Research Statement

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I would be interested in conducting research in remote sensing, GIS, environmental science, and climate change – integrating the geospatial/geologic data collected during fieldwork and lab work with remote sensing data. I am in the process of writing a nonfiction book, "The Art of Science; Seeing, Interpreting, and Analyzing Data, and Visualizing Processes" using examples, which include Migration Patterns of Colorado's Elk Population (GIS and Environmental Science), Tectonic Evolution of the Wadi Bidah Mineral District, Saudi Arabia (Geology), and the Mpemba Effect (Chemistry).

My research uses an interdisciplinary approach to understanding and addressing complex geospatial challenges involving Earth systems, climate change, imagery analysis, geospatial analysis, temporal analysis, and understanding complex socio-ecological systems. I demonstrate this interdisciplinary approach to research in the laboratory exercises I have developed for my remote sensing class at the University of Tulsa. Laboratory exercises include: "Texas' Climate, Biomes, Water Resources, Agriculture, and Industry", "Naval Air Station Dallas and the Life Cycle of the American Automobile" and "Imagery Intelligence Analysis – Omsk, Russia".

The laboratory exercise, "Texas' Climate, Biomes, Water Resources, Agriculture, and Industry," uses Google Earth imagery to answer questions about the climate, biomes, water resources, agriculture, and industry encountered across Texas within three distinct biomes. A complete answer to a question includes an image or images, a description (caption) of what is seen in the image, and the answer to the question/s. Students start out by describing what they see on the imagery, how climate and biomes change as they move from east to west. East Texas has temperate forests and receives more than 40 inches of rain per year. West Texas is a temperate grassland receiving between 10 and 20 inches of rain per year. Central Texas is a zone of transition, an ecotone, separating the forest to the east from the grassland to the west. Students are easily able to see and describe these biomes as they move

from east to west. Students then zoom in to each region and describe what they see on imagery that specifically relates to Water Resources, Agricultural Activity, and Industrial Activity. Water resources include surface water and groundwater. East Texas has many reservoirs and streams (students estimate/calculate area of the region covered by surface water). East Texas is approximately 3% surface water and west Texas is <1% surface water. Agricultural usage of groundwater in west Texas has surface expression as center point irrigation, circular fields. East Texas does not need to irrigate crops because they receive ample rain. Students can easily see changes in the types of agriculture as they move across the state. East Texas has a high concentration of tree farms. Students can see the difference between the tree farms with one species of trees planted in rows and natural forests made up of diverse species of varying sizes. West Texas has center point irrigation so lots of circular fields. Students can also easily describe industrial activity in each region, by describing water usage, wastewater treatment, storage of raw materials, and storage of finished products. The east Texas industry is a paper mill, central Texas industry is a gravel mine/pit, and the west Texas industry is a feedlot.

I am also writing a book, The Art of Science: Seeing, Interpreting, and Analyzing Data in order to Visualize Natural Processes. Chapter 7 is a Temporal and Geospatial Analysis of Elk-Vehicle Collision data used to understand the migratory patterns of Colorado elk. When I lived in Aurora, Colorado and worked in Los Alamos, New Mexico. I would drive down to work early Monday morning and return home Friday afternoon, along the Front Range, up and over the Sangre de Cristo mountains, down the Rio Grande River Valley, and up the side of the Valles Caldera. One spring morning, shortly after sunrise at a stop along highway 285 at San Antonio Mountain just across the New Mexico state line I pulled over to take a break and observed four elk approaching from the east. The elk came to a fence across the road from where I was standing and jumped over the fence, crossed the road, jumped over the fence on the west side of the road, and continued to the west over a ridge and out of sight. When I arrived at work, I told colleagues about my early morning encounter with the elk. I was told that I should be extremely cautious when driving during the elk migration because a vehicle will collide with the elk injuring or

killing the occupants of the vehicle (I would have to assume that the elk would also be seriously injured or killed too). The observations that I made in the field and the conversations with my colleagues about elk migration, elk-vehicle collisions, and people being injured or killed piqued my interest in this problem and I started to ask myself questions, fact check what I had been told about the problem, and acquiring data for the temporal and geospatial analysis.

My most recent publication (2017) is an example of the type of research I conducted for my PhD: Metavolcanic host rocks, mineralization, and gossans of the Shaib al Tair and Rabathan volcanogenic massive sulphide deposits of the Wadi Bidah Mineral District, Saudi Arabia, was a collaborative effort involving geoscientists from the US and Canada. This paper describes the geochemical and petrological evolution of massive sulfides deposits, of the Wadi Bidah Mineral District, Saudi Arabia and also includes a discussion of the tectonic setting (back arc basin) in which the deposits formed as well as the structural evolution of the mineral district.