The Syllabi

Instrumental Analysis

Chemistry 362 Spring semester, 2004

Text: "Principles of Instrumental Analysis", 5th Edition,
Douglas Skoog, F. James Holler and Timothy Nieman

Lecture: MWF 10:00 - 10:50
Instructor - Stuart Belli, phone x5731, email: belli

Lab: Thursday 1:30 - 5:30
Instructors - Stuart Belli, Edie Stout

What is Instrumental Analysis?

It's not just how to use the instruments scattered around the building, although I hope by the end of the semester you will be more comfortable using them, but how the instruments work. However in this class we are going to broaden our horizons to include analytical chemistry.

Goals of the class:

- Learn instrument design.
- Open up the black boxes.
- Develop an understanding of what is happening in there.
- Maybe more important is fostering an attitude that we CAN know what is happening in there.
- Learn experimental design.
- This includes statistics, sampling
- Learn the principles of the phenomena of nature that can be quantified and hence used for analysis.

The laboratory will have two components; short exercises designed to acquaint you with the operation of a specific instrument and longer experiments and/or investigations of much less structure intending to give you practice in adapting, designing, and applying analytical methods to real problems. To avoid wasting your time waiting for instruments and equipment, there will be several experiments running simultaneously which you can rotate through. The exercises will have you collecting data and evaluating the effects of various instrument parameters. You will receive detailed procedures and the write-ups will also be closely scripted. For the investigations we will broaden our attention from the measurement itself to the complete analysis; everything from defining the question to devising a method and evaluating our results. I would like to give as much flexibility on the investigations as possible to allow each of you to explore your interests.

We will also be working with another class, Introduction to Urban Studies, on a project studying lead (Pb) exposure here on Vassar campus. This joint project will be led by Chris Smart and Pinar Batur (Talk about confusing! Can you imagine 3 professors mucking around on one project!) The project requires that you work as part of teams with the Urban Studies students to analyze for Pb exposure.

A new feature this year is our “Chemical Exposure” challenge; you will each be given an item and asked to determine what chemical exposure one would incur through normal use of the item.

Grading:

Exams (3 plus final)	45%
Laboratory	45%
Write-up	
Lab notebook	
Homework	10%

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Spring Semester 2004
Text: Skoog, Holler & Nieman

Monday	Tuesday	Wednesday	Thursday	Friday	Topics from Text
January 19	20	Classes begin - Intro to Analysis 21	Mystery in Vassar Lake 22	23	Ch. 1: Introduction Appendix A: Evaluation of Analytical Data
26	27	28	Spectoscopy 29	30	Ch. 5: Signals and Noise Ch. 6: An Introduction to Spectrometric Methods
February 2	3	4	Spectoscopy **Pizza w/US** 5:30 - 6:30 5	6	Ch. 7: Components of Optical Instruments Ch. 13: An Introduction to UV/Vis Molecular Absorbance Spectrometry
9	10	11	Spectoscopy 12	EXAM 1 - Spectoscopy 13	
16	17	18	Chromatography 19	20	Ch. 26: Intro. To Chromatographic Separations
23	24	25	Chromatography 26	27	Ch.27: Gas Chromatography
March 1	2	3	Chromatography 4	Exam 2 Chromatography 5	Ch.28: High-Performance Liquid Chromatography
Spring Break 8	9	10	11	12	
Spring Break 15	16	17	18	19	
22	23	24	Electrochem 25	26	Ch. 22: Introduction to Electroanalytical Chemistry
29	30	31	Electrochem April 1	2	Ch. 23: Potentiometry
Lecture on Risk Assessment 5	6	7	Project - Lead in Vassar Dust 8	9	Ch. 25: Voltammetry
12	13	14	Project 15	Exam 3 Electrochemistry 16	Ch. 15 Molec. Luminescence Ch. 16: IR Spectrometry Ch. 18: Raman Spectroscopy
19	20	21	Project Lead Presentation to Urban Studies 22	23	Ch. 12: Atomic X-Ray Spectrometry Ch. 31: Thermal Methods
26	27	28	Project 29	30	Ch. 21: Surface Characterization by Spectroscopy and Microscopy
May 3	Last Day of Classes 4	5	6	7	
10	11	Finals 12	13	14	

Pinar Batur
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Office Hours: Tuesday, 9:00–11:00 and Thursday 2:00-3:00
and by appointment.

