

Detective Fiction and Forensic Science: A Proposal

1. A tentative syllabus or description. See the descriptions for the individual courses: CH 1xx, “Introductory Forensic Chemistry,” and EN 299, “American and British Detective Fiction.”
2. A brief discussion of mode of delivery and extent of integration.

Comments on these matters are based on the document “Exploring the Natural World (ENW) Integrated Courses: Expectations and Requirements for Course Approval,” especially Part III. ‘Expectations Regarding the Levels of Linkage, Integration, Interdisciplinarity (Integrative Learning) Between the Two Courses.’

The mode of delivery would correspond most closely to that described by Harden as a “Complementary or Mixed Program.” The teaching in both courses would be “subject-based” and “integrated.” It would be subject-based in the sense that both courses would organize themselves along lines guided by their respective disciplines: Chemistry and English. Yet the pedagogy would be integrated at key points in the form of team-taught sessions, especially at the beginning of the semester to introduce the linkage between the courses and at the end to listen to the student reports based on the signature project assignment (see below). In between the beginning and end of the term, each instructor will be visiting the other’s classes from time to time.

The extent of integration is best described in Level 3 of Klein and Newell’s taxonomy. Students and instructors would seek to “synthesize” knowledge about shared themes and questions through a process of “serial teaching” punctuated by occasional team-teaching as described above.

Both instructors would meet once a month during the Spring 2015 semester and once every two weeks in summer 2015 to discuss the linking of the two courses; the method, content, and pedagogy of the two courses; the signature assignment for the two courses; etc.

3. A brief consideration of the fulfillment of required learning outcomes.

CH 1xx would require students to complete summative and formative assessments including those based in data analyses (to meet the QA requirements) and in research and writing (to meet the Writing requirements). A signature assignment at the end of the semester would require students to integrate knowledge and methods of critical thinking from both disciplines.

EN 299 would offer a short series of writing assignment in the discipline that would culminate in a signature project assignment that would require students to draw upon the learning in both EN 299 and CH 1xx to complete. The in-discipline assignments would ultimately involve research and writing (to meet the Writing requirements). The signature assignment at the end of the semester would require students to integrate knowledge and methods of critical thinking from both disciplines.

The assignments in both these courses would guide the students toward fulfillment of the following learning goals. By the end of the EN 299 and CH 1xx, students would be able to

- a. Demonstrate an integrative knowledge of human and natural worlds. Students in both courses would complete a series of writing assignments that would have them examine common “intellectual questions” in forensic science and detective fiction and then synthesize their knowledge in a signature project assignment.
- b. Develop habits of critical analysis. In CH 1xx, students would show competence, through their writing, not only in demonstrating quantitative literacy and quantitative analysis but also in thinking critically about a real-world problem or intellectual question. In EN 299, students would demonstrate an ability, through their writing, to ponder critically an intellectual question.
- c. Apply creative and innovative thinking. In both courses, students would demonstrate their creativity/innovation in their signature project assignment by answering a question or solving a problem about the combined natural and human worlds.
- d. Communicate skillfully in multiple forms of expression. All of the assignments in CH 1xx and EN 299 would require the students to convey arguments in writing based on valid quantitative reasoning and skillful use of rhetorical means. At least one writing project in each course would ask the students to integrate sources in setting their argument within the context of the course-appropriate field. In addition, the signature project assignment would require students to deliver their findings orally in collaboration with other project team members. All writing would have to observe the proper, ethical ways of documenting sources and the standard rules governing the surface features of writing.

The Course Development grant is necessary, in part, for Drs. Bruce and McBratney to craft a signature assignment that will allow students to demonstrate integration of both fields. One possibility is for student groups to enact a mock court case based on the reading they have done in both classes. Many detective novels end, in a quasi-judicial proceeding, with the detective making the case against the culprit. The students would be required to use the knowledge they have acquired about forensic chemistry techniques to either prosecute or defend the accused perpetrator. Some collected evidence for assessment could include legal briefs, data from the literature, and data analysis. Additional course development is needed for the instructors to learn more about each field to devise a high quality assignment for students.

III. Faculty Development

If Drs. Bruce and McBratney receive a course development grant, both would attend the workshop on integrated courses at the end of the academic year.

IV. Final Report Requirements

If Drs. Bruce and McBratney receive a course development grant, they would submit a final report by September 14, 2015, observing the requisite requirements.

