Regina L. Dickey is a Ph.D. student at Texas A&M and is working with Dr. Thomas Yancey. Her hobbies include camping, boating, birding, fossil collecting, reading, and a 2 ½ year old son.

The goal of this proposed research is to compile a detailed palynological biostratigraphic analysis of the upper part of the Wilcox Group in central Texas, encompassing an interval that includes the Paleocene-Eocene series boundary. This part of the stratigraphic section in the northern part of the Gulf of Mexico region has limited documentation of the changes in microbiota, despite the high level of interest in the interval. The section is thick but fossil content is sparse, except for fossils of plant origin. The majority of fossil remains present are derived from land plants, including large volumes of woody debris , abundant reproductive bodies (pollen, spores), and leaves. Leaf fossils and wood debris is concentrated in shore zone deposits, but pollen and spores are widely distributed. The organic acids produced by the decay of plant tissue have resulted in the diagenetic loss of nearly all carbonate remains. Therefore, palynology provides the best means of determining age relations and documenting the record of environmental change for these deposits. I intend to tabulate the stratigraphic changes in pollen in the uppermost parts of the Wilcox Group, based on outcrop exposures located near the town of Bastrop, Bastrop County, Texas. By doing so, I expect to produce a documentation with applications for the oil and gas industry as well as for academic research. The focus of my research is a study of the Red Bluff section of the Calvert Bluff formation and overlying Carrizo Formation exposed beside the Colorado River. This research is being conducted concurrently with a sedimentological study of the same section by faculty and students in the Department of Geology and Geophysics at Texas

A&M University. Through their thesis work and research, a documentation of the stratigraphy of the section and the depositional environments will be made. With this data in hand, I will be able to focus solely on the palynology of the section.

The Wilcox Group in Texas is an interval of sedimentary deposits extending from the Sabine River on the east to the Rio Grande (Fisher and McGowen, 1969) in the south. It is exposed in a wide outcrop belt and occupies a large volume in the subsurface. It is highly significant in terms of economic value because of the large reserves of lignite exposed in the outcrop belt and shallow subsurface and the large volumes of hydrocarbon-bearing sands in the deeper subsurface. It also contains the largest aquifer in the region and will play an important role in water resource management. The Wilcox Group was deposited primarily during the time of the Laramide orogenic event in the western United States, that generated a large flood of sediment associated with Laramide uplift. These sediments were transported by fluvial processes towards the Gulf Coast and began to fill in the Gulf as they were deposited at and near the marine shoreline, building out the continental shelf. Early work has shown the Wilcox to be a marginal marine environment that is predominantly shore zone to shallow marine. Crabaugh and Elsik (2000) have provided a general zonation that spans the interval. Elsik has also laid the palynological groundwork for the section by producing a basic, but limited, assessment of some of the pollen present. Jardine and Harrington (2008) have done work in the section on a very limited scale as well, with only 25 samples from 4 areas. My research is, therefore, a unique opportunity to look at an interval not well examined previously.

Aside from documenting the palynological biostratigraphy of the upper Wilcox Group in this area, this work will attempt to identify the Paleocene Eocene Thermal Maximum (PETM) boundary in the section. The PETM was a time of rapid warming on a global scale at approximately 55 Ma and a time of climatic instability. This sudden rapid temperature increase is associated with a rapid rise in atmospheric CO_2, several degrees Celsius rise in temperature, the

migration of many plant and animal species to more northern latitudes, and the extinction of various marine and terrestrial species. Opportunistic terrestrial species have been documented in the palynological record during this interval. *Platycarya* (Fig 1.) is an Asian native that migrated to North America during the PETM. "*Platycarya* (Wing and Hickey, 1985) expanded range by spreading into naturally occurring forest clearings that are niches exploited commonly by invasive pioneer taxa in warm-adapted vegetation types during secondary succession" (Harrington, 2001). *Platycarya* has a first occurrence in many localities during the PETM, therefore making it a key palynomorph to study in this time interval. Although the PETM resulted in the extinction of some marine species, other opportunistic species thrived during this time of unsettled environmental conditions. The dinoflagellate genus *Apectodinium* is a cosmopolitan indicator of the PETM. This genus, "which was restricted to low latitude regions before the PETM but showed significant poleward migration at the PETM, inhabited the Arctic Ocean" (Fig. 2, Sluijs, 2006). The thought is that increased temperatures allowed for and increase in rainfall and weathering of the surface layers, thus providing an influx of nutrients to the globally warm oceans and promoting an bloom, or flood, of *Apectodinium*. The determination of a marginal marine environment in sediments of the upper Wilcox (upper Calvert Bluff and Carrizo) in the Bastrop area by ongoing work at Texas A&M University suggests that in addition to pollen, dinoflagellates would be expected here as well.

Fig 1

Fig 2

Closely spaced samples will be taken through a 20 meter section of the Wilcox outcrop near Bastrop. The primary section for the study is located along Riverside Drive in the Tahitian Village

subdivision near Bastrop and borders the Colorado River (Fig 3). Samples have also been taken through a short section in the upper Calvert Bluff Formation in a temporary exposure at the intersection of Highways 71 and 21. I have begun this study by processing samples to extract the fossil pollen and other palynomorphs. This will be accomplished by utilizing facilities of the palynology lab maintained by Dr. Vaughn Bryant in the Department of Anthropology at Texas A&M University. After processing is complete, both Perma-mount and liquid mount slides will be made. Using a light microscope with a camera attachment, digital photographs of each unique pollen sample as well as any additional palynomorphs (dinoflagellates, etc.) will be taken and specimens identified. My goal is to complete processing, analysis and writing of my dissertation in three years.

Figure 3 (Courtesy of Google Earth)

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