

Department of Crop and Soil Sciences

Commemorating Our Centennial, 1907–2007

TOUR OF SOIL CHEMISTRY LABS (09/22/07)

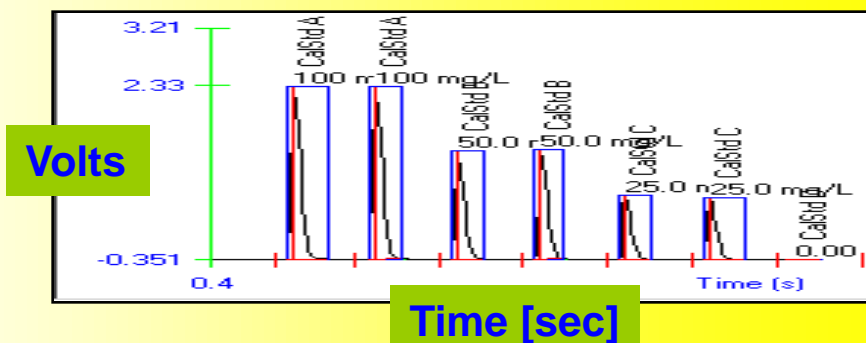


WELCOME TO THE TOUR OF SOIL CHEMISTRY LABS



• **Instrument:** Lachat QuikChem® FIA + 8000 Analyzer

• **Principle:** Analysis is based on reacting sample with reagent to form **color complex which absorbs light at a specific wavelength**. The absorbance of the reaction product is directly proportional to the concentration of the analyte in the sample.



• **Capabilities:** Two sample processing modules (channels) configured to analyze silica, iron, aluminum, nitrate, nitrite, ammonia, total Kjeldahl nitrogen (TKN), total dissolved nitrogen, ortho-phosphate, total dissolved phosphorus, molybdenum.

• **Operator:** Justine Cook, MS Candidate

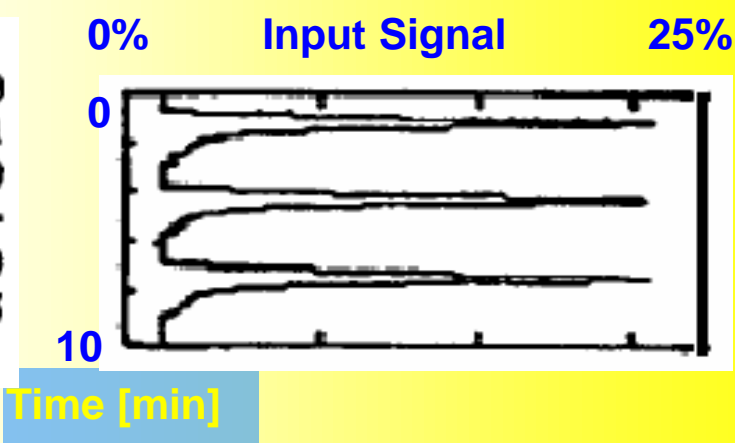


• **Instrument:** Shimadzu SSM-5000A and TOC-5000A Analyzer

• **Principle:** The sample is combusted or decomposed to CO_2 , and detected in a **non-dispersive infrared gas analyzer (NDIR)**. The peak area counts are proportional to concentration of **carbon** in sample

