# AmberArt II

## a journey between science and beauty

ENRICO BONINO

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## A journey between Science and Beauty

Enrico Bonino

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Includes bibliographical references and indices.



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Preface by: George O. Poinar Jr.

If you are interested in following updates on current publishing projects, or commenting on any aspect of the volume, you can visit the website at : www.enrico-bonino.eu
The site provides photos and information on a variety of specimens, ranging from actual insects to microfossils.

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Front cover: Marsh beetle (Coleoptera : Scirtidae) from Baltic area, ~40 Million-year-old
Previous page: A small beetle larva emerging from vegetal debris. Hukawng Valley, Kachin State, Myanmar, ~99 Million-year-old

*To Diana, whose love carried me through long working evenings and week-ends; and to my son Alessio, for the man he will one day become.*

Cyclophoridae (Mollusca : Gastropoda) - Hukawng Valley, Kachin State, Myanmar, ~99 Million-year-old

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# ACKNOWLEDGMENTS

It should go without saying that this book could not have been published without the enthusiastic contributions of many private collectors as well as professional paleontologists and scholars. Nonetheless, I would like to express my personal appreciation to some of the organizations and individuals that played crucial roles in bringing this volume to completion.

First and foremost, my most heartfelt thanks go to my son Alessio Bonino and my beloved Diana van Altena, who patiently tolerated my long hours working at the computer, taking photos, processing images and preparing illustrations for this heavily illustrated book.

I would like to express my sincere gratitude to Guido Gherlenda, Walter Biggi and Fabio Lena. They "opened my path" in the extreme-macro photography domain. Their feedback and specialized tools are of invaluable value to create stunning photography.

I would like to thank the collectors who provided photos and specimens to be photographed. First of all, I'm grateful to Patrick Müller, Jonas Damzen and Lorenzo Tettamanzi; without their exceptional collection, this book would have had far fewer pages. Contributions of excellent photos and specimens were also provided by Michele Baldi, Luca Lista, Paolo Girotti, John van Marcke, Arthur Michalski, Karin Nordmann, Yuhe Gao. All of them gave access to their exceptional specimens, allowing the free use and publication of their priceless specimens. You will also find photos of specimens from my personal collection.

I would also like to thank Amberexperts (amberexperts.com), Jiazhe Yan (www.ebay.com/usr/burmite-researcher), Zeng Xiantai (www.ebay.com/usr/cretaceous-burmite), Har Nit (www.facebook.com/har.nit.752), for selling many amazing specimens and sharing their museum-grade photographs with me. In addition, I want to express my gratitude to all the professionals who have, directly and indirectly, helped in the classification and provided information about a variety of fossilized insects:

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# PREFACE

"While an ant was walking about in Phaëthon's shadow,
resinous drops quietly enshrouded the fragile creature.
Look at it now, unnoticed it was while still living,
but through entombment transformed into a gem."

*Poem by Marcus Valerius Martialis*
*(photo shows an ant in Baltic amber)*

This new second volume of Amber Art follows the same organization as the first but has additional subjects, especially on life forms in Myanmar amber and an extra section on abiotic remains in amber.

The author used a special type of macro-photography with a mirror-less camera, a microscope lens and a stepper motor to stack photos for better clarity and depth of field. Many subjects were photographed in cross-polarized light, giving them a vivid coloration.

Syn-inclusions often served as added attractions to the main subject. Patterns on or adjacent to various subjects prove fascinating in themselves, even if their true identity remains unknown. One can easily become captivated with subjects in amber's biosphere. Details of a snail's shell, an insect's mouthparts, a fly's eye, a leaf's veins and a feather's quills; all found in the worlds amber and copal deposits.

The topics are arranged alphabetically, beginning with the Amphipoda and ending with the Vertebrata. Also included are fungi and various plants, with a very attractive photo of the flower of *Hymenaea protera*, the legume tree that produced Dominican amber.

Some specimens are entombed in "young" amber, often called copal and in the present volume also referred to as "Defaunation resin". Examples are provided with photographs of insects in copal from Madagascar. Lastly an entire chapter on abiotic inclusions is included in this volume.

The entire book makes a wonderful read, not only to scientists and artists, but also to those that wish to glimpse a bit of our world as it was 20 to 100 million years ago.

*George O. Poinar Jr.*
*Amber Researcher*

# INTRODUCTION

It's only been two years since I published the first volume of the AmberArt book, and here I am again, working on a second edition. The success and interest shown by professionals, collectors, and natural science enthusiasts have led me to propose a second volume, one that includes new photographs and subjects found within this ancient resin.

This second volume follows the same organization as the first, aiming to maintain a structure organized by orders of arthropods, while also including other equally fascinating inclusions, such as feathers, plants, vertebrates, and non-biological origins.

The years between the two editions have allowed me to collect new, biologically and faunistically interesting material, including rare and unusual inclusions. I have focused particularly on the fauna found in Cenomanian amber (Upper Cretaceous ~99 million years ago) from Myanmar. Consequently, most of the photographs feature inclusions from this incredible region of Southeast Asia—a region marked by political instability, yet rich in history, peoples, and humanity.

Inclusions from other locations are also represented, based on their aesthetic appeal, scientific interest, and accessibility. Due to space constraints, it's not possible to include the vast array of studied and accessible forms. The purpose of this book is to engage readers in the beauty hidden within amber. Experience awe when you discover the contents of these tiny 'time capsules in close up'. This book is not intended to be a species catalogue.

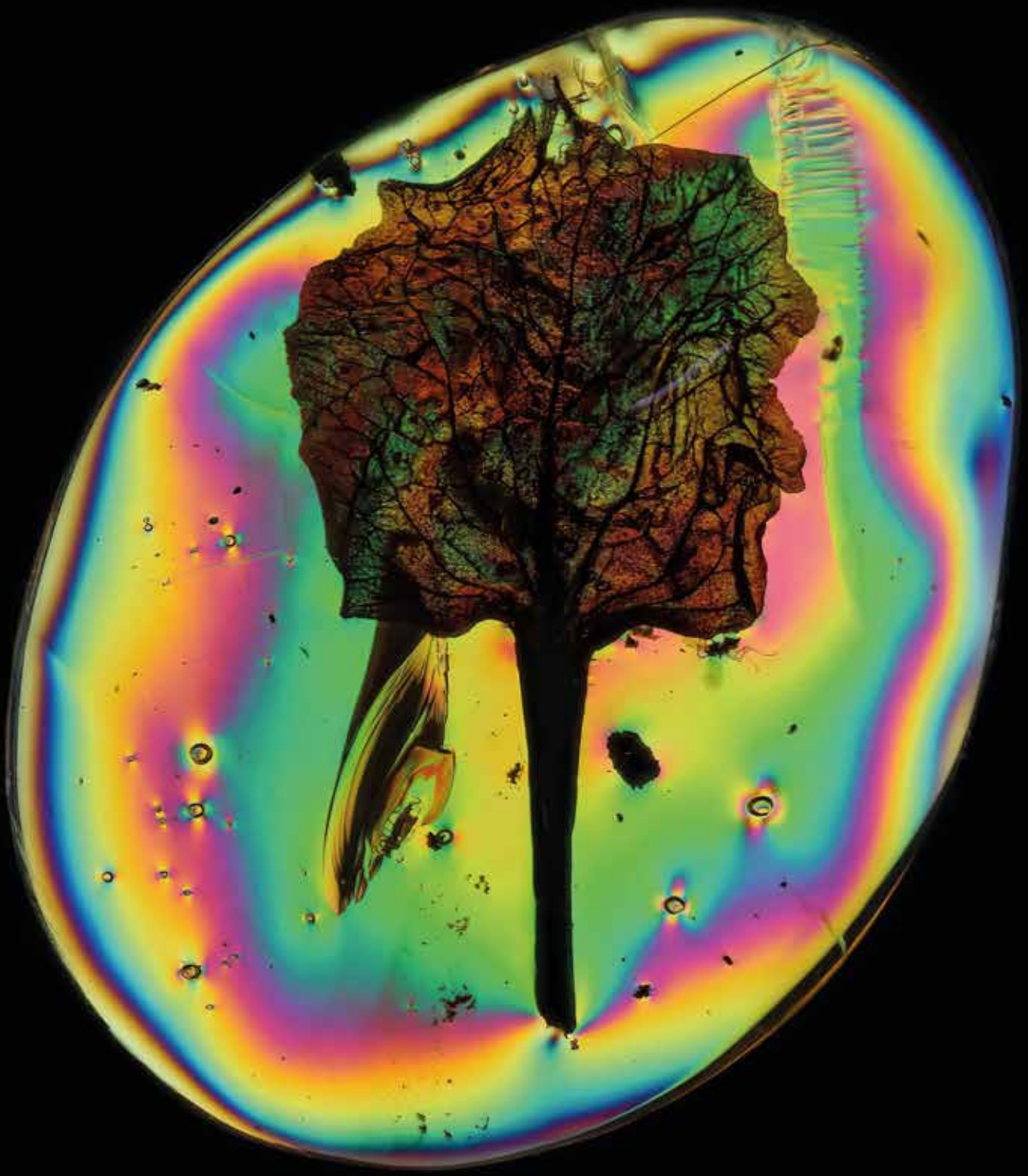
In addition to the specimens I have had the fortune to acquire and photograph personally, this volume again benefits also from the collaboration of collectors and professionals who have provided photographs and specimens from their respective private and public collections.

