

LA-SiGMA Experience

Chris Hynes



Professional Background:

- Ph.D. Analytical Chemistry, Oklahoma State University, 1991
- 20+ years of teaching various courses: Physical Science, General Chemistry, AP-Chem, Organic, Analytical, Polymers
- Current employment: Louisiana School for Math, Science, and the Arts, Natchitoches, LA. Residential high school for high aptitude and highly motivated students.



Projects:

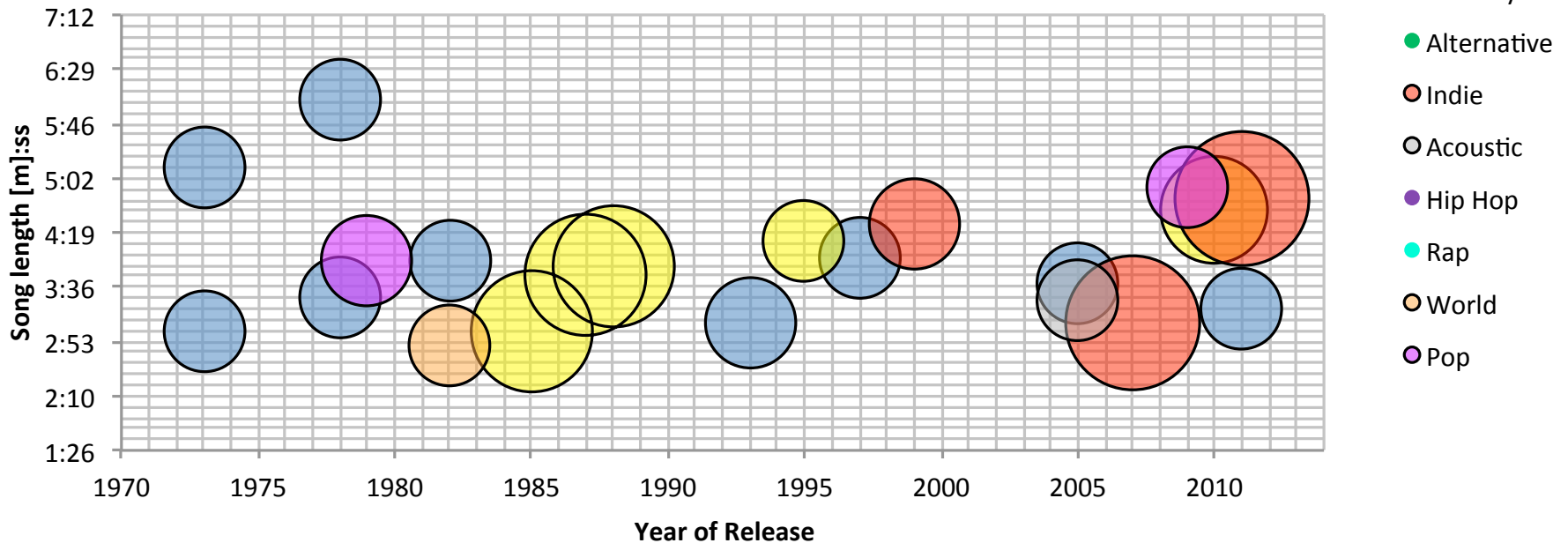
- Develop instructional material to teach a course called "Introduction to Visualization"
- Present the material in an iBook format using iBook Author

Accomplishments:

- Brought together several visualization software packages, mostly freeware (Excel, ImageJ, VisIt, VMD, ParaView)
- Created and imported instructional material into an iBook format
- Two offerings of Introduction to Visualization

