Amber – The Caribbean Approach

When Christopher Columbus stepped onto the sands of the island of Hispaniola in the "New World," amber was already a well-known commodity in Europe, having been used since Neolithic times.

By Alec Corday and Hermann Dittrich

During his voyage, Columbus wrote in one of his letters that he even gave an amber necklace to one of the Taino tribal chiefs on Hispaniola as a gift. The Admiral also recorded the find of large pieces of amber on the island itself, including "one mass of which weighed three hundred pounds." Although this encouraged him to believe that there were more treasures to be found on Hispaniola [1], he and his fellow Conquistadors had their sights set on gold instead of amber, and they wouldn't let a few naked natives stand in their way.

Five hundred years and a genocide later, Hispaniola no longer had any Tainos or even much gold left. Instead, it boasted a thriving population split into two nations—Haiti and the Dominican Republic. Although there were random finds of amber by the locals, the true exploration and exploitation of this material did not start until the 1960s with small mining operations and jewelry fabrications.

Slowly Dominican amber emerged from obscurity and out of the shadow of Baltic amber. By the 1980s, there was a small but flourishing community of miners and artisans around the area of *La Toca* in the *Cordillera Septentrional*, a mountain range located between the coastal city of *Puerto Plata* and the city of *Santiago de los Treinta Caballeros* in the north, and around *Bayaguana* and *Sabana de la Mar* in the east [2].

In the 1990s, Dominican Amber received an unexpected boost from the Steven Spielberg film *Jurassic Park*, and suddenly found itself thrust into the international limelight, with particular emphasis on its fossiliferous nature. But more about this later. When you take a look at Dominican amber, the first thing you will notice is the variety of natural color variations [3].

Blue amber and other oxymora

The amber stone is not called "amber" because of the color—the color is called "amber" because of the amber stone. This confusion is made more incongruous by the linguistic faux pas of the origin of the term "amber." Most Etymologists trace the term back to "ambergris," an Arab word brought to Europe by the Crusaders and referring to sperm whale regurgitations.

Within all this linguistic confusion, it is interesting to note that only about half of the amber found in the Dominican Republic is strictly speaking "amber" colored. The rest is a reflection of the entire color spectrum: white, yellow, red, purple, green, blue, and all shades beyond and in between. Dominican amber even reaches into the invisible ultraviolet spectrum, since it is fluorescent.

Noteworthy in this regard is the so-called "blue amber" as it is blue because of the tightly-packed polycy-

Close up of blue amber.

A prime specimen of blue amber.

clic aromatic hydrocarbon *perylene*. It absorbs high-energy ultraviolet photons and re-emits them as lower-energy visible photons, according to the absorbance curve of the particular fluorophore [4]. This natural fluorescent ability causes the amber to reach its peak emission particularly under sunlight, creating a vibrant and ever-changing blue coloration. Under ultraviolet illumination (at practically any wavelength), the visible photon emission becomes an eerie milky-blue. The cause of this coloration is traced back to irradiation that occurred at some point during its diagenesis.

Of all natural Dominican color variations, blue is the most precious, and is highly sought-after by collectors and high-end jewelers. Alas, only about 50 kilos of top quality blue amber are found per year. And even of the lower grades probably only 300 kilos are found each year. If that number is compared to the 26 tons of gem grade diamonds that are mined per year, this makes blue amber one of the rarest and most exclusive gemstones around. It is closely followed by the natural green amber. In the Middle East, blue amber is much valued for *Misbaha* prayer beads and *Kombolói* worry beads, while China and Japan developed a small niche of blue amber artisans who create lovely carved pieces.