Many specimens in this volume are very rare, not yet described and are of significant paleontological value. I am open to share specimens that may be of interest for future research and scientific publications.

The photographic technique employed utilizes extreme macro-photography, and the setup, as described in the last chapter of the volume, essentially relies on a mirrorless camera, a microscope lens, all managed by a microstep motor that allows for capturing frames spaced by a few microns between each shot. Depending on the lens used, since the depth of field is extremely shallow (down to a few microns), dozens or even hundreds of images may be required to cover the entire thickness of the subject. This technique is known as photo stacking.

Finally, my wish for this book, is to share succesfully the most beautiful images that I have captured, with you. My hope is that these photographs will enable you to discover the marvelous microcosm made possible by amber.

Enrico Bonino



Petal of *Hymenaea protera* POINAR, 1991, acquired in cross-polarized light.
Dominican Republic, Early Miocene to early Middle Miocene, ~20 Million-year-old

# DETAILS...

Discover the beauty of detail. But beware: once you start, you might get hooked. High-magnification photography feeds fascination and awe of nature.

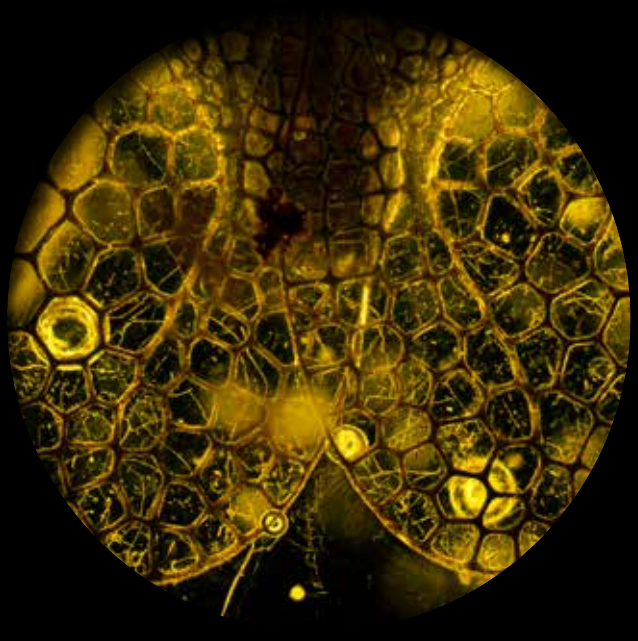
Every encounter through the lens with these organisms holds a surprise. Amazing, unpredictable structures are revealed when building up these images/photos.

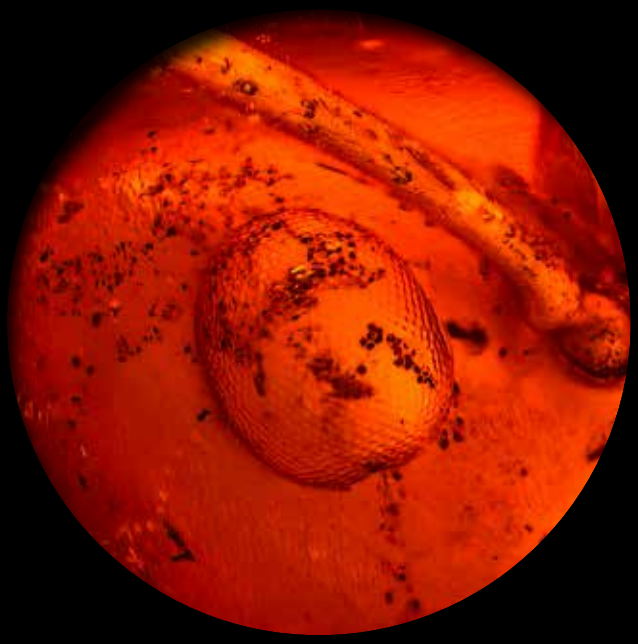
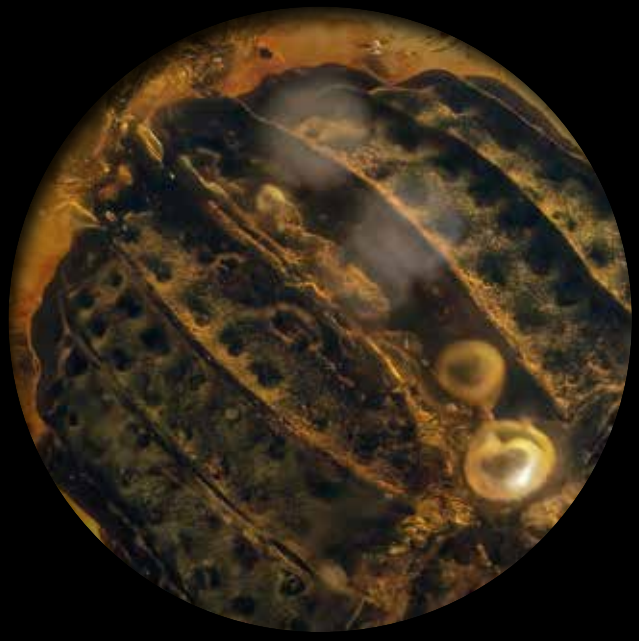
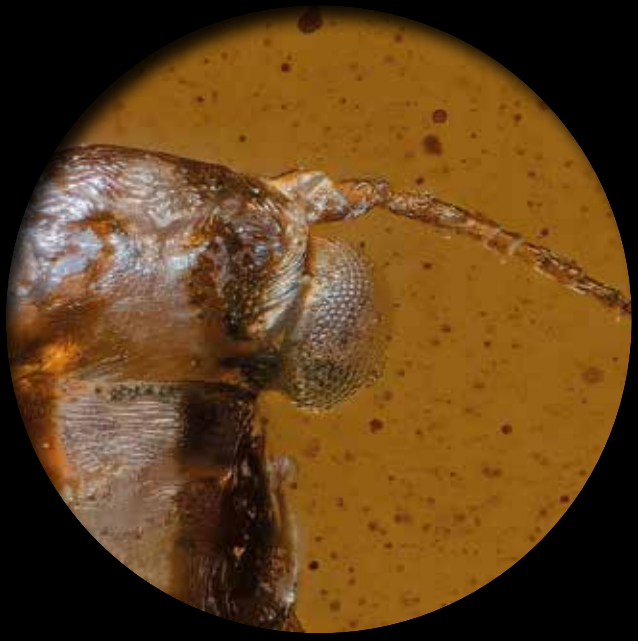
It is a breathless experience to stand eye to eye with a biosphere from a time when mankind was not yet roaming the planet.