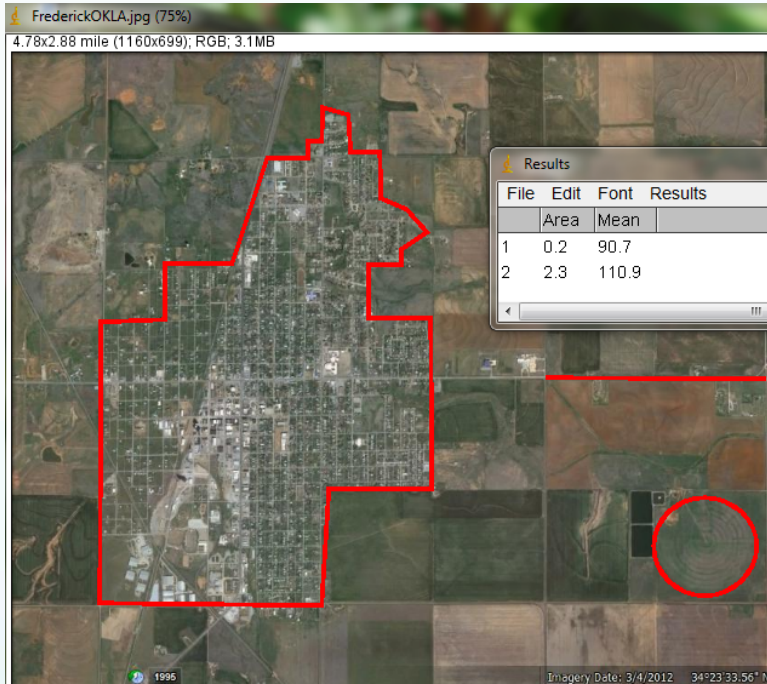
Excel:

Visualization of Song Playlist Top 20
Year, Song Length, Play Count, Genre

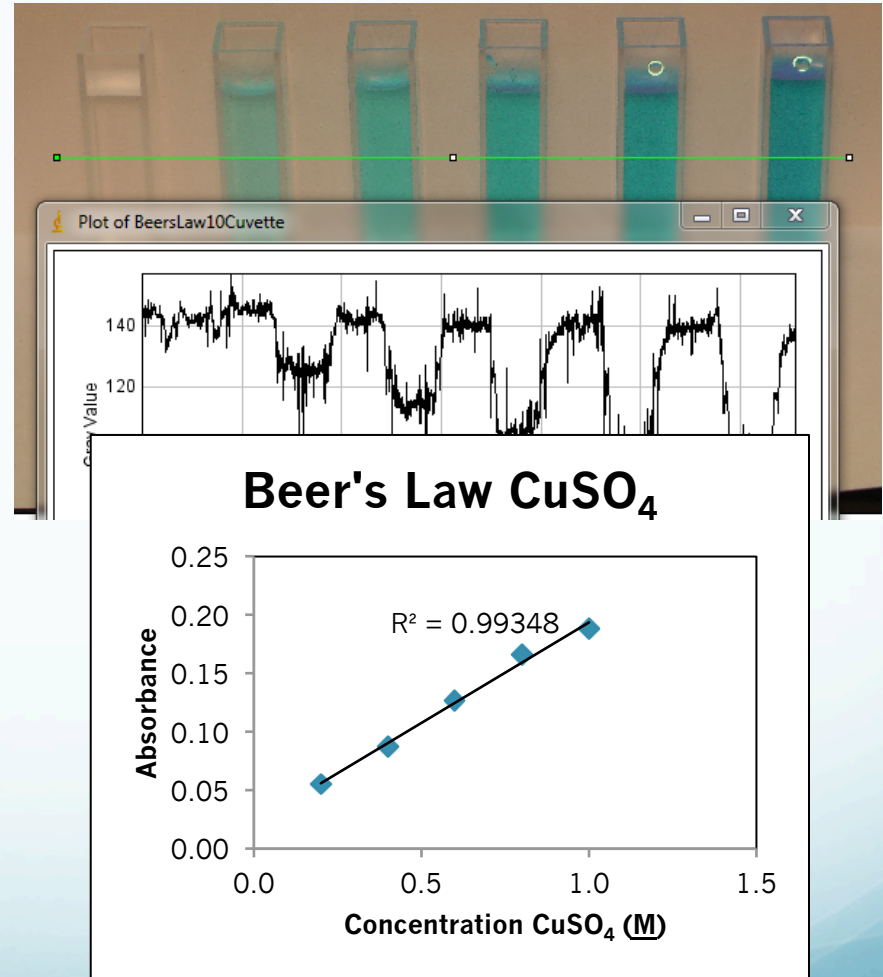


Multi-dimensional plot of personal music interests adding color and size to convey more information.