John McBratney
EN 299

American and British Detective Fiction: A Description

Basic information

- Linked with: CH 1xx
- Instructors: Drs. Chrystal Bruce and John McBratney
- Initial offering: Sp 2016
- Audience: both science and non-science majors (to be)
- Disciplines integrated: Chemistry and English
- Shared theme(s): see discussion below of these themes and their conceptual connections
- Methods, contents, and pedagogical delivery: see discussion below
- Real-world problem(s) and/or intellectual questions: see discussion below

Shared theme(s)

The theme the two courses would investigate together would be the status of knowledge—its powers and limitations—in detection fiction and forensic science; see “Real world problems and/or intellectual questions” below [to be fleshed out later].

Methods, contents, and pedagogical delivery

Methods. The instructor and students would read American and British detective fiction from the nineteenth century to the present and discuss this literature and the student writing based on this literature.

Contents. The contents of EN 299 would consist of detective fiction of the kind described above, including works by Edgar Allan Poe, Wilkie Collins, Arthur Conan Doyle, Agatha Christie, Dashiell Hammett, P.D. James, and others. The instructor is acquainted with nineteenth-century British detective fiction; he knows less about later British and American detective fiction. A course development grant would allow the instructor to read more widely in American and British detective fiction of the twentieth and twenty-first centuries.

Pedagogy. In EN 299, instruction would rely primarily on the Socratic method, supplemented by lecture on, discussion of, and the practice of writing inside and outside the classroom.

Close coordination between Drs. Bruce and McBratney—a coordination that a course development grant would certainly aid—would allow the methods, content, and pedagogy in CH 1xx and EN 299 to be complementary.

Real-world problem(s) and/or intellectual questions

What do detectives know and how do they know it: these epistemological questions would be the focus of both courses [to be fleshed out later]. The more specific “intellectual questions,” shared by both courses, would be these [to be refined later]:

- What methods do detectives use in detection? The students would learn the interrelations between induction, deduction, and abduction (Charles Sander Peirce’s term for hypothesis-formation) in detection and in forensic science. In an exercise of critical thinking, students would also use these methods, including hypothesis-formation, in their own writing in both courses. In CH 1xx, students will research a forensic chemistry technique, including reading the primary literature, to learn the theory behind the technique and its applicability. The students will craft an argument about the use of this technique in court as if they were writing to a legal defense team. They will need to support their assertions with evidence using accepted rhetorical conventions. In EN 299, they would construct a thesis (in a process analogous to forming a hypothesis) and then seek to prove it through argumentation.
- What powers or capacities does detection confer upon detectives? Obviously, these powers are the ability to solve crimes, as understood in a more general sense in detective fiction and in a more specific, scientific sense in forensic science. In CH 1xx, students will learn how detectives collect and handle evidence and why those requirements are in place from a science perspective. In EN 299, students would need to understand how the model of the Panopticon, especially as studied by Michel Foucault, helps us to assess these powers or capacities.
- What are the factors that limit these powers? These limiting factors are two-fold: epistemological and ethical. (1) Detectives are epistemologically limited in the sense that they are often seen as not knowing everything about a case or the persons involved in it. In CH 1xx, students will view this epistemological weakness in the limitations of quantitative measurement—for example, in the problem of error. In EN 299, students will see this defect in the detectives’ failure to embody wholly the model of the Panopticon. (2) But detectives also face ethical difficulties. In CH 1xx, for example, students will learn that bias can interfere with accurate quantitative measurement in forensic science. Likewise, students in EN 299 will observe that detective knowledge is often partial, not just incomplete but influenced by partialities—in other words, by bias.
- Students would write papers in both courses in which they would have analyze both the powers and limitations of detection, as seen in forensic science and detective fiction.