INTRODUCTION TO URBAN STUDIES:
URBAN SPACE AND STRUGGLE

"The inferno of living is not something that will be; if there is one, it is what is already here, the inferno where we live every day, that we form by being together. There are two ways to escape suffering it. The first is easy for many; accept the inferno and became such a part of it that you can no longer see it. The second is risky and demands vigilance and apprehension: seek and learn to recognize who and what, in the midst of the inferno, are not inferno, then make them endure, give them space." Italo Calvino, Invisible Cities, 1974.

This class is about the "inferno." How have cities come to reflect hierarchy of power in space? Where does the challenge to power come from? The city is a social crucible, and urban space reflects conflict and change. This course will examine the classic arguments and the recent discourse in urban theory, and different disciplinary approaches to urban studies to explore changing urban space both historically and cross culturally, within the context of capitalist economic, political and social relations. Along with the assigned reading, class discussions will include emerging issues in the media and in our community.

Required Texts

Eaton, Susan. 2001. The Other Boston Busing Story. Yale.

Fainstein, Susan and Scott Campbell, eds. 2002. Readings in Urban Theory. Blackwell.

Saxenian, Annalee. 2001. Silicon Valley's New Immigrant Entrepreneurs. California: Public Policy Institute of California.

O'Connor, Alice, Chris Tilly and Lawrence D. Bobo. 2001. Urban Inequality: Evidence from Four Cities. New York: Russell Sage Foundation.

Recommended Readings on Reserve

These are recommended readings, that from time to time, I or other instructors in this class will refer to in their lectures. I strongly encourage everybody who is taking this class to take the time to do these readings:

Marx, Karl. 1986. The Communist Manifesto, "Introduction to the
Grundrisse," excerpts from Grundrisse and "Preface to A Critique of Political Economy," from Jon Elster, ed. Karl Marx: A Reader. Cambridge.
Emile Durkheim. 1985. "Professional Ethics and Civil Morals," from
Kenneth Thompson, ed. Readings from Emile Durkheim. Key Texts.
Weber, Max. 1994. "Social Action and Social Relationships," and
"The Meanings and Presuppositions of Modern Capitalism," and "The Evolution of the Capitalistic Spirit," from Wolf Heydebrand, ed. Max Weber: Sociological Writings. Continuum.
Weber, Max. 1958. "The Nature of the City," from The City. Free Press.
Simmel, Georg. 1971. "The Poor," and "The Metropolis and Mental Life," from Donald Levine, ed.
On Individuality and Social Forms. University of Chicago Press.
Wirth, Louis. 1938. "Urbanism as a Way of Life," American Journal of Sociology, 44: 1-24.
Gans, Herbert. 1968. "Urbanism and Suburbanism as a Way of Life,"
from R.E. Pahl, ed. Readings in Urban Sociology. Pergamon Press.
Fischer, Claude. 1975. "Toward a Subcultural Theory of Urbanism,"
American Journal of Sociology 80: 1319-1341.

Course Requirements
1. Attendance, attendance, attendance! More than three unexcused absences will result in reduction of the grade. More than five will result in class failure.

2. Class participation, class participation, class participation!
As citizens of the class, we all have responsibility to join the discussions. Failure to participate in class discussions, group projects, or group presentations will affect our class' possibilities of learning and teaching.

3. Three examinations:

The first mid-term examination will be a closed book, in class exam, combining short answer and essay questions. It usually consists of 5 or 6 short answer questions and 2 essays.

The second mid-term examination (Observation Report) will be a challenge to encourage you to see and understand and to interpret the urban conundrum. For your Observation Report, you are expected to choose a location, such as downtown, or Main Street, or the neighboring K-Mart, or perhaps a soup kitchen. You are expected to report on what you see, and by giving examples, demonstrate how your readings and discussions in the class have improved the sharpness of your vision. In your take-home exam, you will be expected to write a theoretical discussion on what you observed. Even though it resembles torture, this exam is meant to be a learning experience. You will be allowed to discuss the

assignment with other students and with me, and you may conduct additional research in the library in support of your essay. It is acceptable to ask for assistance in finding data or reference works, and even editorial advice. But the take-home exam cannot be written in collaboration with another person. In your essay you will be expected to cite sources you use, and to make proper use of references and quotations. The objective is to encourage you to utilize class material to analyze the "urban" in abstract and everyday life.

