drying chambers/CEPs/FTA paper

Temperature and tube comparisons for DNA storage and new collection substrates

Assignment: Required Reading: Collection and Preservation of Physical Evidence-
Chain of Custody or ***The Real CSI***

Special collection guidelines for Biological Evidence

Spear, T. <http://www.cacnews.org/wordfiles/DNA%20SampleHandling.doc>

Spencer, C. 2004. Genetic Testimony. Questions About the Use of Forensic DNA Profiling. What Sort of Crime Evidence Is Suitable for DNA Analysis? What Are the Uses of Forensic DNA Profiling? What Are the Advantages of DNA Evidence Over Other Types of Biological Forensic Evidence? How Reliable is DNA Profile Technology? What Are the Main Problems with Forensic DNA Profiling?

Additional Optional Readings

Kobilinsky, L. 1992. Recovery and Stability of DNA in Samples of Forensic Science Significance. Forensic Sci. Rev. 4. 67. Gialamas, D and Stockwell, D. 1995. Forensic Biology Sample Collection and Handling Techniques. A Look at Methods Utilized by California Crime Labs CAC News Summer 1995.

Week 5	Biochemistry of DNA and Human Genetics: DNA Structure, Function and Replication, Cell Biology, Chromosomes, Genes and Forensic DNA markers DNA Biology- The Scientific Basis for DNA typing	ButlerC2/InmanC4
02/19	Introduction to DNA and Basic Human Genetics Scientific Basis for DNA typing - <u>Why DNA?</u> Intro to Deoxyribonucleic Acid: Central Dogma- DNA extraction Genetic Code , DNA Structure, Function and Replication Cell Biology, Chromosomes, Genes and DNA markers <i>Laboratory: DNA extractions: Phenol chloroform vs. Chelex extractions- Differential extraction of male vs. female DNA from sexual assault evidence.</i>	
02/21	Basic Human Genetics- <u>A tribute to Mom and Dad</u> Inheritance of DNA – Mendelian Genetics DNA variation and DNA Methods Web links for DNA biology http://www.geneed.com/demo/index.html - Go to Methods in Molecular biology- Go to the fundamentals- section 6- DNA/RNA structure http://www.blc.arizona.edu/Molecular_Graphics/DNA_Structure/DNA_Tutorial.HTML Video on forensic DNA (Lee will be at the American Academy of Forensic Sciences meeting)	Butler C 19
Week 6:	Methods used in Forensic DNA : DNA extractions and quantification BC3/ IC5&C6	
02/26	DNA extractions- Types and amount of samples required for DNA typing DNA Extraction and Quantification or <u>How do they get DNA?</u> Overview of Typing- Methods used to isolate DNA and Quantify DNA <u>How much DNA do they need?</u> DNA from a Cougar- <i>Whos' DNA is it? Human or Non-human?</i> Quantification of DNA : Non nucleic acid-based quantification methods Macroscopic and Microscopic examination Chemical and immunological methods Total genomic methods- DNA based Both intact and degraded UV Spectrophotometry Pico-green homogeneous microtitre plate assays Intact vs. Degraded DNA Agarose yield gel electrophoresis Human and higher primate specific methods – DNA based Both intact and degraded Slot Blot Hybridization using a D17Z1 probe AluQuant Intact vs. Degraded DNA Southern analysis of agarose yield gel-blot with D17Z1 Real-time PCR, DNA-based human target specific methods Total human autosomal DNA <i>Laboratory: DNA extractions and quantification- Agarose Gels/Plate assays</i> <i>Differential extraction of male vs. female DNA from sexual assault evidence and DNA quantification using agarose gel electrophoresis.</i>	
02/28	Review for Exam 1: Student led reviews	Butler C1-C3&19/ Inman C1-C6

