

Chem 221

Instrumental Analysis

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Spring 2005

January 19, 2005

- **Syllabus**
- **ALL class materials will be available *online only* at: www.uvm.edu/~jgoldber/courses/chem221**
- **Assignment!**

Send me an email message (this week!) with the following information:

 - Academic level (undergrad? Grad?)
 - Major/grad program
 - Previous coursework in analytical chemistry
 - Conflicts with three evening exams?
 - Suggestions for office hours?

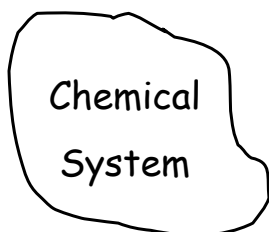
What is Analytical Chemistry?

- "Analytical chemistry is what analytical chemists DO!"
- "The study of methods for determining the composition of substances."
- Two areas:
 - 1) *Qualitative Analysis (what?)*
 - 2) *Quantitative Analysis (how much?)*

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The Chemical System

First, we need something to study:



Chemical
System

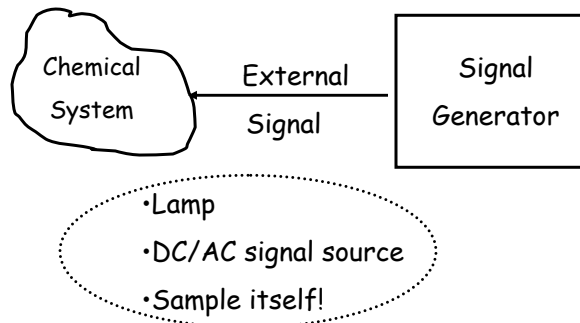
• Can be anything:

- Coal
- Blood
- Gas
- Food
- Reaction mixture

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The Signal Generator

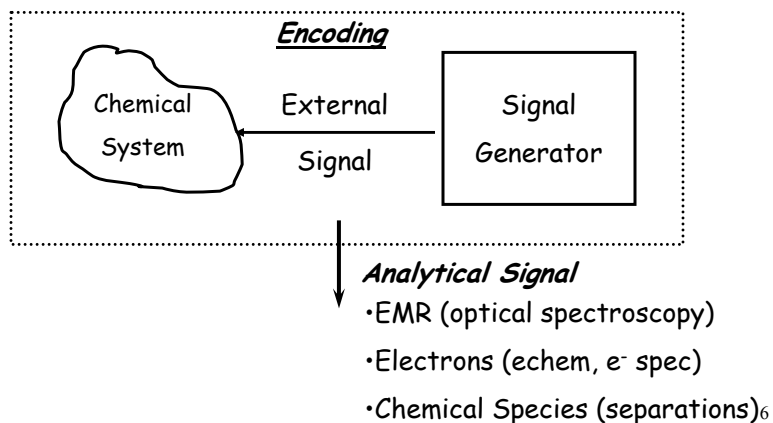
- Interacts with the *Chemical System* to produce an *Analytical Signal*:



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The Analytical Signal

- Produced by the interaction of the *signal generator* with the *chemical system*: **ENCODING**



Decoding the Analytical Signal

- How do we decipher the *chemical information* encoded in the *analytical signal*?

- **Four Steps:**
 1. *Disperse* the analytical signal (selectivity)
 2. *Convert* to an *electrical* signal
 3. *Process* the electrical signal
 4. *Output* the resultant signal

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Dispersive Element

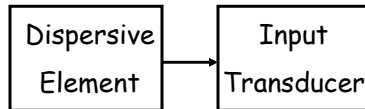
- Enables the *selective* measurement of the analytical signal

- **Examples:**
 - ✓ *Monochromator* (optical spectroscopy)
 - ✓ *Magnetic Field* (mass spectrometry)
 - ✓ *Chromatographic Column* (separations)

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Input Transducer

- Converts the *analytical signal* to an *electrical signal*:



Examples:

- **Photomultiplier tube (PMT)**
(photons → electrons)
- **Electrode**
(chem potential → electrical potential)