Course Syllabus

Syllabus:

PLSCI 1150, CSI: Forensic Botany

Instructor: William L. Crepet, wlc1@cornell.edu, 408 Mann Library
TA: Azra Concho Twombly Ellis act228@cornell.edu
Meeting time and place: MWF 1:30, Room 146 Stocking Hall
Live (with supporting documents on Canvas)
Office Hours: by appointment, contact me by email
Grading: Student Option, (3 credits)

Description/Rationale:

Plant based evidence has been an important component in solving crimes for centuries. Modern techniques and facilities have made plant evidence more importantly dispositive. There have been some stunning examples of the importance of forensic botanical evidence in the United States since the notorious Lindbergh baby kidnapping trial of 1935. We will blend criminal cases and plant science in this course. There will be an introduction to how the courts have evolved with respect to the admissibility of scientific evidence and how that evolution has affected cases that have involved and even depended upon significant plant based evidence. Students will learn, at the introductory level, the plant science needed to understand the importance of plant based evidence in crime solving and ensuing trials. We will focus on particular cases and will cover relevant plant structures, diversity, distribution, reproductive biology (including pollen analysis), other disseminules (leaves and fruits), and molecular genetics evidence. The course structure will include a combination of lectures, flipped classroom exercises and discussions, a diversity of expert guest speakers, explications of some of the tools of the tools (SEM, CTScan, etc.), and visits to facilities used to analyze plant evidence (including the L. H. Bailey Herbaria and Conservatory) aimed at exposing the students directly to relevant aspects of plants. An overriding but intrinsic theme will be how the
scientific method is useful and integral to applying logic to a body of plant-based evidence in the context of the facts of specific cases. Moreover, students will gain some insights into the machinations of the legal system by reading and analyzing case histories, parts of trial transcripts, and from occasional live guest speakers.

Learning objectives and expected outcomes:

After Taking this course students will be able to:

- Identify and evaluate the nature and potential significance of plant based evidence.
  · Observe how plant-based evidence has been used in criminal proceedings.
- Apply logical analysis to complex sets of facts relevant to crime solving.
  · Describe techniques used to discover, describe, and evaluate plant-based evidence including light microscopy, electron microscopy, CTScan technology, DNA analysis, and natural history.
  · Attain a knowledge of “Illegal” plants and their derivatives, including poisons -identifying them and sourcing them.
  · Attain a broad and appropriate knowledge of plant structure including morphology, wood anatomy, and distribution.
  · Gain a broad knowledge of plant diversity/taxonomy
  · Describe plant reproductive biology, including life cycles, seasonality and correlated plant disseminules, including palynology (micromorphology, ultrastructure and taxonomic utility), fruits and seeds, leaves or leaf fragments, and including poisons.

Learning Resources:

You will learn through through lecture demonstrations or direct visits, of key tools important or potentially important in plant forensics including:
· Microscopy—morphology, anatomy, pollen analysis
· DNA analysis
· CTScan
· The L. H. Bailey Conservatory for Living plant morphology and structure
· The Cornell University Herbaria

Textbook and other references:

We will use a textbook that combines case histories and plant evidence: Heather Miller Coyle: “*Forensic Botany: Principle and applications to criminal casework*’ We will also use literature and other resources such as US case law sites such as Justia, US Law etc., articles in law journals (Legal Information Institute, Cornell Law School, Columbia Law
Review, Harvard Law Review, Yale Law Journal etc.), American Academy of Arts and Sciences Journal, newspaper articles, and even selected movies or

television shows if and as appropriate—(e.g. Reversal of Fortune, My Cousin Vinnie, The Verdict, the Paper Chase).

Grading:

The percentages may vary but will be based on quizzes (20%), class discussions—with attendance an important consideration, participation in exercises--including an individual case presentation (40%) , a midterm (20%) and final exam (20%). Student participation in discussions, quiz development, and other student leadership roles associated with the flipped classroom will be very important in determining grades. Given advances in technology these days perhaps video presentations of cases with be accepted and as mentioned in lecture ChatGPT integration in creative and instructive ways may be acceptable—but permission should be sought. Percentages may change pending class discussions.

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Academic Integrity:

Each student in this course is expected to abide by the Cornell University Code of Academic Integrity. Any work submitted by a student in this course for academic credit will be the student's own work. This may not be strictly adhered to depending on how and if ChatGPT is integrated in an acceptable fashion where appropriate.

Lectures and Lecture Topics:

There will be some dynamic changes in these depending, and some of these topics may not be covered because of additions of new topics to reflect changes, but the list covers most of the subjects/topics. It is not a calendar so the order of topics may not reflect the order of lectures:

1.Why do plants provide important forensic evidence?-- Specificity and dispersibility and an example of how plant evidence was critical in solving an internationally famous crime—the kidnapping of the 20th Century
2. What are the major kinds of plant-based evidence?
3. Plant Structure (anatomy) and—Guest Lecture **Professor Niklas**
4. Plant Morphology
5. DNA Guest Lecture I—DNA and fingerprinting, microsatellites, SNPs methodologies, **Professor Doyle**
6. DNA Guest Lecture II-- DNA utility in identifying plants and individuals **Professor Doyle**
7. Fraud: Case histories using chemical and DNA marker analysis to authenticate misrepresented high value plant derived products. Guest Lecture **Professor Davies**

8. Case Histories using these methodologies to place defendant near crime scene
9. Legal considerations associated with evidence—the admissibility of scientific and related expert testimony (Frye Standard 1923, Federal Rule 702, Daubert Standard, 1993, Kumho Tire 1999).
10. Methodologies, tools, facilities—see discussion below for more details).
11. Plant variety-taxonomy—not all plants have the same characteristics and plant diversity equals diversity in types of evidence
12. Flowering Plants vs. Non flowering Plants vs. non seed plants, algae, and fungi
13. Plant geography—obviously particular plant species do not grow everywhere, species have definite locations that might provide evidence as to crime scene etc. and, in cases where the dominant plant species evidence is not useful by itself because the species is widely distributed in the area of the crime, combinations of species disseminules at the crime scene or associated with suspects may provide clues to geography.
14. Plant life cycle—timing related to crime and to timing of disseminule dispersal
15. Disseminules and their identification—fruits, seeds, leaves-- Case histories
16. Guest Lecture Former State Police Investigator, present **Detective- David Beers** on the Peter Wlasiuk murder case
17. Pollen 1. —morphology, micromorphology, ultrastructure, function and dispersal
18. Pollen 2. Pollen diversity and specificity.

19. Case History Guest Lecturer: Yellow Rain—International Incident, guest lecture, **Professor Seeley**
20. Guest Lecture/demo identifying Plant based poisons—**Professor Nixon**
21. Case histories-student presentations
22. Mosses Guest Lecture **Professor Fay-Wei Li**
23. Illegal plants-identifying them and sourcing them