INVESTIGATION OF THE INTERMEDIATE SYSTEMATICS OF FOSSIL INSECTS COLLECTED AT THE CLARE QUARRY SITE IN THE FLORISSANT FOSSIL BED, FLORISSANT, COLORADO FROM 1996-PRESENT

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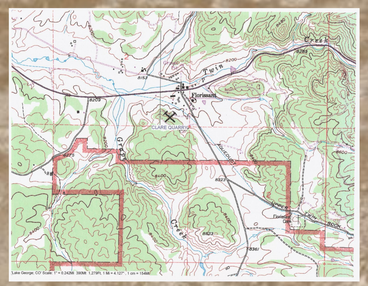
Abstract

The Clare Quarry is a proprietary Quarry located in the town of Florissant, Teller County, Colorado, approximately 30 miles west of Colorado Springs on land proximal to the Florissant Fossil Beds National Monument. The elevation at the quarry face is 2500 meters ASL. 40Ar/39 dating of the upper beds of the Florissant Formationindicates an age of 34.07 +/- 0.10 Ma. An Oreodont fossil jaw and other mammalian fossils place the formation in the Chadronian Age. The basin in which the formation lies is undergirded by Wall Mountain Tuff dated at 37Ma, which sits on Pike's Peak Granite, which is dated at1080 Ma. In the Late Eocene the Florissant region was lacusterine in nature due to the intermittent damming of the river valley which runs north into Florissant. The ash and lahars from volcanic eruptions in the Thirty-nine Mile Volcano Field formed impoundments that produced shallow lakes for what is thought to have been a period of 5000 years. Repeated ash falls placed plant matter and insect material in the lakes and streams that were formed intermittently during the period. The ash layers in the Florissant Formation are very fine grained, and contain diatomaceous mats that formed on the lake deposited ash layers aiding in the preservation of plant and insect material.

Early work on Florissant Fossils was done by Lesquereaux (plants) 1878, Scudder (insects) 1890, and Mac Ginitie (plants) 1953. This project began 17 years ago and has consisted of collection trips ranging from one to eight days during the summer months. The collection consists of 2400 catalogued plants, insects, and fish fossils. To date classification is superficial. One of the early objectives of this work was to collect series of the same genera however there is no discernible pattern below the ordinal level due to the random nature of fossil preservation. In this phase the primary objective will be to place as many insect specimens into families as possible. Many insect families (but no genera) found in the Florissant persist in life today.

Florrisant with respect to Colorado Springs



Clare quarry location with respect to the monument

METHODOLOGY

OBJECTIVE: To Collect a sufficiently large sample of insect fossils to enable identification to the family level. The initial intent was to try to collect series of insect fossils that would allow the determination of Genera. Over the past 16 years collection trips of from two to eight days in a summer have resulted in 2406 cataloged and stored accession numbers. Presently 450 insect fossils ranging in quality from poor to Pristine have been separated from the main collection for study. To Date there has been insufficient duplication of identifiable insect fossils in the collection to provide enough views that will allow work at this level. Currently 18 percent of the catalogued and stored material is insect. The preponderance of material is plant material. The insect fossils in the collection are often in the 2mm range though there are occasional fossils which are well preserved and of sufficient size to be readily identifiable. The quality of preservation in plant material is better because leaves are usually oriented flat as they are buried and compressed. Insects are three dimensional and rotation and loss of appendages is common. Wings can be bent and overlapped making venation problematic in the identification process.

EQUIPMENT: The Shale in which the bulk of the material is located is extremely fine. Additionally diatomaceous mats formed on the surface and covered many insects with a layer of diatoms which appear to have improved preservation. Single edged razor blades, Exacto Knife chisels, and pin vices are used in locating and fining out delicate insect parts. Field work tends to be gross while lab work is much finer. There is little hammer and chisel work but a lot of splitting and looking. Insects tend to be small and faint compared to most of the plant material.

Steel sewing pins are sharpened to very fine points on an oiled whet stone which is part of the kit. Good steel sewing needles are best because there is little vibration due to flexing which can easily destroy a good specimen. In fine work these needles can easily follow a wing edge or an antenna when properly used.

A compound called Vinactin B - 15 which is soluble in acetone is mixed and used for repairs of cracks and breaks in the shale. With the shale it is better used for rejoining broken rock than for covering a specimen. When the Vinactin dries it leaves a sheen on what it is applied to and obscures detail in later viewing.

A dissecting microscope on an arm is used both in the quarry and in the lab. The scope has a zoom that with different eye pieces can give magnification from seven to 450 diameters. The moveable arm allows for use with different thicknesses of substrate. Shale coming off the quarry face is usually wet and should be dried. In the quarry steel plates are placed on tables. As the sun climbs the plates heat up and by placing shale on them the drying process is accelerated. A couple of weeks in an El Paso garage is effective. In the quarry an afternoon shower or storm can end a day's effort in short order. The use of a plastic tarp can guarantee a quick recovery or a good start on a following day.

IMAGING: Imaging of specimens is important as comparison with other collections and written descriptions takes the place of insect keys which are used with stored or collected insect specimens living in present time. To date three methods have been tried, use of an iphone through the eyepiece of a dissecting scope, Scanning Electron microscope (SEM) and Gigapan imagery.

The iphone provides good real time images that can be easily transmitted by phone or on line. SEM imagery has provided poor images of carbon prints through low contrast. In collaboration with Northern Virginia Community College initial trials have been completed on specimens of varying size and quality with excellent results. The Gigapan system through computer stitching of multiple digital images produces high quality images of extremely fine detail with zoom capability which is very useful in examining taxonomic characters.

CONCLUSIONS: At this stage of the study conclusions are premature. Future use of knowledge gained will have applications in climate study through systematics and ecological relationships that change over geological time.

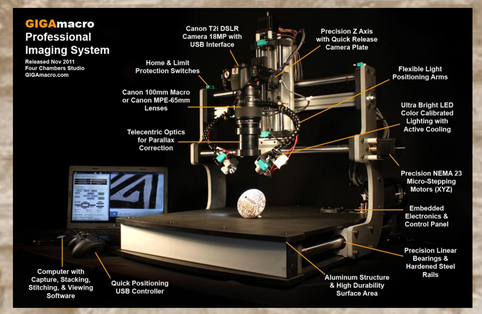
Mega fossil, Redwood buried in Lahars

Fagopsis leaf, predominant tree species at the site in the late Eocene. Genus extinct, Family well represented in the present

Butterfly, Clare Collection

GigaPan and iphone images of Cranefly used in comparison of taxanomic characters of Eoccene and present day specimens

GigaPan image, Diptera, Robber Fly length 9mm



GigaPan imaging device with permission, Four Chambers Studio

Equipment and Storage: a. Handtools, b. Dissecting Scope, c. Main storage, d. Oversize storage, e. micro storage

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GigaPan image, Diptera, length 5 mm

GigaPan Image, Coleoptera, a and b sides, length 1.15 cm

GigaPan Image, Hymenoptera, length 8mm

GigaPan image, Detail of Neuropteran wing Fragment

Field and lab accession notes

Refined data in spreadsheet form

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