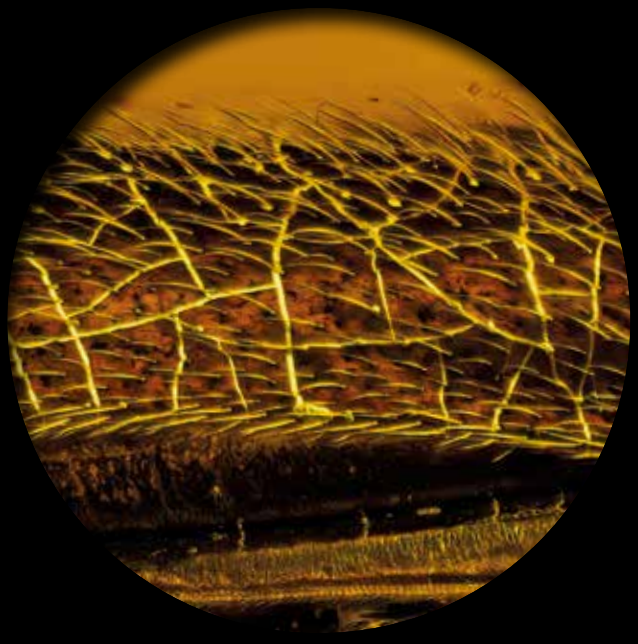
May I invite you to visit a long lost microcosmos filled with wings, antennae, compound eyes, mandibles, bristles and so much more?

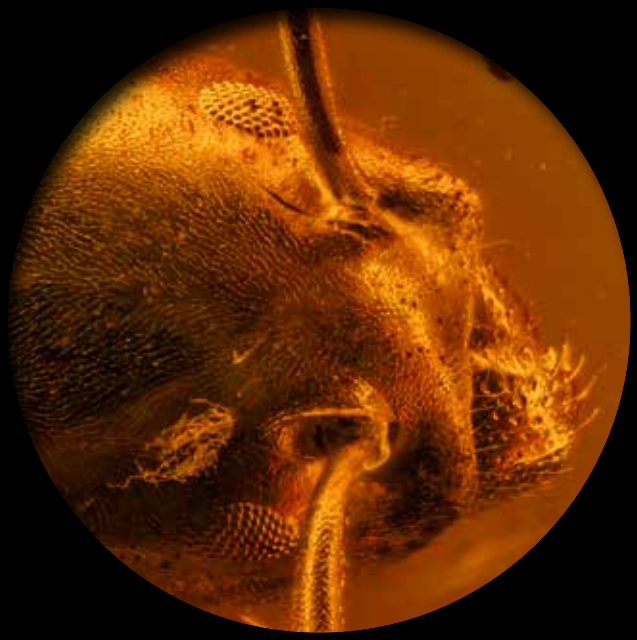
Be ready to encounter a mesmerizing world once filled with buzzing but now silent. See those delicate flapping of wings. A fresh bite in a prey. All frozen in time, at the same time both fragile and sturdy, captured forever.

