

# Historical Radiological Events: Trend Analysis

## Technical Reachback

2017

### Interns

**Shu Saechao**, California Polytechnic State University 2019, Electrical Engineering  
**Timothy Trammel**, California State University, Stanislaus 2018, Cognitive Science  
**Byron Ullauri**, New York City College of Technology 2018, Computer Systems Technology

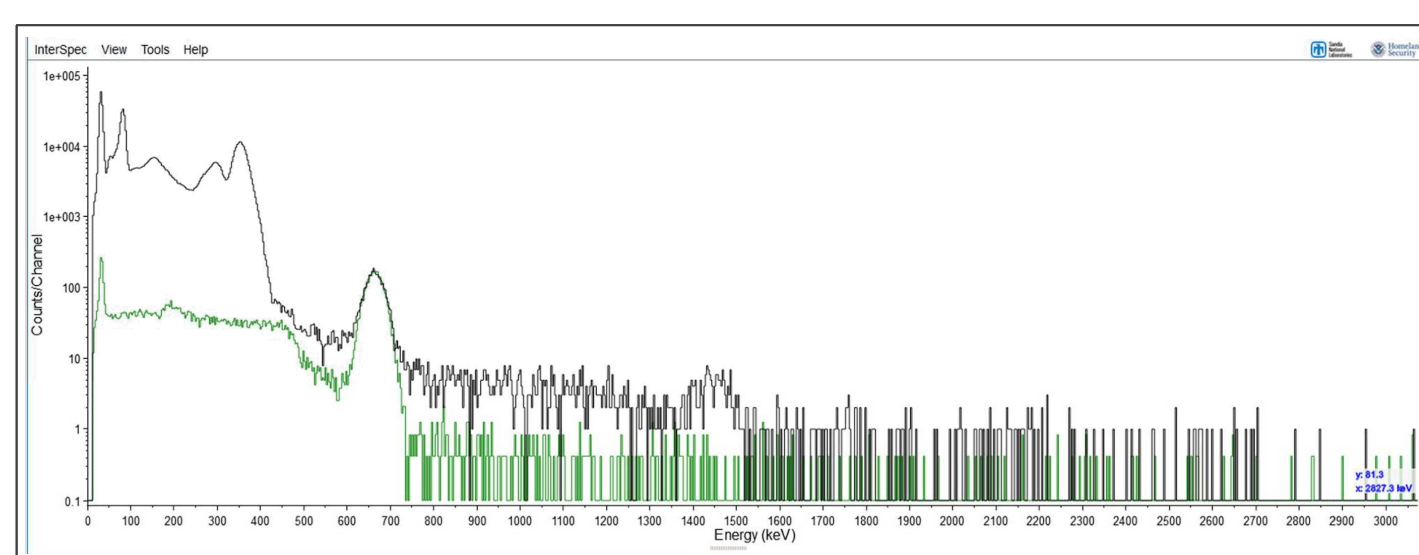
### Mentors

**Heather Seipel**, Org 8727 Rad/Nuc Detection Systems  
**Edward Walsh**, Org 8754 Quantitative Modeling & Analysis  
 Sandia National Laboratories, CA  
 U.S. Department of Energy

**Abstract:** Sandia National Laboratories' Technical Reachback (TRB) program, sponsored by the Department of Homeland Security's Domestic Nuclear Detection Office, develops tools and analysis capabilities to support radiological detection. Primarily, this support is related to radiological threat assessments reported within the United States and at its borders. TRB supports Radiological Triage, a National Nuclear Security Administration program, by analyzing historic Triage report data in order to identify isotope reporting trends, and to develop an analysis capability to support this historic data set. This analysis is intended to provide improved understanding of the historic event information, and to provide data which enables the continual improvement of the Triage process.



**Data Extraction:** The first phase of this project was to extract data from our source materials: Triage Event Viewer and spectrum files. We wrote Python scripts to format the data for easy import into the project's SQL database. These scripts are general and robust enough to be used to add future data to the database.



Example radiation spectra as seen in the InterSpec software tool.

**Database Construction:** The project's database stores information for each event. Our team integrated many data sources to form our dataset, and worked on establishing a knowledge base that can answer questions such as: What isotope was encountered the most in a specific event/area? What events had the most isotopes reported within a date range? What isotope pairs were most often found?