Chrystal Bruce
CH 1xx

Introductory Forensic Chemistry

Basic information

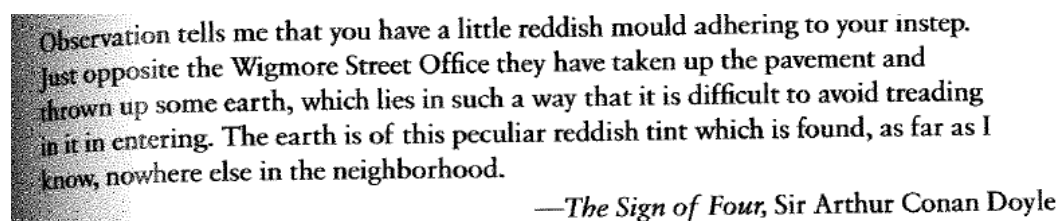
- Linked with: CH 1xx
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Shared theme(s)

Acquisition and integration of knowledge to devise a hypothesis and test that hypothesis by acquiring additional information (data) and critically evaluating the reliability of all information gathered to draw inferences within the context of Detective Fiction and Forensic Chemistry.

Dr. Bruce and Dr. McBratney will be in contact via email frequently, will meet at least every other week, and will attend each other's classes at important points during the semester when content is particularly relevant to the linked course.

Additionally, the textbook that I have chosen routinely incorporates quotes from Detective novels. For example, this quote is scanned from the discussion of soil analysis in the chemistry textbook:



Observation tells me that you have a little reddish mould adhering to your instep. Just opposite the Wigmore Street Office they have taken up the pavement and thrown up some earth, which lies in such a way that it is difficult to avoid treading in it in entering. The earth is of this peculiar reddish tint which is found, as far as I know, nowhere else in the neighborhood.

—*The Sign of Four*, Sir Arthur Conan Doyle

Methods, contents, and pedagogical delivery

Methods. Students in the Forensic Chemistry course will learn through reading, discussion, writing, lab activities, and data analysis.

Contents. Reading assignments and homework problems will come from the textbook *Investigating Chemistry: Introductory Chemistry from a Forensic Science Perspective* by Matthew Johl. Additional reading assignments for in-class and out-of-class activities will come from the primary literature such as *Talanta: The International Journal of Pure and Applied Analytical Chemistry* and the *Journal of Forensic Research*. See Sample QA activities for how these articles will be used. Secondary resources such as *Forensic Magazine* and newspaper

articles will also be assigned so students can see how forensic techniques are being used in contemporary cases.

Pedagogy. The format of class will be daily reading quizzes using clickers, mini-lectures on the chemistry topics from the reading that will incorporate clicker questions so the students are interactive, group assignments on QA activities, and class discussion on the reading or in-class activities.

Real-world problems and/or intellectual questions

As part of the theme of the linked courses, students will be studying the decision making process of fictional detectives and real-life forensic scientists, both sets of whom use hypothesis creation and testing and logical reasoning (induction, deduction, abduction). See notes in the description for EN 299 for additional information on the questions that will be raised and how students will be asked to answer them.

Additional requirements of ENW course

1 cr. Hour of QA content

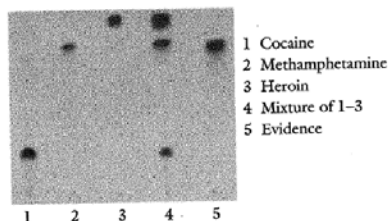
QA skills are required for a good detective story. The detective must do all of the following

- Find and pose precise questions
- Draw inferences from data
- Think critically about quantitative statements
- Recognize sources of error (as defined in the field of chemistry)
- Think critically about a real-world problem

To be explicit about the connection between detectives, forensic scientists, and QA content, students in CH 1xx will complete homework problems, in-class activities, exam questions, and a final project where they also make use of these skills.

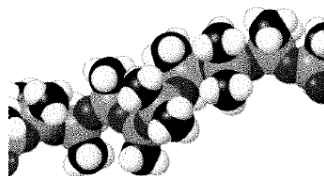
Example Context: Many students are familiar with the use of soil samples to provide clues as to where a suspect has been or where a crime was committed. Early in the semester, we will perform paper chromatography and discuss how components of a mixture are separated from each other. A sample problem from the textbook:

51. Evidence seized in a drug bust was analyzed using thin-layer chromatography (TLC), and the result is shown below. What illegal drug is identified by the TLC? Is this absolute proof that the person was in possession of the illegal drug? Explain why or why not. (EA)