ImageJ:



Satellite Imagery: %Populated vs %Farmland Area¹

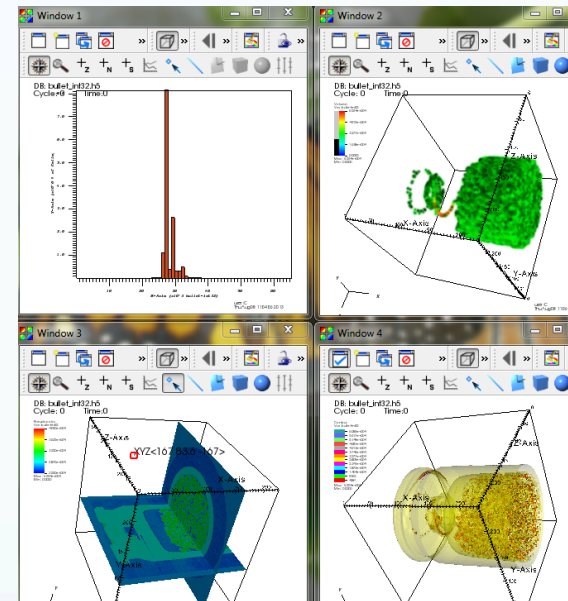
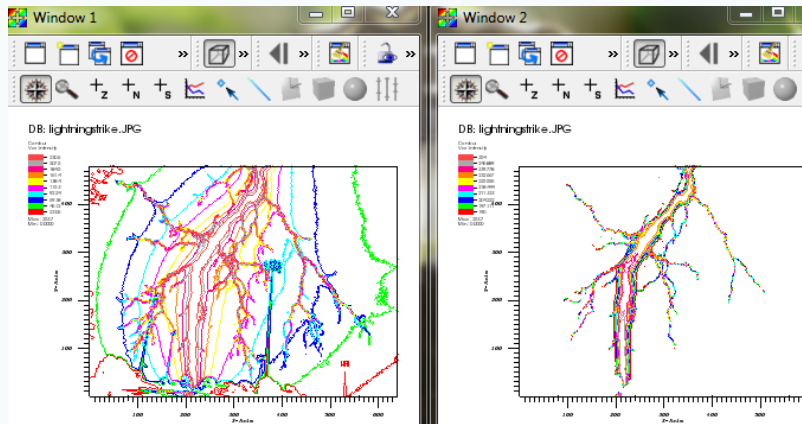


\$20 camera versus \$2000 instrumentation

VisIt

Lightning Strike², small, 2-D data set

Bullet³, very large, 3-D data set



Danger!!! Laptop crash ahead. Solution? High performance computer

iBook

Overlays, Marker colors, & Marker glyph style

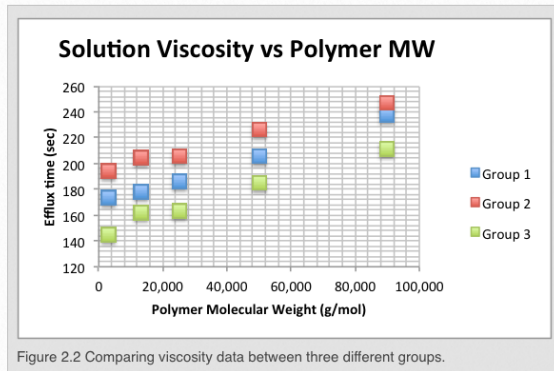


Figure 2.2 Comparing viscosity data between three different groups.

The main focus of this section will demonstrate how to overlay several data sets on the same plot within Excel. Secondly it will demonstrate how to change the marker color and glyph style. Re-sizing the Y axis will also be reviewed.

Now would be an appropriate time for the Reader to download the Excel files that will be used for the step-by-step Gallery 2.1 ([Polymer viscosity](#)) and Gallery 2.2 ([IR Spectra](#)). Click on the links and it should take you to a website where the data files

are stored. Download them (REMEMBER WHERE SAVED THEM). For additional practice exercises [Cyclic Voltammetry](#) and [Gas Chromatography](#) can be downloaded.