The comprehensive final examination will be given according to the college final exam schedule. It will consist of 5 or 6 short answer questions, and 2 essay questions.

4. Short Opinion Papers a five page Opinion Paper is due after each section of the class, to tie each section's discussion to the others. The four short Opinion Papers (actually, there are five of them, but one of them will be given as an essay question at mid-term.) will become a guide to disciplinary diversity in Urban Studies.

Grades

Grades will be assigned accordingly:
In class mid-term.....25%
Take home mid-term (Observation Report).....20%
Short opinion papers.....20%
Final exam.....25%
Class participation.....10%

Course Outline

January 22.....Introduction.

January 24.....What is the City? What makes it Urban? How Did the Process of Urbanization Evolve Under Capitalism? Required Reading: Readings in Urban Theory, pp. 23-101.

January 29.....Changing Urban and Regional Systems. Required Reading: Readings in Urban Theory, pp. 101-186.

January 31.....Race and Urban Poverty. Viewing of "Your Loan is Denied." Required Reading: Readings in Urban Theory, pp. 187-262.

February 5.....Politics of Redevelopment, Public-Private Partnerships and Gentrification. Required Reading: Readings in Urban Theory, pp. 263-354.

February 7.....The City and Culture. Required Reading: Readings in Urban Theory, pp. 359-435.

First Opinion Paper: What is the most urgent question in Urban Theory?

This is due by February 8th at Sundown, according to The Old Farmer's Almanac.

This Section will be led by **Professor Leonard Navarez of Sociology**.

February 12.....Why is Urban Sociology a way to understand how history, social order, and social conflict get embedded in space? (urban space-that is!!!) Required Reading: Ronald Van Kempen and Peter Marcuse. 1997. "A New Spatial Order in Cities?" American Behavioral Scientist, volume 41; Peter Marcuse. 2000. The Language of Globalization," Monthly Review, volume 52.

February 13.....Guest Speaker- Peter Marcuse.

February 14.....Technocity: Space as a function of Capitalism. Required Reading: : Saxenian, Silicon Valley's New Immigrant Entrepreneuers.

February 19.....Leaving Silicon Valley. Required Reading: Camagni, Roberto. 2001. "The Economic Role and Spatial Contradictions of Global City-Regions: The Functional, Cognitive, and Evolutionary Context." Pp. 96-118 in Global City-Regions: Trends, Theory, Policy, edited by A. J. Scott. Oxford: Oxford University Press; and Nevarez, Leonard. 1999. "Working and Living in the Quality-of-Life District." Research in Community Sociology 9: 185-215.

February 21....**Second Opinion Paper: What is the "New Spatial Order" of globalizing cities? How does space reveal the contradictions of capitalism? In serving economic needs, how do technocities simultaneously set in motion a contradiction of capitalism?**

This is due by the 22nd, no later than the rise of the Moon over the pines, according The Old Farmer's Almanac.

This Section will be led by **Professor Tiffany Lightbourn of Psychology** and **Professor Joy Lei of Education**.

February 26.….Segregation, Desegregation, Resegregation. Required Reading: Orfield and Eaton, "Leading Decisions on Deseregation, 1896 – 1995;" Orfield, "Segregated Housing and School Segregation;" Eaton, The Other Boston Busing Story, Chapters 1-2.

February 28....Institutional Effects of Desegregation. Required Reading: Eaton, The Other Boston Busing Story, Chapters 3-4.

March 5.....Individual Effects of Desegregation. Required Reading: Eaton, The Other Boston Busing Story, Chapters 4-5.

March 7.....**In-class Examination and Third Opinion Paper as one of the Essay Questions: What is segregation? What is your opinion on desegregation policies? How would you respond to counter-arguments to your opinion?**

The essay question is due by the 8th, before the cows come home (they do not read The Old Farmer's Almanac).

This Section will be led by **Professor Jon Rork of Economics**.

March 26....Urban Economics and its Challenge: Alternative Ways to Study Urban Inequality. Required Reading: O'Connor, Tilly and Bobo, Urban Inequality. Chapters – Introduction and Chapter –1.(Suggested chapter to read: Chapter –2.)

March 28....Guest Speaker – Professor Susan Fainstein.

April 2....Housing, Segregation and Spatial Mismatch. Required Reading: O'Connor, Tilly and

Bobo, Urban Inequality, chapters 4-5-6.

April 4...Economics of the Labor Market. Required Reading: O'Connor, Tilly and Bobo, Urban Inequality, chapters 7-8-10.