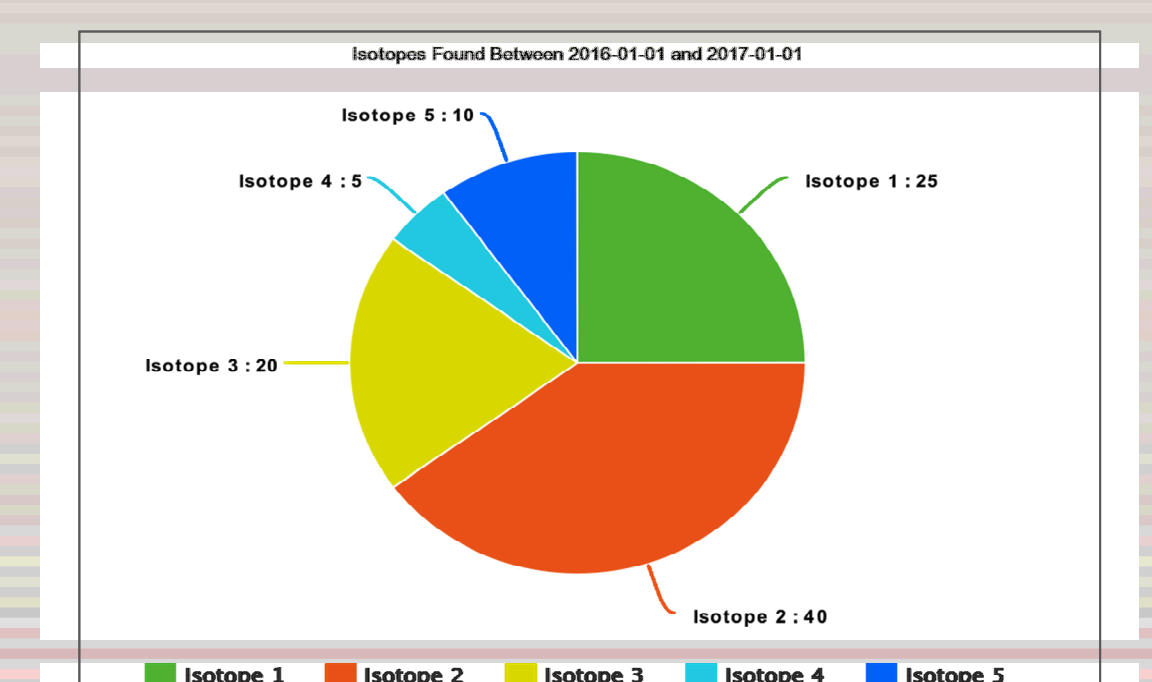
TRB interns use a handheld radiation detector to scan for the presence of radioactive isotopes.

**Data Set Review:** Due to the potential impact of this project, it is crucial that the data being analyzed can be trusted. Therefore, one of the phases of the project is to perform a manual review of the data for each event. This manual review must be tracked and we designed software to allow the team to track when and by whom each event was reviewed.

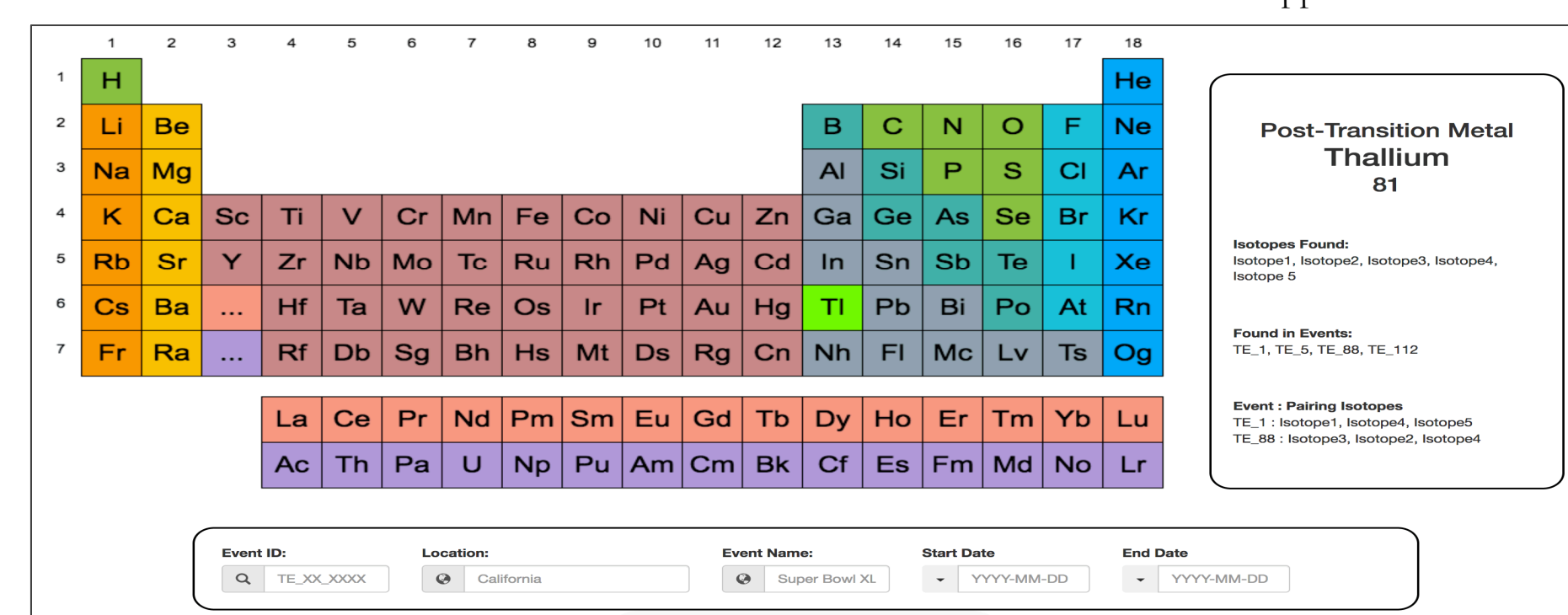
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TE-11-1113	Yes	TE-11-1113.docx	Byron	7/30/17	7/32/17
TE-11-1114	Yes	TE-11-1114.pdf	Byron	7/32/17	7/32/17
TE-11-1114	No	Unknown	Byron	7/32/17	7/32/17
TE-11-1115	Yes	TE-11-1115.docx	Byron	7/30/17	7/32/17
TE-11-1116	No	Unknown	Timothy	7/30/17	7/32/17
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The Data Quality Review Spreadsheet allows users to assign events to team members and tracks key information such as assignment and completion dates.