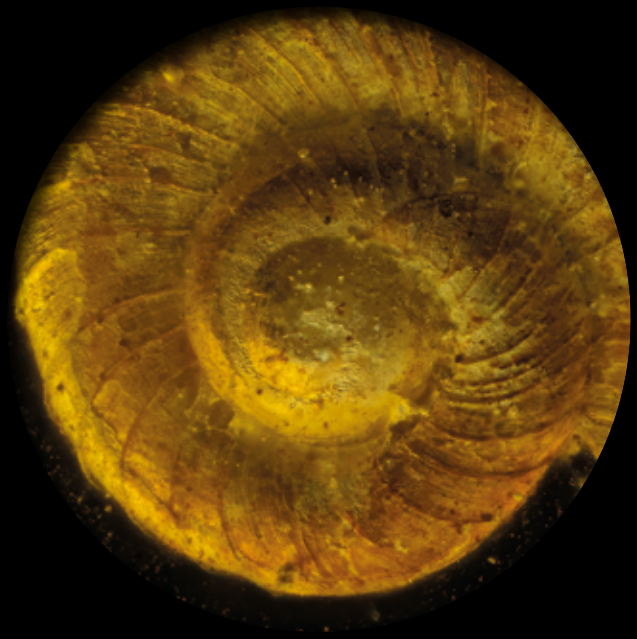




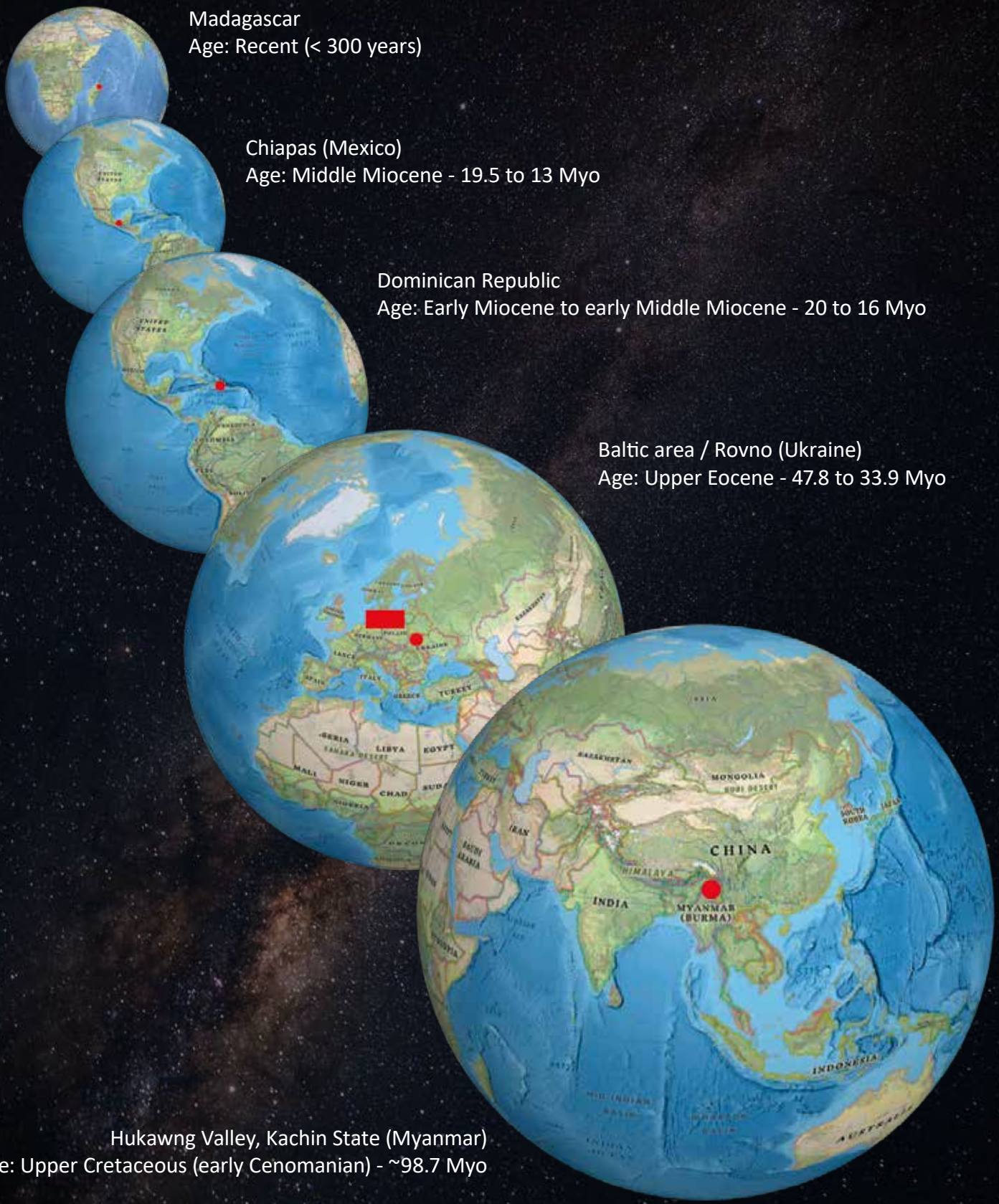


# AMBER DEPOSITS

There are about 200 described fossil sites in the world that yield amber. Many of these ambers exhibit a remarkably detailed fauna and fossil flora of the past. The rich iconography, illustrated in the following pages, originates from specimens that come from a relatively small number of fossil sites.

Unfortunately, whether because of intense exploitation for economic purposes and research, or because of political imbalances, many ambers are and will become increasingly difficult accessible to the general public. The market for these precious fossils, like the complex trade of other fossils, will likely undergo continuous contractions in the years to come.

# SITES COVERED IN THIS VOLUME



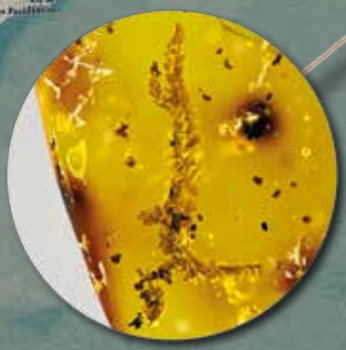
Scan to access and navigate
to the on-line digital map or type:
https://tinyurl.com/2v77phk4

**Baltic Area**
***Upper Eocene 47.8 - 33.9 Myo***

**Chiapas Region, Mexico**
***Middle Miocene 19.5 - 13 Million years old (Myo)***

**Sicily, Italy**
***Miocene***
***Aquitanian-Burdigalian and Tortonian 20 - 12 Myo***

**Dominican Republic**
***Early Miocene to early Middle Miocene 20 - 16 Myo***



**Amhara Region, Ethiopia**
***Early Miocene 23 - 16 Myo***


Rovno, Ukraine
Upper Eocene 47.8 - 33.9 Myo
Fushun, Liaoning Province, China
Lower Eocene 53 - 50 Myo
Lebanon
Early Barremian - Lower Cretaceous ~129 Myo
Kachin State, Myanmar
Cenomanian - Upper Cretaceous 98.7 Myo
Defaunation resin - Copal
East coast, Madagascar
Recent to ~300 years
Recent
Cenozoic
Mesozoic
Paleozoic

# PLATES

The specimens you will encounter in this volume are found in ambers originating from different corners of the globe. Some are extremely rare and unique, others, come from regions that have provided ambers with a very rich flora and fauna and are more easy to find for sale on the market. These originate from the Dominican Republic, Myanmar, the extensive geographical region of the Baltic Sea, Ukraine, and Madagascar.

The fossils are organized in taxonomic and alphabetical order. Each photo is accompanied by a scale and a legend. The scale bar (when present) shows the size of the subject.

The legend contains detailed classification, provenance and the owner of the amber or the photo (subject to availability of this information).

With the intention of establishing order in the complex diversity of the animal and plant kingdoms, the publication of the tenth edition of Carl Von Linné's Systema Naturae (1758) gave rise to the creation of an elaborate hierarchical classification system the beginning of zoological nomenclature.

The basic unit of this hierarchy was the species, and the system's purpose was to group organisms together according to their interrelationships. Each species was given a two-part or "binomial" scientific name composed, first, of the name of the genus to which an organism belonged.

The genus name was followed by the species or "specific" name, which is the hierarchical level just below the genus.

The genus (or generic name) is always written with an initial capital letter, while the specific name is always written in lower case.

Both names are printed in italics (for example, *Mesothelyphonus parvus*). If the name has been mentioned previously in a text—or in the case of a list of species that belonging to the same genus—the generic name may be abbreviated using its first letter (*C. ellenbergeri*), but it can never be omitted.

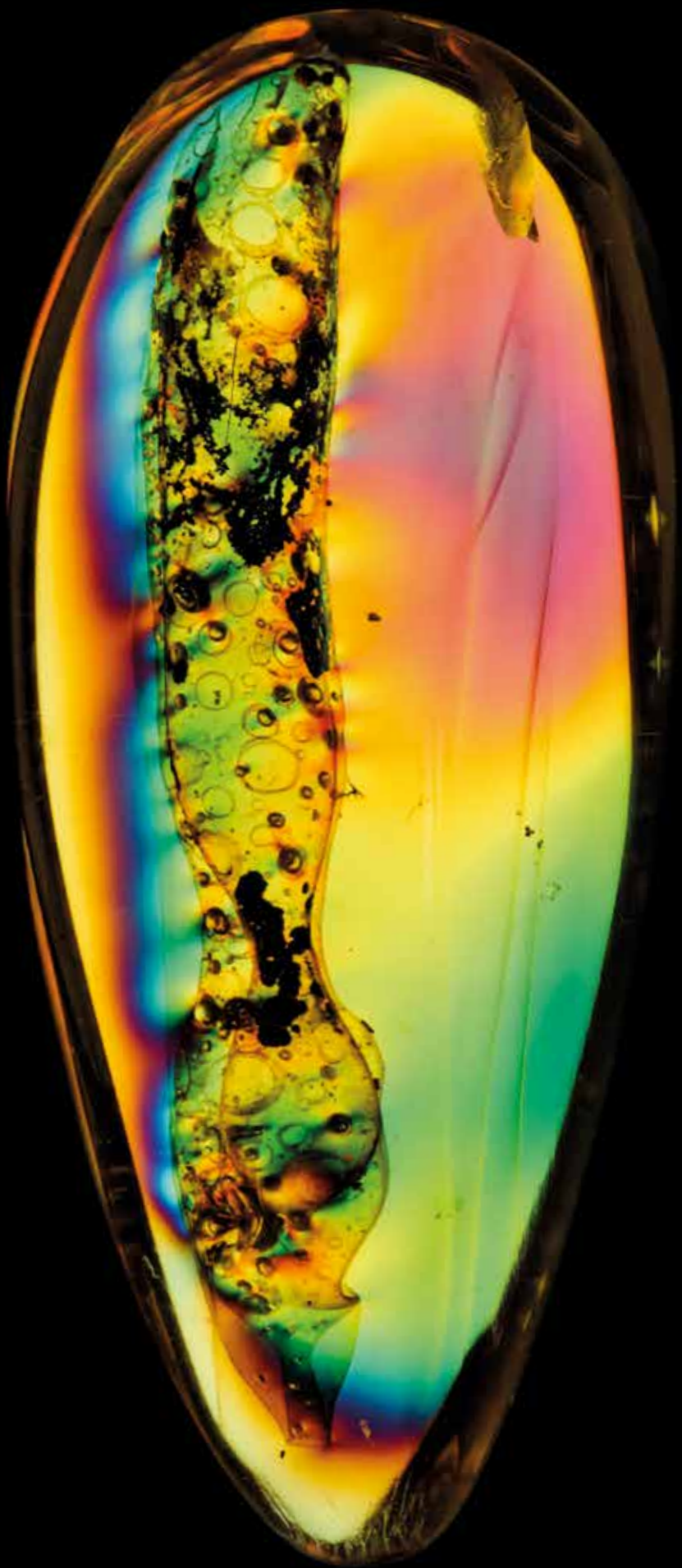
The name of the "author" or authors follows the binary or Linnaean classification; these are the persons who first named and described the organism — for example, the coleoptera *Eoceniretes antiquus* PERIS & JELINEK, 2019, or the dipteran *Electra formosa* LOEW, 1850.

