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National Museum of Natural History

From Buried Dead to Alive in Your Pocket: Moving Fossil Data from Spreadsheet to Database to Print to Mobile Phone Key APP

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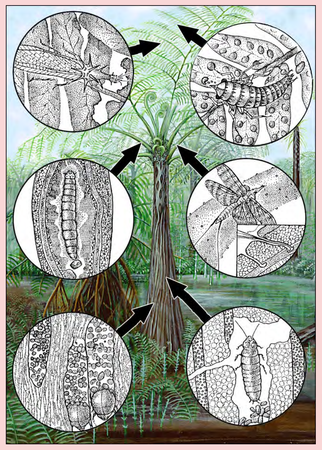
Tracing the path of arthropods-flora interactions from their millions-old deposition & burial toward a live user-responsive interaction smartphone application.

Introduction

Paleobotanical specimens from the fossil record reveal the interaction of insects and plants. Our investigations have two initial endeavors: 1) to identify and morphotype leaves and other paleo-flora and 2) to identify and morphotype the damage caused by insects on such leaves. These are our **Damage Types**. These Damage Types, or "DTs," can be put into ten broad interaction groupings and are referred to as the "Functional Feeding Groups."



Examples of the different types of plant-insect interactions that can take place on a single plant (Psaronius).

The Functional Feeding Groups:

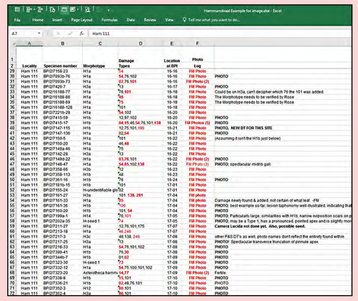
Plant Galling
Hole Feeding
Margin Feeding
Leaf Mining
Surface Feeding
Skeletonization
Piercing and Sucking
Wood Boring
Oviposition
Pathogen

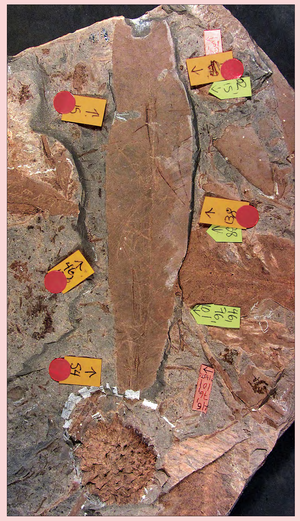
Data Collection

Paleobotanical specimens are collected first hand in field localities.

Specimens already collected by other paleobotanists and housed in their musuems are re-examined for insect damage.

Data is entered on spreadsheets. Botanical specimens that are located in a museum's collections are identified by morphotype, damage types are compiled per specimen, photos are taken (both macro and micro), and unique and specific features are noted.





A typical paleobotanical specimen marked with various damage types.

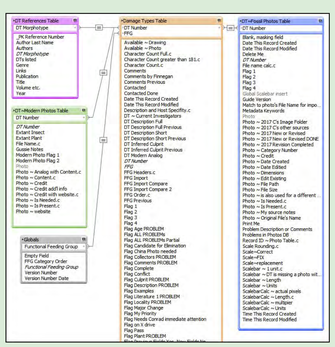
Data from Excel and photos are transferred to Filemaker Pro

Filemaker Pro Advanced

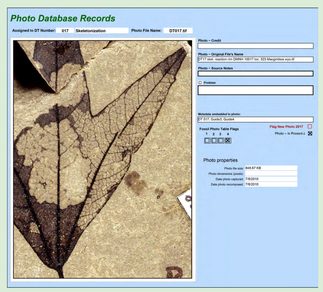
Filemaker Pro Advanced is a database tool for organizing information and establishing relationships between tables of datasets. Our database is composed of five interrelated tables.

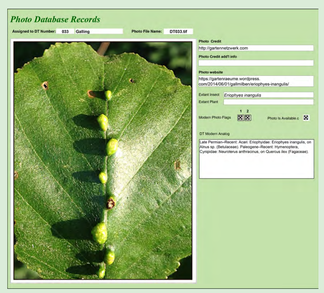
The Damage Table (right) is where the bulk of the data is entered. Two more tables hold photos of fossils and modern examples. A third holds reference material, citations, bibliographies, etc.

The Damage Type ("DT") Number is the *primary key* field for the relationships between tables (below).



The Damage Type Table where most of the relevant data pertaining to a given damage type is recorded. The DT Descriptions are of two lengths, the shorter one for importing into the portable Damage Guide booklet.