April 9.....**The Fourth Opinion Paper: Imagine yourself investigating segregation in a majorU.S. city. Which variables define segregation patterns best? How would you investigatethem?**

This paper is due by the 10th, before I leave my office to check if The Old Farmer's Almanac is accurate regarding the sunset.

This Section will be led by **Professor Chris Smart of Chemistry** and **Professor Pinar Batur of Urban Studies and Sociology**.

In order to prepare for this section, please read "RACE AND INEQUALITY" (PART II, pages 127-195,) Readings in Urban Theory, Susan Fainstein and Scott Campbell.

April 11.....Lead Poisoning and Epidemiology: How Did Heavy Metal Kill Beethoven? Required

Reading: Eric Millstone, 1997. "Lead", "Is Lead Poisonous?" and "The Neurotoxicity of Lead" (chapters 1-3) from Lead and Public Health. Herbert Needleman, 1999. "The Removal of Lead from Gasoline: Historical and Personal Reflections." Environmental Research Section. 84:20-35.

April 16.....Science and Judgment in Risk Assessment: Toxicity and Lead. Required Reading:

Kassa, Hailu, et al., 2000. "Assessment of a Lead Management Program for Inner-City Children," Journal of Environmental Health, vol. 62; and Shoshana Melman, 1999. "Prevalence of Elevated Blood Lead Levels in an Inner-City Pediatric Clinic Population," JAMA, The Journal of the American Medical Association, vol. 281; M.J. Friedrich, 2000. "Poor Children Subject to Environmental Injustice," JAMA, The Journal of the American Medical Association, vol. 283; and J. Gasana and Armondo Chamorro, 2002. "Environmental Lead Contamination in Miami Inner-City Area." Journal of Exposure Anaysis and Environmental Epidemiology. 12: 265-272.

April 18…. Politics and Economics of Pb Contamination: Required Readings: "Toxic" by J.

Cohn, The New Republic, Dec. 23, 2002; page 17-18, Herbert Needleman, 1997. "Clair Patterson and Robert Kehoe: Two Views of Lead Toxicity." Environmental Research Section. 78: 79-85; and David E. Jacobs, et all. 2002. "The Prevalence of Lead-Based Paint Hazards in U.S. Housing." Environmental Health Perspectives. Volume 110: A599-A606; and Dori Reissman and Rachel B. Kaufmann. 2002. "Is Home Renovation or Repair a Risk Factor for Exposure to Lead Among Childeren Residing in New York City?" Journal of Urban Health. Volume 79: 502-510; and Joanne McFadden. 2003. "Get the Lead Out: Learn to Identify Possible Sources of Lead Poisoning in Your Home". Hudson Valley Parent. May: 6-7; and 19; Francis Calpoltura and Rinku Sen, 1994. "PUEBLO Fights Lead Poisoning," from Unequal Protection: Environmental Justice and Communities of Color, edited by Robert Bullard, Sierra Club Books.

April 23.....…. **JOINT CLASS/ Chemistry Students—PRESENTATION OF LEAD CONTAMINATION FINDINGS.**

April 25.....….**JOINT CLASS/ Urban Studies Students—PRESENTATION OF LEAD CONTAMINATION POLICY DISCUSSION.**

April 30……Prof. Herbert Neeedleman "Low Level Lead Exposure: Lessons from Public Health," at 5:00 – Taylor Hall 203.

The Fifth Opinion Paper: What is your urban policy proposal for lead poisoning?

This is due by the 3th, before Jupiter and Saturn descend lower in the western sky at nightfall to lie near the Moon, according to The Old Farmer's Almanac, of course.

May 2.....Discussion and review: How do we search and find our way in urban space?

Supporting Materials

Selected Sources: In addition to assigned reading list for our class, the following is a selection that includes some of the sources that we have found useful in teaching the module on lead poisoning in the urban environment.

Books on the history and epidemiology of lead poisoning:

English, Peter C. (2001). Old Paint: A Medical History of Childhood Lead-Paint Poisoning in the United States to 1980. New Brunswick, New Jersey: Rutgers University Press.

Markowitz, Gerald and David Rosner (2002). Deceit and Denial: The Deadly Politics of Industrial Pollution. Berkeley: University of California Press.

Millstone, Erik (1997). Lead and Public Health. London: Taylor and Francis.