**Data-Visualization:** We created a web application that provides users a means of querying the project's database. This web-app facilitates analysis by generating various charts that depict resulting data-sets.

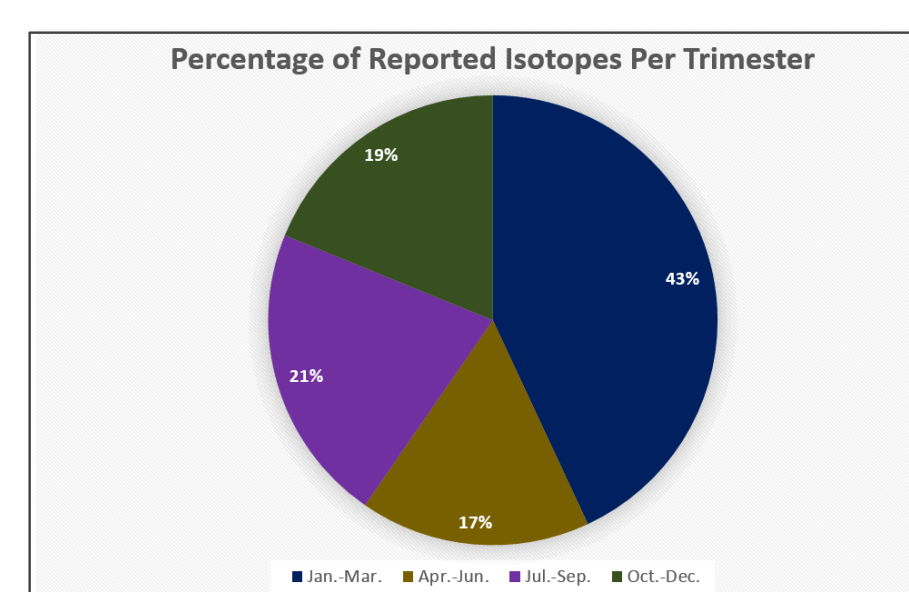


Example of data visualization types the web-app supports.



The web-application allows analysts to easily pull up data on a by-element basis.

**Data Analysis:** The constructed database will enable continuing analysis of the data set. To improve situational awareness of radiological events, software tools were written to extract data from incident reports and from RIID (Radioisotope Identification Devices) reports. Analysts can use the data to identify trends and anomalies. The nation's security is enhanced through improved analysis capabilities of this historic isotope reporting data.



This chart identifies an isotope trend that can support analysts.



This graph shows trends in reports over a period of time.

**What is Radiological Triage?** Radiological Triage is an NNSA program that remotely assists emergency responders during nuclear or radiological incidents. Triage draws upon the expertise of scientists and engineers from the NNSA and the Department of Energy's national laboratories for rapid and accurate assessment of radioisotopes (nnsa.energy.gov, 2016).

#### References

nnsa.energy.gov. (2016, 10 29). *Radiological Triage*. Retrieved July 14, 2017, from nnsa.energy.gov: <https://nnsa.energy.gov/abouts/ourprograms/emergencyoperationscounterterrorism/respondingtoemergencies/rendersafe-2>