

Chem 221 Instrumental Analysis

Professor Joel Goldberg
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- **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?

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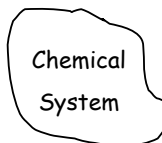
What is Analytical Chemistry?

- "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:



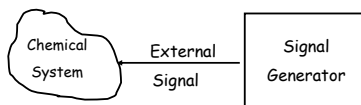
• Can be anything:

- Coal
- Blood
- Gas
- Food
- Reaction mixture

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The Signal Generator

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

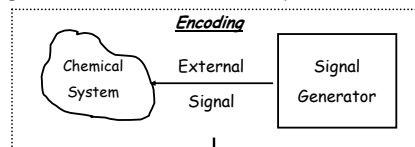


- Lamp
- DC/AC signal source
- Sample itself!

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The Analytical Signal

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



↓ *Analytical Signal*

- EMR (optical spectroscopy)
- Electrons (echem, e⁻ spec)
- Chemical Species (separations)

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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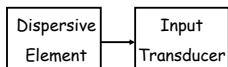
Dispersive Element

- 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)

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