A genus (the plural is "genera") includes one or more species that share a number of characteristics. Moving up the taxonomical hierarchy, a group of genera with shared features are contained within a family, whose name ends in the suffix "-idae." Groups of families, in turn, may be placed within superfamilies (suffix "-oidea"), suborders (suffix "-ina"), and collected into orders (suffix "-ida"), orders into classes, and classes into phyla (the singular is phylum). At the very top of the hierarchy is the Kingdom.

**List and Acronyms of Private collections and Depositories**

The specimens, unless otherwise indicated, are part of the collection of the author **[EB]**.

**[AM]** : Photo courtesy Artur Michalski
**[AE]** : Courtesy Amber Experts (www.amberexperts.com)
**[HFM]** : Collection Hanoi Fossil Museum (Hanoi, Vietnam)
**[JD]** : Photo courtesy Jonas Damzen (www.amberinclusions.eu)
**[LL]** : Photo courtesy Luca Lista
**[LT]** : Collection Lorenzo Tettamanzi
**[MB]** : Photo courtesy Michele Baldi
**[PM]** : Collection Patrick Müller
**[YG]** : Photo courtesy Yuhe Gao



“Resin stalactite” in amber acquired in cross-polarized light - Hukawng Valley, Kachin State (Myanmar)


▲ Erythraeidae (Trombidiformes) - Hukawng Valley, Kachin State (Myanmar)
▼ Possible Arrenuridae (Hydrachnida) parasitizing a small dipteran - Hukawng Valley, Kachin State (Myanmar)


▲ Trombidiidae (Trombidiformes) - Baltic area
▼ Ologamasidae (Mesostigmata) - Dominican Republic - [LT]

# Arachnida - Araneae


▲ Araneae - Baltic area

▼ Araneae - Hukawng Valley, Kachin State (Myanmar)


▲ Lagonomegopidae and *Discoscapa apicula* POINAR, 2020 - Hukawng Valley, Kachin State (Myanmar)
▼ Araneae and Ceratopogonidae - Hukawng Valley, Kachin State (Myanmar)

1mm

▲▼ cf. *Nuttalliella* sp. (Parasitiformes) - Hukawng Valley, Kachin State (Myanmar) - [PM]

1mm


cf. *Nuttalliella* sp. (Parasitiformes) - Hukawng Valley, Kachin State (Myanmar) - [PM]

# ARACHNIDA - RICINULEI

Ricinulei, commonly known as hooded tickspiders or ricinuleids, are a fascinating yet relatively obscure group of arachnids. Despite their small size and cryptic lifestyles, they play a significant role in the ecosystems they inhabit.

These arachnids are characterized by their unique appearance, with a distinctive hood-like structure covering their cephalothorax, giving them their common name. One of the most remarkable features of ricinuleids is their primitive anatomy, which has remained relatively unchanged for millions of years. They belong to a lineage that diverged from other arachnids over 380 million years ago, making them living fossils.

Found primarily in tropical regions, particularly in Central and South America, as well as parts of Africa, ricinuleids are often encountered in leaf litter, soil, and forest debris. Their secretive nature and nocturnal habits make them elusive to researchers and casual observers alike. Ricinuleids are predatory in nature, feeding on small invertebrates such as insects, mites, and other arachnids.

Despite their small size, ricinuleids exhibit fascinating behaviors and adaptations. For example, they have been observed engaging in complex courtship rituals and maternal care behaviors, indicating a level of social complexity not commonly associated with arachnids.

*Poliochera cretacea* Wunderlich, 2012, second or third stage nymph
Hukawng Valley, Kachin State (Myanmar)

1mm

# ARACHNIDA - SCORPIONES

Scorpions are eight-legged predatory arachnids that are easily identified by their pair of grasping pincers and a narrow, segmented tail, which is frequently carried in a distinctive forward curve over the back and always ends in a stinger.

Scorpions can be as small as 8.5 mm or as large as 20 cm. The cephalothorax (also known as the prosoma) and abdomen (or opistosoma) are the two tagmata that make up a scorpion's body. The cephalothorax houses two pairs of eyes on the top and, in most cases, two to five pairs of eyes along the front corners. Although some species of scorpion hunt vertebrates, most species feed primarily on insects and other invertebrates. They use their pincers to catch and kill prey, or as a form of defence. Although they have adapted to a variety of environmental conditions, they primarily live in deserts.

Scorpion fossils have been discovered in a variety of strata, including marine Silurian and estuarine Devonian deposits, Carboniferous coal deposits, and amber.


*Fragosublatta pectinata* Chen et al., 2020 (Blattodea : Corydiidae),
*Betaburmesebuthus bellus* Lourenço & Beigel, 2015, (Archaeobuthidae),
and *Eorhopalosoma lohrmanni* Boudinot & Dungey, 2019, (Vespoidea : Rhopalosomatidae)
Hukawng Valley, Kachin State (Myanmar) - [PM]


cf. *Mesothelyphonus parvus* CAI & HUANG, 2017, (Thelyphonida : Thelyphonidae)
Hukawng Valley, Kachin State (Myanmar) - [PM]


cf. *Mesothelyphonus parvus* Cai & Huang, 2017, (Thelyphonida : Thelyphonidae)
Hukawng Valley, Kachin State (Myanmar) - [PM]

Scutigeridae (Scutigeromorpha) - Hukawng Valley, Kachin State (Myanmar)