#	AREA	ppm
1	9017	11.500
2	8728	11.131
3	8931	11.390

MN	8892	11.340
SD	148	0.1893
CU	1.66	%



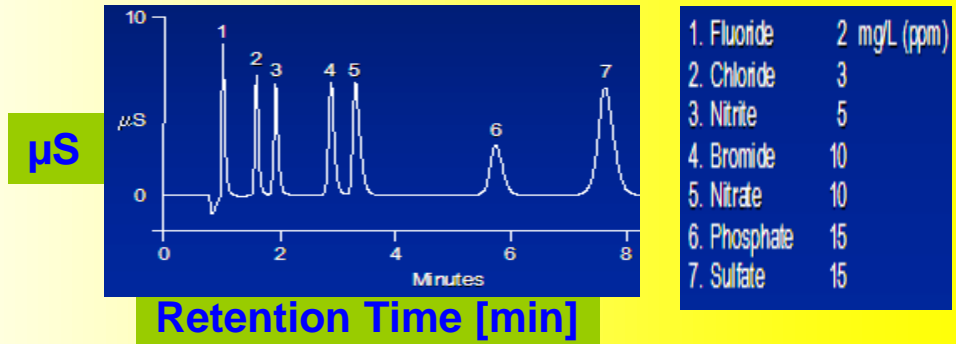
• **Capabilities:** Analysis of total carbon (**TC**), total organic carbon (**TOC**), inorganic carbon (**IC**), dissolved organic carbon (**DOC**), purgeable organic carbon (**POC**), and non-purgeable organic carbon (**NPOC**).

• **Operator:** **Kulbhusan Grover, PhD Candidate**



- **Instrument:** Dionex DX 500 Ion chromatograph (IC)

- **Principle:** Dionex DX 500 is a **liquid chromatograph** where charged **species are separated by selective distributions** in an electrolytic mobile phase and a stationary phase with weak ionic sites. Detection is performed by a **conductivity detector** – the greater the concentration of ions the higher the conductivity of the solution.



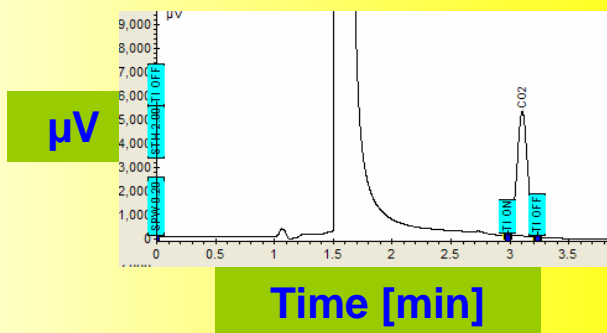
- **Capabilities:** Rapid, sequential measurements of **halides** (Br⁻, Cl⁻ and F⁻), **oxides** (NO₂⁻, NO₃⁻, PO₄³⁻, SO₃²⁻ and SO₄²⁻) and alkali metal and alkaline earth **cations**.

- **Operator:** **Dr. Ephraim Govere (Manager)**



- **Instrument:** Varian CP-3800 Gas Chromatograph

- **Principle:** A portion of the sample is injected into a gas chromatograph (GC) and compounds in the sample are moved through the column by the carrier gas. They travel through the column at different rates depending on **differences in partition coefficients** between the mobile and stationary phases and are determined by detector and integrator.



- **Capabilities:** Varian CP 3800 is equipped with *flame ionization detector (FID)*, a selective and mass flow dependent detector for most organic compounds, specifically hydrocarbons, an *electron capture detector (ECD)* for a selective and concentration dependent detector for halides, nitrates, nitriles, peroxides, anhydrides, organometallics, and a *thermal conductivity detector (TCD)* a non-selective detector and concentration dependent detector for organic and inorganic compounds.

- **Operator:** Marshall McDaniel
PhD Candidate



• **Instrument:** INNOVA 1412A Gas Analyzer

• **Principle:** Optical radiation, from infrared-source, is used to excite a gas molecule. The sample absorbs some of this radiation resulting in an increase in the internal energy. The **pressure changes** that occur upon periodic or pulsed sample heating can be detected by using a **microphone to monitor the acoustic wave**.