Week 7:	Exam 1	
03/05	Exam 1 covering Butler C1-C3&19/ Inman C1-C6, URLs, journal articles, lab protocols and laboratory exercises that have been assigned, videos and any guest lecturers <i>Laboratory:</i> Differential extraction of male vs. female DNA from sexual assault evidence and Real-Time PCR	
03/07	Methods –Quantification of DNA-	Butler C1&4/ InmanC6
	Real-time PCR Multiplex Real-Time PCR Intact vs. Degraded DNA End-point PCR DNA quantification RNA based quantification methods Sources of Variation in Quantification methods: DNA quantification standards Interlaboratory studies on DNA quantification	
Week 7:	Methods used to assess DNA variation	ButlerC1&4/Inman C6
03/12	Restriction Fragment Length Polymorphisms, Polymerase Chain Reaction, Dideoxy sequencing, Denaturing High Performance Liquid Chromatography (dHPLC), Single Nucleotide Polymorphism Detection using array-based tech Evaluating DNA variation or <i>Does size matter?</i> Introduction to RFLP – <i>Laboratory:Restriction Digests- role of positive controls, negative controls</i> Electrophoresis in a Classroom	
03/14	Introduction to Polymerase Chain Reaction – <i>Who wants to be a DNA billionaire?</i> http://www.pcrlinks.com/generalities/introduction.htm http://www.accessexcellence.org/RC/VL/GG/polymerase.html	
Week 8:	Introduction to STR markers	Butler C5,6&7/ InmanC6-C7
03/19	STRs- Short Tandem Repeats- CODIS loci <i>Laboratory: PCR amplification</i> –positive controls, negative controls - <i>STR amplification</i>	
03/21	Repeat Slippage, Mutation rates, Chromosomal abnormalities and consequences on Forensic STR results Reading- Moxon et al 1999. Sci Amer. 280: 94 to be distributed Web Link- www.cstl.nist.gov/biotech/strbase Budowle et al. 2001. JFS 46:453-489 (CODIS STR Pop) <u>Additional Optional Readings</u> Walsh et al. 1996 NAR. 24:2807-2812, Levinson et al. 1987. Mol Biol Evol. 4:203-221, Brinkmann. 1998 Am J Hum Genet 62:1408, Henke et al. Am J Hum Genet 64:1473.	
Week 9	Spring Break 03/26-03/30	
Week 10:	Data collection (instrumentation) and Interpretation	C12-15/C6-C8
04/02	DNA separation methods- Gels vs Capillaries STR detection methods - Introduction to Fluorescence Web link- http://www.probes.com/servlets/publications?id=144 Laboratory : <i>PAGE vs. CE: Introduction to the ABI 310, 3100 and FMBIO III plus</i> JS 196e- Forensic Molecular Biology: Spring 2007 p.9	

04/04 Student Led Exam 2 Review Butler C5-7, 12-15/Inman C6-8

Week 11 Exam 2

04/09 Exam 2 Covering Butler C5-7, 12-17/Inman C6-8 URLs and journal articles lab protocols and laboratory exercises that have been assigned, videos and any guest lecturers
Laboratory : CE: ABI 310 set up and detection continued

04/11 Understanding STR results C18-19& C7/ C4&C8
Introduction to population statistics
Population Stats - Genetics- Hardy-Weinberg Equilibrium- Statistics of single source samples and mixtures-
Laboratory: Computer laboratory analysis of STR data. Genemapper ID and Image analysis

Week 12 Understanding STR results, Forensic Issues& DNA Databases

Butler C7, 19-21& C7/In C4&C8

04/16 Population Stats - Genetics- Hardy-Weinberg Equilibrium
Degraded DNA, PCR inhibition, contamination, Mixed samples and Interpretation
SWGAM STR Interpretation Guidelines
<http://www.fbi.gov/hq/lab/fsc/backissu/july2000/strig.htm>
Combined DNA Index System- Value of DNA databases
Levels of CODIS, Privacy Issues, QC, Searching, sample collection
Database Laws- Int'l DNA databases <http://www.fbi.gov/hq/lab/codis/index1.htm>
Assignments- Required Readings:
Spencer C. 2004. Genetic Testimony: Questions About Interpreting DNA Profiles. Why are DNA Profiles Interpreted in Terms of Probabilities? How Are DNA Profile Probabilities Calculated and Presented? Is a Person's DNA Profile Unique? If a Defendant's Profile Matches That of the Crime Scene Sample, Does That Prove the Defendant's Guilt?
Computer laboratory: troubleshooting STR results-forensic issues