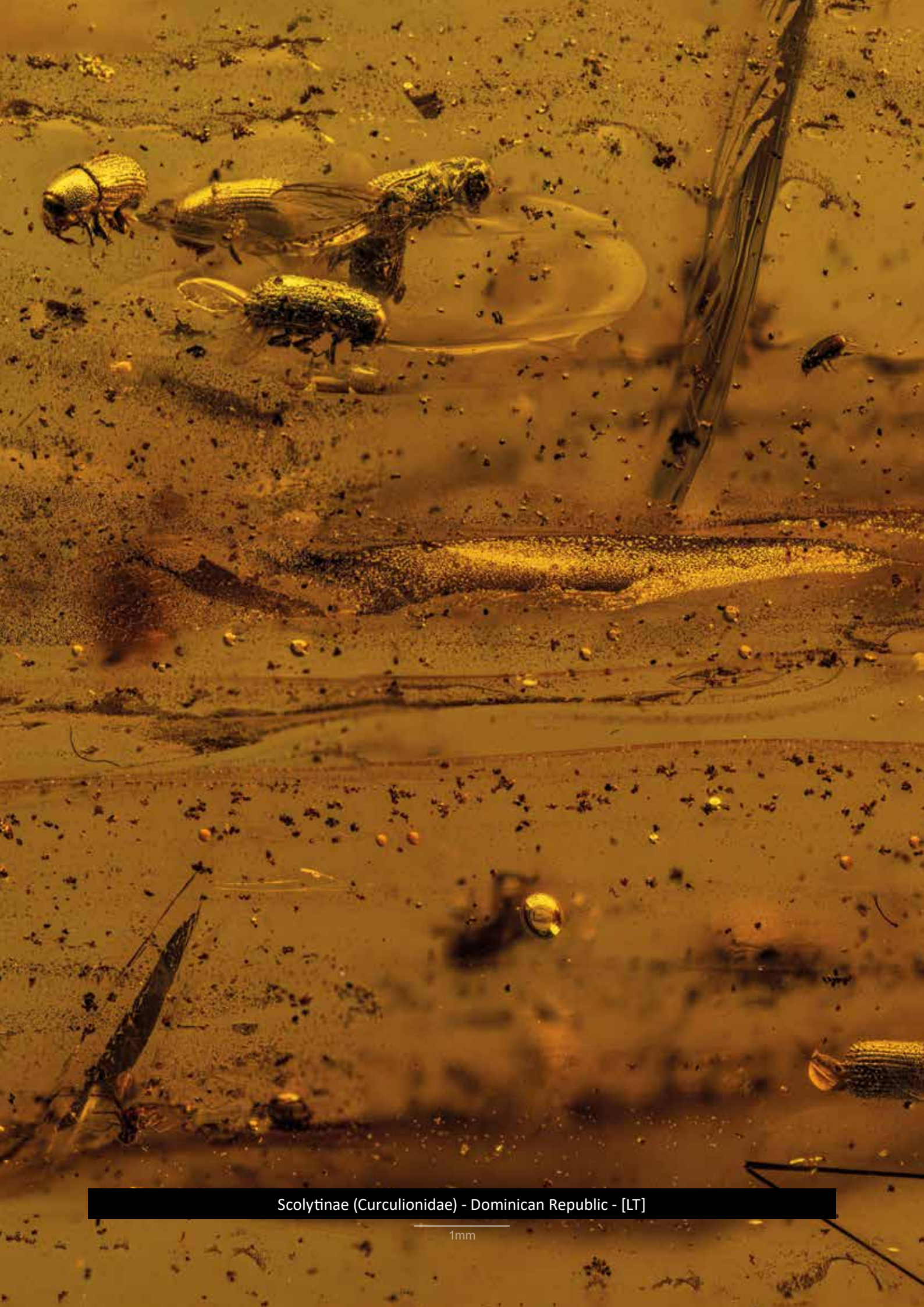
1mm


▲ *Acalyptomerus thayerae* CAI et al., 2018, (Clambidae) - Hukawng Valley, Kachin State (Myanmar) - [PM]
▼ Dytiscidae - Hukawng Valley, Kachin State (Myanmar) - [PM]


▲ *Paleoripiphorus* sp., (Ripiphoridae) - Hukawng Valley, Kachin State (Myanmar) - [MB]
▼ *Amberocula* sp., (Ripiphoridae) - Hukawng Valley, Kachin State (Myanmar)

*Mallecupes* cf. *qingqingae* JARZEMBOWSKI ET AL., 2016, (Cupedidae) - Hukawng Valley, Kachin State (Myanmar)

2mm



Scolytinae (Curculionidae) - Dominican Republic - [LT]

1mm

*Tytthodiplathys mecynocercus* ENGEL, 2011 - Hukawng Valley, Kachin State (Myanmar)

1mm

# Dictyoptera - Alienopteridae


▲ Nymph stage of Alienopteridae (cf. *Teyia* sp.) - Hukawng Valley, Kachin State (Myanmar)
▼ Morphotype III alienopterid nymph - Hukawng Valley, Kachin State (Myanmar) - [LL] • [EB] ▼



▲ *Kalotermes burmensis* POINAR, 2009 - Hukawng Valley, Kachin State (Myanmar)
▼ *Mastotermes electrodominicus* KRISHNA & GRIMALDI, 1991, with Enhydro and fecal pellets - Dominican Republic

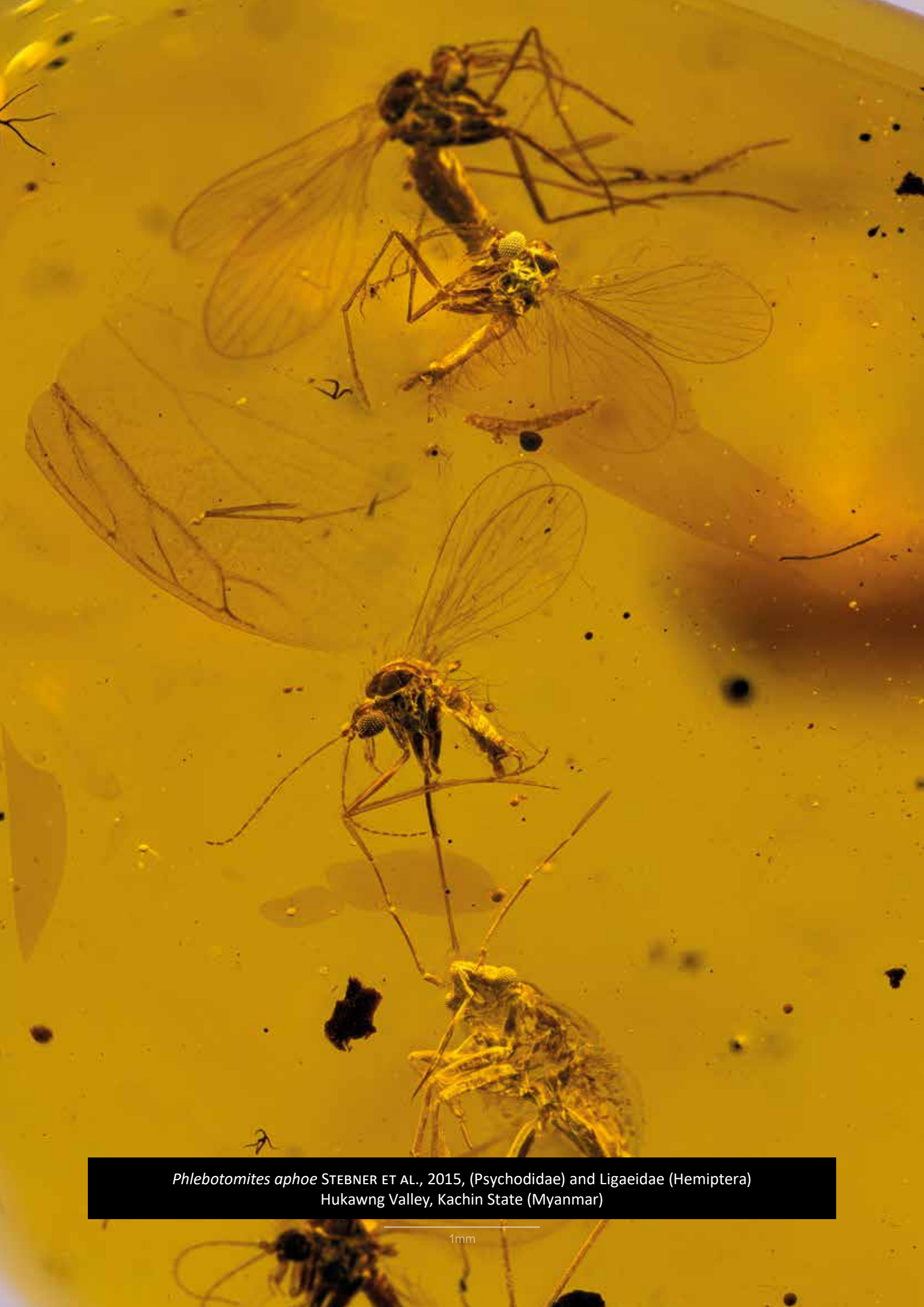

Mantis (nymph) - Hukawng Valley, Kachin State (Myanmar)

Mantis - Hukawng Valley, Kachin State (Myanmar) - [PM]

2mm

*Siphonophora* sp. - Hukawng Valley, Kachin State (Myanmar)

2mm



*Phlebotomites aphoe* Stebner et al., 2015, (Psychodidae) and Ligaeidae (Hemiptera)
Hukawng Valley, Kachin State (Myanmar)

1mm

*Foveopsis* sp., (Perforissidae : Fulgoroidea) - Hukawng Valley, Kachin State (Myanmar)

1mm


*Paleolepidotus macrocolus* POINAR ET AL., 2020b, (Coccomorpha) - Hukawng Valley, Kachin State (Myanmar)


Braconidae - Hukawng Valley, Kachin State (Myanmar)

Myrmeleontoid morphotype MII - Hukawng Valley, Kachin State (Myanmar)

1mm


cf. Myrmeleontidae - Hukawng Valley, Kachin State (Myanmar) - [PM]


*Cretoperipatus burmiticus* GRIMALDI ET AL., 2002
Hukawng Valley, Kachin State (Myanmar)

*Sialomorpha dominicana* POINAR & NELSON, 2019, and fungal strands - El Mamey Formation Dominican Republic, Upper Eocene - [#CASG 100155], photo courtesy: Poinar G.