Time	A: AMMONIA [ppm]	B: CO2 [ppm]	C: NITROUSOXIDE [ppm]
05-07-23 02:31:29	0.315	535.385	0.270
05-07-23 02:32:32	0.179	546.048	0.244
05-07-23 02:33:32	0.239	541.960	0.247

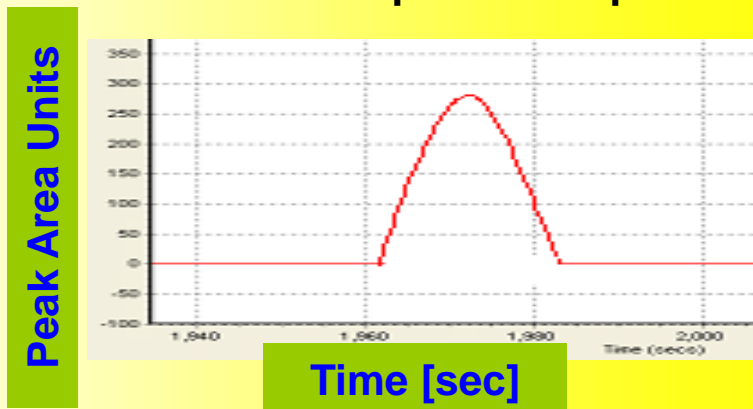
• **Capabilities:** Highly accurate, reliable and stable quantitative carbon dioxide (CO₂), nitrous oxide (N₂O) ammonia (NH₃), methane (CH₄), volatile organic carbons (VOC) and water (H₂O) vapour monitoring system. Capable of measuring almost any gas which absorbs infrared light.

• **Operator:** **Marshall McDaniel, PhD Candidate**



• **Instrument:** LICOR LI-7000™ CO₂/H₂O Analyzer

• **Principle:** The LI-7000 is a **differential, non-dispersive, infrared (NDIR) gas analyzer**. Measurements are based on the difference in absorption of infrared (IR) radiation passing through the reference cell of known CO₂ or H₂O concentration and the sample cell of unknown concentration. The radiation at the detectors is measured in both cells and used to compute absorption.



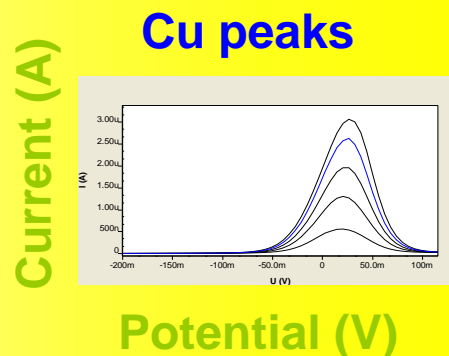
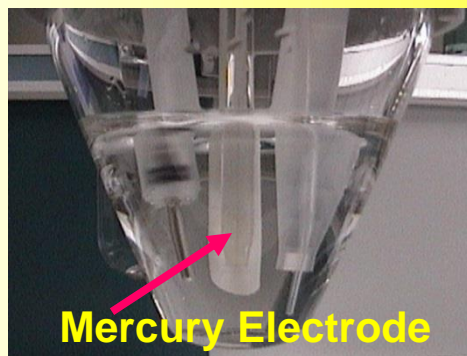
• **Capabilities:** High performance, dual cell analyzer for **CO₂** and **H₂O** in the same gas stream.

• **Operator:** **Emad Aboukila, PhD Candidate**



• **Instrument:** Voltammeter - **Metrohm 797 VA Computrace**

• **Principle:** **Current-Potential** measurements from **redox reactions** are made at a **working electrode** for determination of organic compounds or trace metals.