04/18 Population Stats - Genetics- Hardy-Weinberg Equilibrium Butler 19-21/IC8
Assessing the strength of the Evidence

Week 13: Databases, Cold Hits, and Unsolved crimes Butler 18,20,24/Inman C9

04/23 DNA databases- Unsolved crimes -CHOP
Combined DNA Index System- Value of DNA databases - Levels of CODIS, Privacy Issues, QC, Searching, sample collection- DNA Database Laws- International DNA databases - Cold Hits/ Unsolved crimes Innocence Project- Uses of DNA in exonerating the innocent
· Summary CA Prop 69 Initiative Statute: Noble
· Walsh, SJ. 2005. Legal Perceptions of forensic DNA profiling Part I: A review of the legal literature. Forensic Science International, Volume 155, Issue 1, 1 December 2005, Pages 51-60
· Judicature Genes and Justice. November-December 1999. 83 (3).
· CODIS <http://www.fbi.gov/hq/lab/codis/index1.htm>
· Kaye, DH and ME. Smith, 2003, Wisc Law Rev - 3:414-459
http://www.dnapolicy.net/depository/dhk_pubs_dna_identification_databases_2003_wisconsin_law_review.pdf

Laboratory: Report writing and statistics. Technical and Administrative review of forensic STR reports. Court testimony.

04/25

**Forensic DNA database issues- Familial Searching, Privacy and Ethical Issues
Gender typing, Amelogenin and Y STRs or Is it a boy or a girl? Butler C 18, 20, 24**

Assignments- Required Reading:

Bieber, F., CH Brenner, and D. Lazer. 2006. Finding Criminals through DNA of their Relatives. Science. –Scienceexpress.org -May 11, 2006.

Additional reading: Spencer, C. Genetic Testimony: Questions About the Use, Collection, and Storage of DNA Profiles. How Many Profiles Are in the CODIS Databanks? Whose DNA Profile Should Be Included in DNA Databases? After Profiling and Electronic Storage of the Profile, Should the Tissue Sample Be Retained or Destroyed? Can Personal or Medical Information Be Obtained from DNA Profiles?

•Butler, JM. 2006. Genetics and Genomics of Core Short Tandem Repeat Loci Used in Human Identity Testing. J For Sci. 51:253-265

•Report of the National Task Force on Privacy, Technology, and Criminal Justice Information. 2001. NCJ 187669

•Ethical Legal and Social Issues Raised by the Human Genome Project Research (HGP)

•Streisand, B. 2006. Who's Your Daddy?. Sperm donors rely on anonymity. Now donor offspring (and their moms) are breaking down the walls of privacy. US News and World Report 140:53-56.

•Nilstun, T and G. Hermeren. 2006. Human tissue samples and ethics. Medicine, Health Care and Philosophy. 9:81-86.

•DNA and legal privacy issues

<http://www.dnfiles.org/resources/res07.html#cat5>

•Ethics of Genetic Testing- <http://www.nhgri.nih.gov/12010621>

Week 14

The “new” genetic markers- mtDNA and Y chromosome markers Butler C8-11

04/30

Mitochondrial DNA: Inheritance, heteroplasmy, ancient DNA, Armed Forces DNA Identification laboratory applications

Laboratory: Mitochondrial DNA sequencing laboratory or Y STR amplifications

05/02

Y chromosome markers

Butler C 8 and 9

Overview of Y chromosome characteristics

Brief History of the Y chromosome

Forensic Applications

Other applications

Structure and Biology of the Y chromosome

Y polymorphisms- SNPS and STRs

Y databases

Week 15

Quality Control, Validation, Admissibility, and Training Standards

ButlerCh 16, A IV&V, In10-11

05/07

Scientific and Technical Working Groups on DNA Analysis Methods

DNA Advisory Board (DAB), Validation and Accreditation

Optional Reading

Holt et al. 2002. JFS 47:15 TWGDAM Validation

JS 196e- Forensic Molecular Biology: Spring 2007 p.11

Laboratory: DNA sequence interpretation, alignments, and comparison to Anderson sequence. Report writing and mtDNA statistics and/or Y STR result interpretation issues