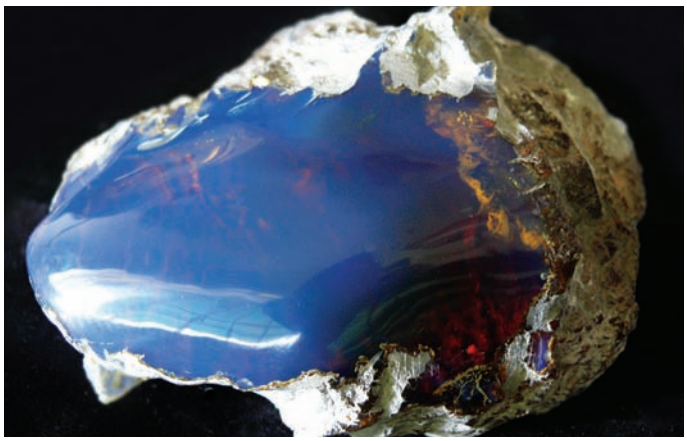
Inclusions

Besides these unbelievably florescent natural colors, what especially sets Dominican amber apart from Baltic amber and amber from other regions is the amount, variety, and condition of the inclusions. The variety is immense: 1 inclusion or more for every 100 pieces, while Baltic amber contains approximately 1 inclusion for 1000 pieces. This high ratio in combination with its nearly uniform natural transparency allowed for a detailed reconstruction of the tropical Oligocene and Miocene ecosystem [5].

Inclusions can be both organic and inorganic. Sulfur and pyrite for example are inorganic inclusions, while decayed botanical debris, carbonized wood, cones, buds, blossoms, leafs, bark, and, of course, insects are organic. Over a thousand species of insects and crustaceans have been identified, and interestingly enough 54 percent of them are flies. It seems flies were already a pest even back then and the sticky tree resin served as natural flypaper. In its re-deposition process, amber also came in contact with the sea and so barnacles and other skeletons of colonial crustaceans are sometimes found attached to it.

While such rarities as lizards [6] and frogs are also found, the majority is still a fantastic crosscut of arthropod life and its various subphylum during the Oligocene to Miocene, and there have even been random finds of mammal hair and bird feathers. Despite many mosquitoes found in amber, the movie *Jurassic Park* still has a plot hole that is millions of years wide. Scientific consensus is that dinosaurs died out approximately 65 million years ago, while that same consensus also holds that Dominican amber is no more than 20 to 40 million years old. This negates the possibility of ever finding dinosaur DNA in Dominican or even Baltic amber, which, according to G.

Blue amber prince.

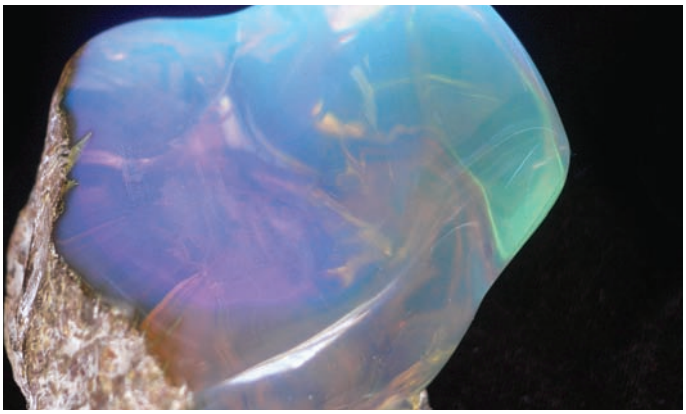


Blue amber princess.

Inside an amber mine in the Dominican Republic.

O. Poinar's "Life in Amber," is 30 to 40 million years old. Amber from Northumberland in the USA is considered to be up to 345 million years old so, when compared to it, both Dominican and Baltic amber are "babies" and have no reason to be haggling over a few million years here and there.

Blue amber jewelry.



Specimen of top quality blue amber.

Inspecting the quality of blue amber.

Genesis

To explain age and genesis, we might want to briefly outline the general history of Dominican amber, according to the gospel of geology [7], which is somewhat different than Baltic. While Baltic amber originated with a conifer, Dominican and Mexican amber are from the extinct legume *Hymenaea Protera*. Using its contemporary descendant, the *Algarroba* tree as an analogy, we can establish an approximate "whodunit." The roots and trunk exude a yellowish to red resin and form hard lumps, which become buried in the soil at the tree base. It is interesting to note that *Algarroba* does not bleed much when damaged. The assumption therefore is that either lightning or fire caused a whole forest to practically bleed to death and hemorrhage such large amounts of resin. Said resin was then washed down slope into lagoonal and coastal areas. This step may have only taken a few days or weeks at the most, but the next step is calculated in millions of years.

Sixteen to 20 million years ago—a shooting-from-the-hip estimate—amber was still called copal and the enclosed insects where just getting cozy in it. Hispaniola on the other hand was nonexistent. Most likely, there was a whole series of smaller islands, created a few million years earlier by a massive head-on collision between the Caribbean and the North American tectonic plates. As stated above, the copal had by now hit rock bottom and begun to dig, so to speak. It was going deeper into its marine environment, with tons of water pushing down as well as more and more debris accumulating on top. It is estimated that the copal went down up to 300 feet in depth, and it was down here that it finally began its diagenic changes. The depth and pressure practically baked the copal, until it fossilized into amber.