65µm


Phthanoxenidae - Hukawng Valley, Kachin State (Myanmar) - [PM]

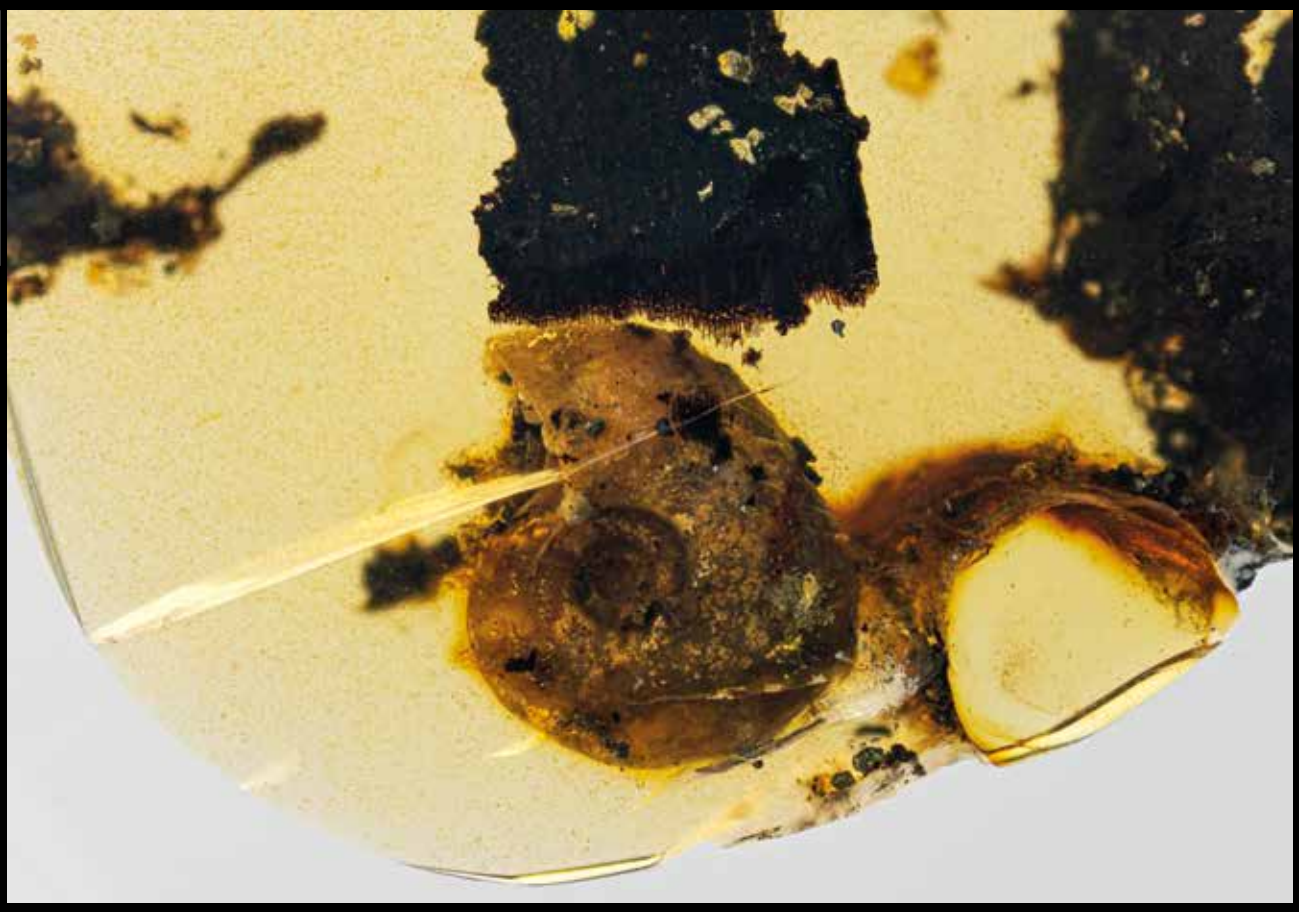

▲ Phthanoxenidae - Hukawng Valley, Kachin State (Myanmar) - [PM]
▼ Phthanoxenidae - Hukawng Valley, Kachin State (Myanmar) - [PM]


Polycentropodidae - Hukawng Valley, Kachin State (Myanmar)