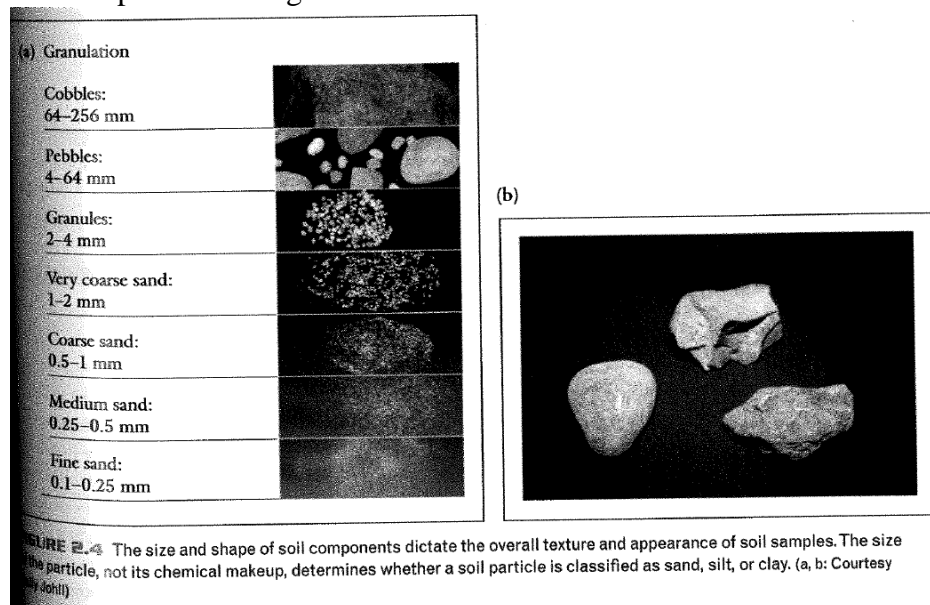
As the semester proceeds we will learn about intermolecular forces, polar and non-polar compounds, and solubility.

76. Arson investigators collect samples of debris from the suspected point of origin of the blaze to test for the presence of an accelerant, such as gasoline. Investigators also collect a sample of debris from a region believed not to contain any accelerant. The evidence is analyzed by exposing a small fiber coated with the polymer (see figure) to the air that is trapped in the vial above the debris. If gasoline is present, the compounds are adsorbed onto the fiber and subsequently analyzed. Explain in terms of intermolecular forces why the compounds that constitute gasoline would be present in the airspace and why they would collect in the fiber. Why is it important to collect and analyze a sample that is believed to contain *no* accelerant? (CP)



We will then read an article from the *Journal of Forensic Science* (*J Forensic Sci*, January 2007, Vol. 52, No. 1 doi:10.1111/j.1556-4029.2006.00301.x) that uses a modern technique to separate components in a soil sample to characterize that sample. Students will complete a Guided Inquiry activity in groups in class to use QA skills. I have had introductory students read journal articles in the past, so I know it is possible. It requires guidance before and during the reading activity, but it is really invaluable in instructing students about chemistry as a discipline.

We will compare this method for characterizing soil samples to one based on the observed composition of the sample. The image below is from the textbook.



Additional topics where QA methods will be used include fingerprinting, ballistics, poison-detection, and arson.

Written Expression

By spending time reading primary and secondary literature in forensic chemistry, students will become familiar with disciplinary expectations of writing in chemistry. Students will then research a forensic technique where data is collected and analyzed. As if a member of a legal team defending a client where evidence based on this technique will be presented in court, students will be write an analysis of the technique and what the data can and cannot tell us. They will have to address the reliability and limitations of the technique as well as suggest ways to explain the technique to a jury.

Hello, Natalie--

I'm writing to offer my support for the proposal submitted by Drs. Chrystal Bruce and John McBratney (me!) for an integrated course development grant. I'm aware of the proposal and support his (my!) teaching of EN 299, "American and British Detective Fiction," in Spring 2016. Thank you.

--

John McBratney
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Hello, Natalie--

I'm writing to offer my support for the proposal submitted by Drs. Chrystal Bruce and John McBratney for an integrated course development grant. I'm aware of the proposal and support Chrystal's teaching of CH1xx (still waiting for direction on how to number these new courses):

Introductory Forensic Chemistry in Spring 2016. In fact, I am counting on it. The department will need to offer such a class to service this next year's incoming Freshman class. Based upon past records of Freshman enrolling in our Div IV lab science courses, I expect at least 20 Freshman would be registering for the course, with the possibility of another 5-7 students who would have previously taken a Div IV lab science course as part of their major.

Thank you,

Mike