After a few million years, the tectonic plates, like an unhappy card player, once again reshuffled. Up became down and down became up. Lagoons became mountain ranges, pushing the amber deposits into the clouds. This explains why miners high up in the mountains unearth planktonic and marine microorganisms, mollusks, fish teeth, crocodile, turtle, and dugong fossils alongside the amber.

Mining

The amber mine as depicted in the movie *Jurassic Park* was also a fallacy. Although most people understand the concept of shaft mining when thinking of mines—trolleys, lamps, pillars, etc.—this is not the case in Dominican mines.

The preferred method is bell pitting, which is basically a foxhole cut into the sediment using short-handled picks, shovels and machetes. The pit itself follows the amber veins as deep as possible or safe. Miners crawl around on their knees and there is a shocking lack of safety measures.

Blue amber ring.

Candles are usually the only source of light out of sheer simplicity. Humidity inside the mines is at 100 percent and the temperature cool and bearable, but after several hours of hard work, the air becomes stale. During the rainy season, the holes quickly fill up with water and the unsecured walls crumble. With this entire disregard for safety, it is close to a miracle that there have been very few accidents.

Some mining families have done this for years, but in recent times, less and less are digging, and the number of people involved in the mining business fluctuates around 3000, island wide. Mines are privately held, but hardly ever by the miners. Most owners permit the miners to dig on their premises and then buy the findings from them. It is not uncommon for a miner to make 3,000 to 20,000 pesos (US$85 to $500) in a good week (the nation's minimum wage is 2,600 pesos per month in the public sector).

Mines spring literally out of the ground over night. Sometimes, they last only a short time and run dry. Others seem to go on for years and specialize in certain types of amber like the extremely fossiliferous or the blue and the green.

Carved green amber depicting two frogs *(photo courtesy of Jas L).*

The sincerest form of flattery

Recently, a new product emerged onto the world market, labeled as "Caribbean amber." It has a strong transparent green hue and is sold with the shtick of having been "recently found on a Caribbean island." As Hispaniola is the only Caribbean island that has confirmed amber deposits, one would assume this Caribbean amber refers to green Dominican amber. Nevertheless, a closer inspection of this "new" gem reveals a definite Colombian copal origin, that has been autoclaved and transformed into "old" amber. How is this done? You will find much information here: http://www.amber.com.pl/eng/amber/amber_imitations_copal.php as well as on Wikipedia http://en.wikipedia.org/wiki/Caribbean_amber

Besides the autoclaved Colombian copal sold as "Caribbean amber," there are few imitators of Dominican amber simply because it is not financially viable. While in the Baltic, it is an established practice to treat amber in order to improve consistency, colors, and shape as mentioned

Variety of blue amber pieces.

Carved green amber depicting two lions *(photo courtesy of Jas L).*

before, there are no facilities in the Dominican Republic allowing similar processes. Whatever "fake" Dominican amber is out there is usually mislabeled (intentionally or otherwise) copal or Baltic amber. Even the unique Dominican blue amber has been copied and donned with "sun spangles"—a dead giveaway of the enhancing process.

The rumor that some people drill holes into the amber stones in order to insert insects is not unheard of, but rare. The high amount of inclusions found in Dominican amber renders this effort pointless. Besides, contemporary, perfectly preserved insects in amber are a geological impossibility, which makes distinguishing real from false fairly easy, a few fleeceable tourists notwithstanding.

Carved green amber depicting a crane *(photo courtesy of Jas L).*

The same piece of carved green amber under UV light *(photo courtesy of Jas L).*

Compared to amber, humanity is still in its infancy and with every specimen emerging from the amber mines, our understanding of the insect world—and indeed our own—grows. There is much we have yet to learn from amber, but it is a pleasure to know that amber combines the two aspects of our existence education aspires to—that of knowledge and sheer beauty.

References

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All photos are courtesy of the authors except where specified, and all pictures are of untreated, 100 percent natural Dominican amber, blue and green, the way it comes from the mines, only polished to one degree or another. They are all taken in sunlight or shade, without any additional light source. Only the one of the model has some additional UV light from one side.

Bracelet made of a variety of amber pieces.