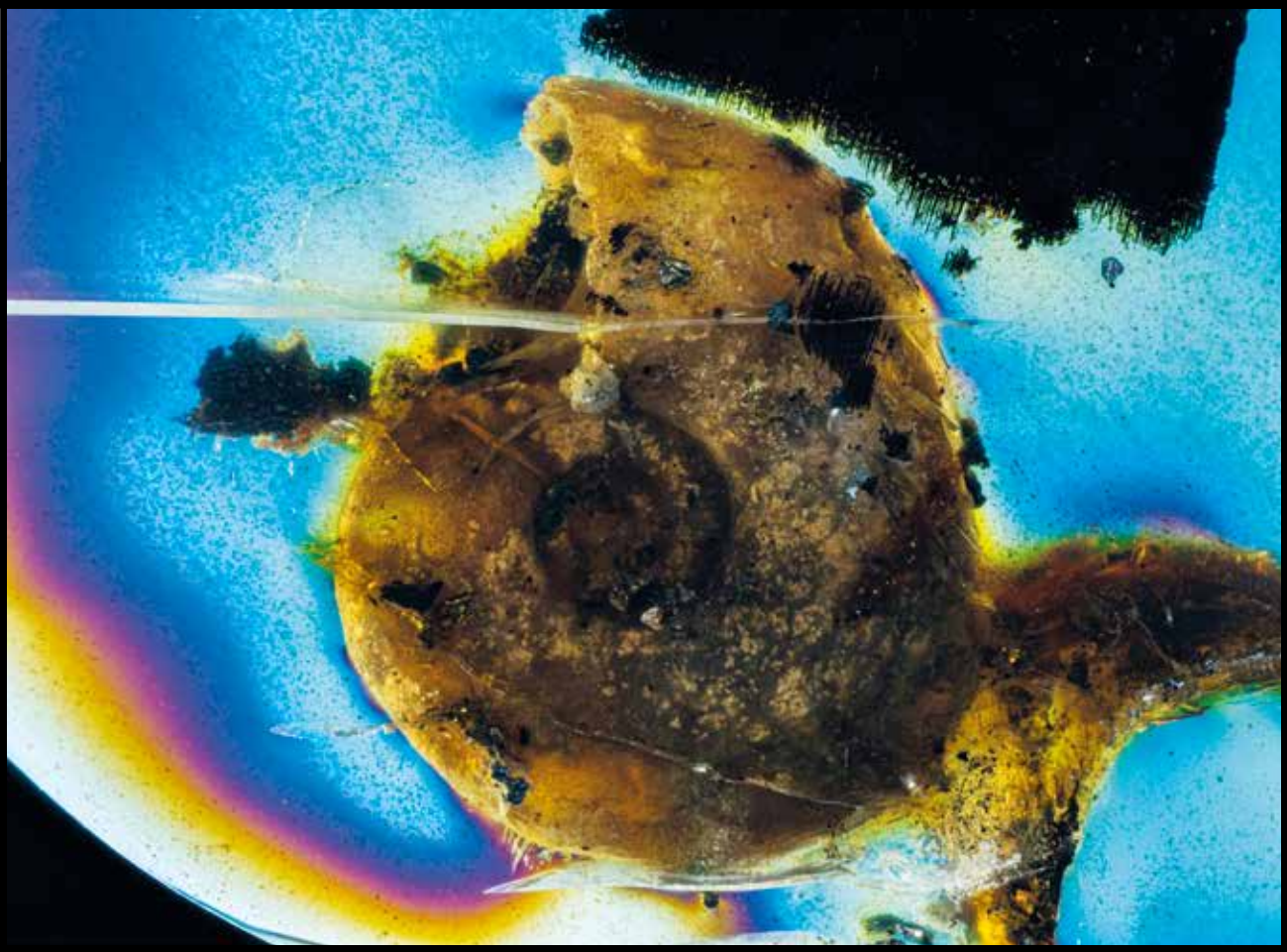

Marasmiaceae (Basidiomycota : Agaricomycetes : Agaricales) - Hukawng Valley, Kachin State (Myanmar) - [PM]
1 mm

Chernetidae (Arachnida : Pseudoscorpiones) and mycelium in a cross polarized filters image
Hukawng Valley, Kachin State (Myanmar)

1 mm




▲ cf. *Puzosia* sp. (Cephalopoda : Ammonitida) - Hukawng Valley, Kachin State (Myanmar) - [PM]
▼ Same specimen acquired with cross polarized filters




Simaroubaceae (Angiosperms : Sapindales) flower - Dominican Republic - [LT]

Feather (down), (Vertebrata : Aves) - Hukawng Valley, Kachin State (Myanmar)

1mm


Claw (Vertebrata : Aves ?) - Hukawng Valley, Kachin State (Myanmar) - [PM]


▲ Resin stalactite with inclusions - Hukawng Valley, Kachin State (Myanmar) - [PM]
▼ Multiple resin flows are recognizable in the illustrations below. These structures can be easily identified by their varying compositions, densities, inclusion content, and degrees of alteration.


Interpreted as “fish scales,” these structures are actually air bubbles deformed within amber as a result of diagenetic processes
Hukawng Valley, Kachin State (Myanmar)

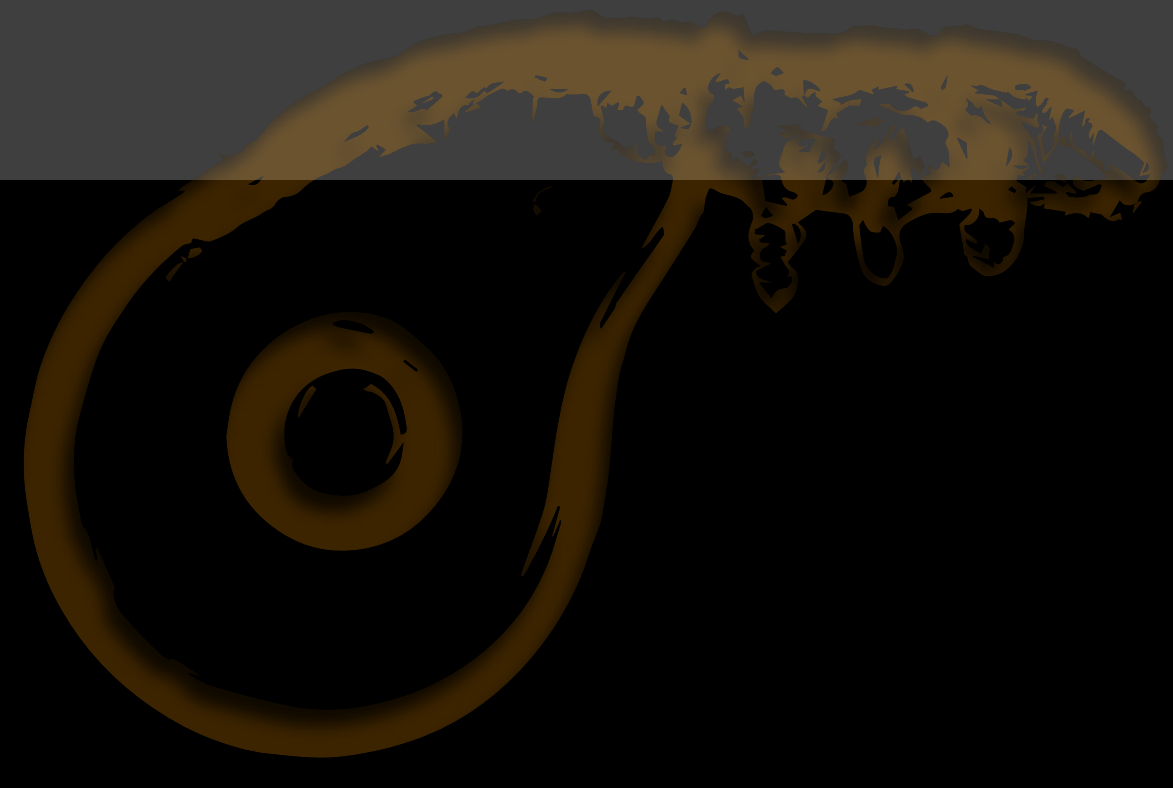
# ENHYDRO

Amber, with its golden hue and ancient allure, often holds within its translucent depths a mesmerizing secret known as an enhydro. An enhydro is a fascinating inclusion within amber — a fossilized resin that contains a small pocket of liquid trapped within its hardened matrix.

These liquid-filled cavities, often composed of water or other fluids, serve as windows to the past, encapsulating a moment millions of years ago when the resin dripped from trees and ensnared tiny pockets of air or water. As the resin solidified, these enhydros remained suspended, preserving a snapshot of prehistoric environments within the ancient resin.

Enhydros are not only remarkable for their ability to preserve liquid over immense periods but also for their dynamic nature. When gently tilted or warmed, the liquid inside may move, offering a tantalizing glimpse of motion frozen in time. Some enhydros even contain ancient organisms or plant matter, further enriching the story held within these ancient gems.

To hold an amber specimen containing an enhydro is to hold a tangible link to the distant past—a relic that whispers tales of primeval forests, long-extinct creatures, and the enduring mysteries of our planet's history.



Enhydro - Baltic area - [AE]

1mm

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This volume, like the first, does not delve into the origin of amber—its paleoenvironmental and paleogeographical contexts, composition, color, or age.
Instead, it invites you on a virtual tour, showcasing the stunning beauty of organisms encased in amber, with the hope of inspiring awe and curiosity.

With approximately 290 plates and over 500 beautifully photographed animals and plants, this book unveils a mesmerizing world that once teemed with life:
The delicate flapping of wings.
A fresh bite into prey.
An intricate spider web.
Frozen in time—fragile, yet preserved forever.

Enrico Bonino is a geologist specializing in stratigraphy and paleontology, with a degree from the University of Earth Sciences in Genoa, Italy. He currently resides in Belgium.

Driven by a deep passion for the Earth, from its microcosms to macrocosms, he explores the possibilities of extreme macro photography of microfossils. His favorite subjects are inclusions trapped in amber, which offer stunning and novel perspectives on tiny, ancient creatures. These images reveal the intricate beauty of nature, giving viewers an intimate glimpse into the biodiversity of the past.

Skilled in digital image processing, mathematical morphology, and illustration, Enrico is the author and editor of scientific books and articles on Paleozoic arthropods, fossil lagerstätten, trilobites, and inclusions in amber.

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