Stapleton, Richard M. (1994). Lead Is a Silent Hazard. New York: Walker and Co.

Warren, Christian (2001). Brush with Death: A Social History of Lead Poisoning. Baltimore: Johns Hopkins University Press.

Additional articles on lead contamination/poisoning as a case study in the college courses:

Bellinger D.C. and H.L. Needleman. (2003). "Intellectual Impairment and Blood Lead Levels," New England Journal of Medicine, 349 (5): 500.

Breslin, Vincent (2001). "The Lead Project: An Environmental Instrumental Case Study," Journal of Chemical Education, 78:1647-1651.

Kesner, Lana and Edward M. Eyring (1999). "Service-Learning General Chemistry: Lead Paint Analysis," Journal of Chemical Education, 76: 920-924.

Leviton, A. et al. (1993). "Prenatal and Postnatal Low-Level Lead Exposure and Children's Dysfunction in School," Environmental Research, 60 (1): 30-43.

Markow, Peter (1996). "Determining the Lead Content of Paint Chips: an Introduction to AAS," Journal of Chemical Education, 73: 178-180.

Needleman H.L. and D. Bellinger. (1987). "Lead and Children's IQ," Lancet, 2 (8553): 285-286.

Needleman, H.L., et al. (1996). "Bone Lead Levels and Delinquent Behavior," JAMA, 275 (5): 363-369.

Needleman, H.L. (1998). "Childhood Lead Poisoning: The Promise and Abandonment of Primary Prevention," American Journal of Public Health, 88 (12): 1871-1877.

Needleman, H.L. (1999). "Childhood Lead Poisoning Prevention - Needleman Responds,"
American Journal of Public Health, 89 (7): 1130-1131.

Needleman, H.L and P.J. Landrigan. (2004). "What Level of Lead in Blood is Toxic for a Child?," American Journal of Public Health, 94: 8-18.

Web site (2004). http://www.nd.edu/~chem191/ (Accessed 1/21/04; a course on Chemistry and Public Policy at the University of Notre Dame).

Analytical methods related to lead analysis:

National Science Foundation (1997). User Friendly Handbook for Mixed Method Evaluations. Washington, D.C.

United States Environmental Protection Agency (1996). Method 6010B: Inorganics by ICP –Atomic Emission Spectroscopy, Revision 0, December.

United States Environmental Protection Agency (1996). Method 3050B Acid Digestion of Sediments, Sludges and Soils, Revision 0, December.

United States Environmental Protection Agency (1998). Method 6200: Field Portable X-ray Flourescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediments, Revision 0, January.

Lead related websites:

http://www.atsdr.cdc.gov/toxprofiles/tp13.html
http://www.epa.gov/opptintr/lead/index.html
http://www.epa.gov/lead/403FS01.pdg
http://www.epa.gov/opptintr/lead/leadhaz.htm
http://www.epa.gov/superfund/programs/lead/products/rule.pdf
http://www.epa.gov/grtlakes/seahome/leadenv/src/foodad.htm
http://www.health.state.ny.us/nysdoh/environ/lead.htm
http://www.health.state.ny.us/nysdoh/environ/lead/leadq.htm
http://www.cdc.gov/nceh/lead/lead.htm
http://www.nsc.org/library/facts/lead.htm
http://www.leadsafe.org/
http://www.haz-map.com/leadfact.htm
http://www.hud.gov/offices/lead/index.cfm
http://www.un.org/events/wssd/journal/020831E.pdf

Instrumental methods of chemical analysis have become the principal means of obtaining information in diverse areas of science and technology. The speed, high sensitivity, low limits of detection, simultaneous detection capabilities, and automated operation of modern instruments, when compared to classical methods of analysis, have created this predominance. Professionals in all sciences base important decisions, solve problems, and advance their fields using instrumental measurements. Instrumental methods of analysis. Analytical chemistry is the study of the separation, identification, and quantification of the chemical components of natural and artificial materials.Â Analytical chemistry is also focused on improvements in experimental design, chemometrics, and the creation of new measurement tools to provide better chemical information. Analytical chemistry has applications in forensics, bioanalysis, clinical analysis, environmental analysis, and materials analysis. Instrumental analysis methods. General information. In order to perform quantitative and qualitative analysis of organic substances, the changing physical properties of these substances are utilized. Various methods have been developed for this purpose. With each of these methods, a changing physical property of the substance is measured.