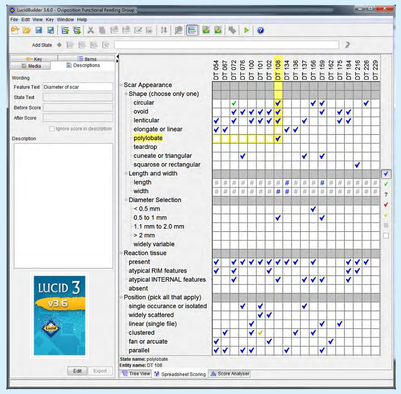
Data from Filemaker Pro is transferred to Lucid

Lucidcentral.org

The Lucid Builder

Using the Lucid 3.6 Builder program an array is created with the Damage Types on one axis and a list of defining characteristics on the other axis. As more damage types are discovered characters are checked off in the matrix. This provides a visual clue for refining the set of characters unique to a DT and helps to distinguish one DT from another.

A character can also be weighed as to its importance. Characters that are vague or often misinterpreted can be indicated. And a choice of one set of characters can be made to restrict the choices available in another set.



How the Player Works:

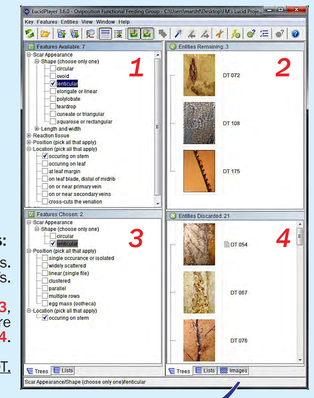
Box 1 presents all the available features.
Box 2 are all the available DTs.

Chosen features in Box 1 drop into Box 3, while DTs that are absent those features are simultaneously discarded into Box 4.

What remains in Box 2 is the final, appropiate DT.

The Lucid Player

The Lucid 3.6 Player is generated from the Builder and can be played on your computer. It can be packaged as a self-contained java applet and distributed to others on a CD. It can be served on-line and viewed in a browser, tablet, or smartphone.



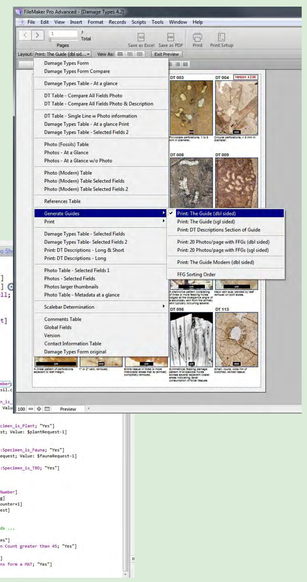
TRY IT! https://tinyurl.com/y8vxsjyo

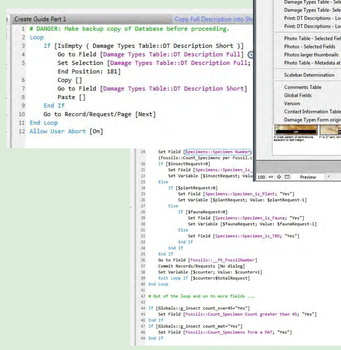
(But sorry, this APP is in-progress, and not yet formatted for the smartphone.)

Under the hood:

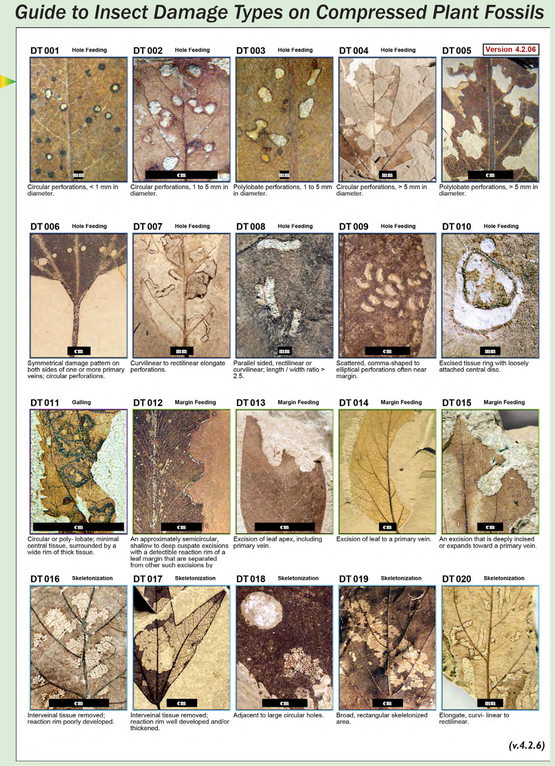
Filemaker Pro *Advanced* allows you to write powerful scripts for processing data and creating reports. A script was written to extract selected content from the Damage Table and combine it with images from the Fossil Photos Table and from the Modern Photos Table. The scripts can generate a variety of Damage Type booklets for distribution, sorted either by DT number or by FFG.

Damage Type Data
Photo Images
Photo Data





Guide to Insect Damage Types on Compressed Plant Fossils



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