Let's begin with looking at Gallery 2.1. Open the Excel file **Polymer viscosity** and you should see something that resembles the first Gallery slide. Follow the slides at your own pace and perform each step. A red box highlights the portion of the Excel spreadsheet that is your current task.

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| Group | Molecular Weight (g/mol) | Efflux time (sec) | Trial 1 (sec) | Trial 2 (sec) | Trial 3 (sec) | Trial 4 (sec) | Trial 5 (sec) |
|---------|--------------------------|-------------------|---------------|---------------|---------------|---------------|---------------|
| Group 1 | 10,000 | 175 | 175.7 | 177.2 | 181.5 | 205.3 | 217.8 |
| Group 1 | 20,000 | 185 | 185.9 | 187.7 | 191.9 | 202.5 | 215.0 |
| Group 1 | 50,000 | 205 | 205.42 | 206.42 | 206.72 | 217.58 | 224.22 |
| Group 1 | 90,000 | 235 | 235.59 | 235.7 | 237.69 | 248.61 | 263.74 |
| Group 2 | 10,000 | 195 | 195.19 | 201.49 | 205.28 | 218.51 | 248.62 |
| Group 2 | 20,000 | 205 | 205.3 | 205.3 | 205.7 | 217.69 | 248.61 |
| Group 2 | 50,000 | 225 | 225.3 | 225.3 | 225.3 | 237.69 | 263.74 |
| Group 2 | 90,000 | 250 | 250.3 | 250.3 | 250.3 | 263.74 | 293.7 |
| Group 3 | 10,000 | 145 | 145.3 | 145.3 | 145.3 | 148 | 184.6 |
| Group 3 | 20,000 | 155 | 155.3 | 155.3 | 155.3 | 158 | 211.4 |
| Group 3 | 50,000 | 175 | 175.3 | 175.3 | 175.3 | 178 | 211.4 |
| Group 3 | 90,000 | 205 | 205.3 | 205.3 | 205.3 | 208 | 211.4 |

Highlight the cells for Group 1 - Molecular Weights & Trial 1

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After creating overlays and changing marker colors and styles, it is left up to the reader as to what style they want to make their plot. The markers can all be the same color but different style, all the same style but different colors, or different colors and different styles. Whatever you choose, I wouldn't recommend making it too foo-foo

looking. Keep it professional. Also consider whether you have a color printer or not. If you don't have a color printer, all of your colors may end up being indiscernible shades of gray. You should change your marker styles to "X", "O" (open circle), shaded circle, open/shaded boxes and/or triangles. The reader

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Textbook layout with interactive Widgets and hyperlinks

Challenges:

- Learning how to use 6 different software
- Finding/Creating appropriate data sets

Continuation:

- I have been able to offer this course twice and hopefully will continue to do so.
- Refine the course material using student feedback.
- Add more types of visualization software (VMD, KiwiViewer, ParaView, 123D, augmented reality, Blender).
- Add more data themes (esp. humanities).
- Disseminate the material to teachers, students, technicians, and continuing education
 - at professional meetings
 - online availability through iBooks and/or LONI website.

Acknowledgements:

- This material is based upon work supported by the NSF EPSCoR Cooperative Agreement No. EPS-1003897 with additional support from the Louisiana Board of Regents.
- Special thanks to Dr. Les Butler (mentor), LSU Chemistry Dept. for planting the seed of developing a visualization course
- Shawn Liner and Gerald Knapp (Viz iBook contributors).



References:

- ¹Google Earth 2012
- ²Courtesy of Robert Firth
- ³Courtesy of Les Butler

Why?

- Started with a need for developing instructional material for a local industry that was unfamiliar with visualizing X-ray tomography data. After obtaining data, what can you do with it?
- Informal instruction how to render it, extract information, manipulate, and capture images for communication.
- Same visualization skills are applicable to most data sets. A great opportunity to create a visualization course
- With ever-increasing creation of large, complex data sets, there is a legitimate need for people with visualization skills to transform the data into a comprehensible manner for the scientific community and general public.