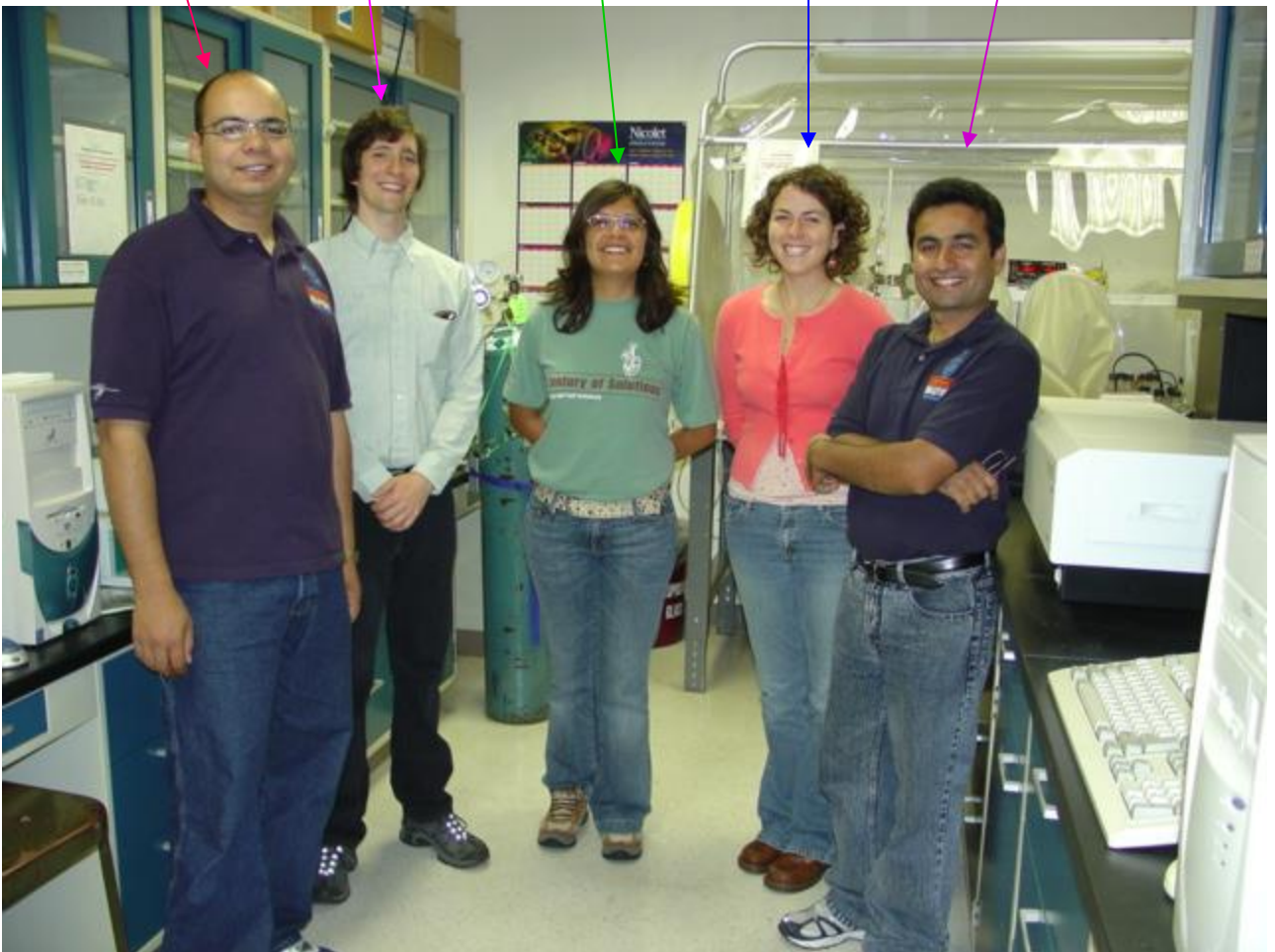
• **Capabilities:** Analysis of **organic compounds and trace metal** with a **high degree of sensitivity** (i.e. 50 ppt Cu) and with the additional capability to differentiate between **various oxidation states and free and non-free ions**.

• **Operator:** **Nadia Martínez-Villegas, PhD Candidate**



WELL DONE!!!

Emad, Marshall, Nadia, Justine, Kulbhushan



Thank you Alumni, graduate students, & Dept Head for making the tour a success!!