05/09

Educational standards for Forensic DNA analysts and court issues

Admissibility Standards and Testimony

Inman C11

Frye, Daubert and Federal Rules of Evidence

http://www.forensic-evidence.com/site/EVID/EL00003_4.html

STR admissibility link- http://www.denverda.org/html_website/index.html

Week 16 Legal/ethical considerations of DNA typing and Future of Forensic DNA In C 11

05/14

Legal/Ethical Considerations of DNA typing

See URLs

DNA and legal privacy issues

<http://www.dnfiles.org/resources/res07.html#cat5>

Ethics of Genetic Testing- <http://www.nhgri.nih.gov/12010621>

How DNA Technology Is Reshaping Judicial Process and Outcome

<http://www.csis.org/tech/Biotech/nbpp/Seminar2Brief.htm>

http://www.bc.edu/bc_org/avp/law/lwsch/journals/bciclr/24_2/05_FMS.htm

CAC Code of Ethics (on line at www.cacnews.org)

Laboratory: Court testimony exercise

05/16

Innocence Project- Uses of DNA in exonerating the innocent

Exonerating the wrongfully convicted through post conviction DNA testing

<http://www.innocenceproject.org/>

Convicted by Juries, Exonerated by Science- Case studies

<http://www.ncjrs.org/pdffiles/dnaevid.pdf>

Future of DNA typing- Forensic Phenotype Profiling

Future of DNA testing- MicroCE, SNPs, DNA arrays- Bead based methods, hand held???

http://www.ojp.usdoj.gov/nij/pdf/dna_studyreport_final.pdf

Assignments: Required Reading:

- **Sobrino, B, M Brion and A Carrecedo. 2005.** SNPs in forensic genetics: a review of SNP typing methodologies. For Scie Int.
- **Wetton et al 2005.** Inferring population of origin of DNA evidence within the UK by allele-specific hybridization of Y SNPs. For. Sci Intl. 152: 45-53.
- **Cho, M and P. Sankar. 2004.** Forensic genetics and ethical, legal and social implications beyond the clinic. Nature Genetics Supplement.36(11):S8-S12
- **Shriver, M, T. Frudakis, and B. Budowle. 2005.** Getting the science and the ethics right in forensic genetics. Nature Genetics 37(5) 449-450.
- **Small group discussion on Forensic Phenotype profiling**
- Morin, PA, G Luikart, RK Wayne, and the SNP workshop group. 2004. SNPS in ecology, evolution and conservation. Trends in Ecology and Evolution. 19:208-216
- Webster, MT. And NGC Smith. 2004. Fixation biases affecting human SNPs. Trends in Genetics. 20:122-126
- Moskowitz, Ellen. 2003. Five foot two with eyes of blue: Physical profiling and the prospect of a genetics-based criminal justice system. US and Canadian Law Reviews

- **Spencer, C. 2004. Genetic Testimony; Questions About DNA Profiling**

Course Review for final exam Student Led Final Review- **Final Exam: May 21, 2007**

JS 196e Forensic Molecular Biology: Schedule at a glance:

Week 1: Overview of Forensic DNA typing and History of Forensic DNA	Butler C1/ Inman C3&C5
24 Jan 07 Handouts-Syllabus- Reading material	
Week 2: Basics of Biological Physical Evidence	Butler C3/Inman C1-C2
01/29 Introduction to Physical Evidence	
01/31 Biological Physical Evidence	
Week 3 Identification of biological evidence: Intro to Detection and Screening methods	
02/05 Biochemistry of biological evidence: blood, saliva, semen	**Jones
02/07 Biochemistry of biological evidence continued	Butler C2 / Inman C4
Week 4 Collection and preservation of Biological Evidence	Butler C3/InmanC2
02/12 Review –types of biological evidence	
02/14 <i>Laboratory: Collection and preservation of biological evidence continued</i>	
Week 5 Biochemistry of DNA and Human Genetics: DNA Structure, Function and Biology- The Scientific Basis for DNA typing	ButlerC2/InmanC4
02/19 Introduction to DNA and Basic Human Genetics	
02/21 Basic Human Genetics- <i>A tribute to Mom and Dad</i>	Butler C 19
Week 6: Methods used in Forensic DNA : DNA extractions and quantification	Butler C3/ Inman C5&C6
02/26 DNA extractions- Types and amount of samples required for DNA typing	
02/28 Review for Exam 1: Student led reviews	Butler C1-C4&19/ Inman C1-C6
Week 7: Exam 1	EXAM I
03/05 Exam 1 covering Butler C1-C3&19/ Inman C1-C6, URLs, journal articles, lab protocols and laboratories that have been assigned, videos and any guest lecturers	
03/07 Methods –Quantification of DNA-	Butler C1&4/ InmanC6
Week 7: Methods used to assess DNA variation	ButlerC1&4/Inman C6
03/12 Restriction Fragment Length Polymorphisms, Polymerase Chain Reaction, Dideoxy	
03/14 Introduction to Polymerase Chain Reaction – <i>Who wants to be a DNA billionaire?</i>	
Week 8: Introduction to STR markers	Butler C5.6&7/ InmanC6-C7
03/19 STRs- Short Tandem Repeats- CODIS loci	
03/21 Repeat Slippage, Mutation rates, Chromosomal abnormalities	
Week 9 Spring Break 03/26-03/30	
Week 10: Data collection (instrumentation) and Interpretation	Butler C12-15/ Inman C6-C8
04/02 DNA separation methods- Gels vs Capillaries	
04/04 Student Led Exam 2 Review	Butler C5-7, 12-15/Inman C6-8
Week 11 Exam 2	EXAM 2
04/09 Exam 2 Covering Butler C5-7, 12-17/Inman C6-8 URLs and journal articles lab	
04/11 Understanding STR results	Butler C18-19& C7/ InmanC4&C8
Week 12 Understanding STR results, Forensic Issues& DNA Databases	Butler C7, 19-21& C7/In C4&C8
04/16 Population Stats - Genetics- Hardy-Weinberg Equilibrium	
04/18 Population Stats - Genetics- Hardy-Weinberg Equilibrium	Butler19-21/IC8

Week 13:	Databases, Cold Hits, Unsolved crimes, other markers	Butler 18, 20, 24 /Inman C9
04/23	DNA databases- Unsolved crimes -CHOP	
04/25	Forensic DNA database issues- Familial Searching, Privacy and Ethical Issues Gender typing, Amelogenin and Y STRs <i>or Is it a boy or a girl?</i>	Butler C 18, 20 and 24/Inman C9
Week 14	The “new” genetic markers- mtDNA and Y chromosome markers	Butler chapters 8-11
04/30	Mitochondrial DNA: Inheritance, heteroplasmy, ancient DNA, Armed Forces DNA Identification laboratory applications	
05/02	Y chromosome markers	Butler C 8 and 9
Week 15	Quality Control, Validation, Admissibility, and Training Standards	Butler Ch 16, A IV&V, In10-11
05/07	Scientific and Technical Working Groups on DNA Analysis Methods	
05/09	Educational standards for Forensic DNA analysts and court issues	
Week 16	Legal/ethical considerations of DNA typing and Future of Forensic DNA In C 11	See URLs and Inman C 11
05/14	Legal/Ethical Considerations of DNA typing	
05/16	Innocence Project- Uses of DNA in exonerating the innocent Future of DNA typing- Forensic Phenotype Profiling	
05/21	Final Exam- Comprehensive 1215-1430	