Palynological reconstructions of early Eocene environmental and biotic perturbations in the Wind River Basin, Wyoming, USA

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The effect of early Cenozoic geologic perturbations on evolutionary trajectories in the sedimentary basins of Wyoming can be extensively studied using palynomorphs. During the late Jurassic, a large foreland basin, extending from the Arctic Ocean to the Gulf of Mexico, was forming as a result of crustal shortening associated with the Sevier Orogeny. From the end of Cretaceous through the early Eocene, this large basin was dissected into a series of well-established smaller basins as a consequence of the Laramide Orogeny. Superimposed on these Laramide geologic changes are previously documented climatic changes. Studies of late Paleocene through early Eocene (~58 – 50 Ma) climate record warming to a sustained Cenozoic maximum called the Early Eocene Climatic Optimum (EECO). With the onset of North American Land Mammal Zone Bridgerian 1b (Br1b, ~51 – 48.5 Ma), the climate became very cool and arid.

This study focuses on ecological trends in the Wind River Basin during the early Eocene. As this location has not been systematically studied paleobotanically, we will examine the pollen-rich lithofacies found widespread throughout the area. With this information, it will be possible to contrast biotic changes in the Wind River Basin to those previously documented in the Bighorn and Green River Basins, to the north and south, respectively. Pollen is very responsive to climatic and environmental changes, which makes it ideal to answer the following questions: (1) How do palynofloral changes in diversity and composition reflect large and small-scale changes, both geographically and stratigraphically? (2) Did Laramide geologic and environmental perturbations affect plant diversity and evolutionary trajectories?

It can be hypothesized that pollen taxonomic and ecological diversity should increase with warming through the early Eocene until the end of the EECO, as seen in plant and mammal communities in the adjacent basins. We predict a major decline in ecological diversity during the Br1b cooling, parallel to that observed in Wind River Basin mammal faunas. It can also be postulated that as Laramide deformation continued to disturb the environment, ecological communities and evolutionary paths will be altered.

Pollen samples were collected from varying lateral and stratigraphical sections of Wasatchian 6 (53 Ma) through Br1b (48.5 Ma). Thus far, 32 samples from the Wind River Formation have been processed. At least 300 pollen grains per sample were indentified, noting where geographically, temporally, and depositionally different genera are recovered. From this, we developed an ecological record used to infer environmental conditions and how they changed through time. Variations in taxonomic diversity were quantitatively analyzed using rarefaction,

Thus far, only broad scale variations of early Eocene palynofloras have been documented in the Wind River Basin. The pollen and spore floras consist largely of non-monocot angiosperms and have a large percentage of Tiliaceae, Aceraceae, Leguminoseae, and Liliales. Fern spores (especially *Lygodium*) are also abundant, and Pinaceae pollen is rare. The location and organization of documented species through time suggests correlation with early Eocene warming through the EECO until the later Bridgerian crash based on individual families climactic preference. In the future, we plan to contrast lateral changes in uniform beds to variations seen between facies at one location. This will help better evaluate the large-scale palynological trends due to the climatic and geographic changes.