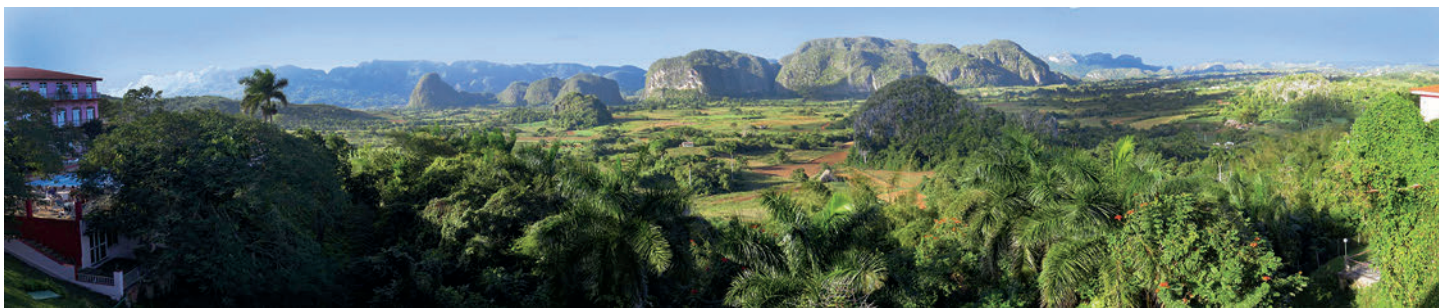


Exploring the Caves and Karst of Cuba in the Context of Changing US-Cuba Relations

María Alejandra Pérez, Douglas Soroka, Harvey DuChene, and Jim Patera



Jim Patera

The Cuban government set aside the Viñales Valley in 1976 to protect its outstanding karst landscape. In 1978, it was given better protection when it was declared a National Monument. The valley is noted for steep-sided Jurassic karst hills called mogotes. Composed of either limestone, marble, or dolomite, the mogotes are surrounded by flat alluvial plains.

Talk about interesting timing! We were fortunate to visit some of the caves and karst of Cuba right before and after some dramatic political developments between this country and our own. On December 17th 2014, Cuba and the US began the process that led to the reestablishment of diplomatic relations on July 2015. This historical event has since unleashed more political, economic, and social change. With Cuba on the minds of many, including a lot of cavers, we share the experience of our December 2014 trip and a second one in February 2016. But first, some background.

The exploration and scientific study of caves and karst has a long history in Cuba. The Sociedad Espeleológica de Cuba (Speleological Society of Cuba or SEC) was founded in 1940 by a young geographer named Antonio Núñez Jiménez. He remained president of this Society until his death in 1998, and is remembered to this day for his tireless dedication to speleological work and promotion, particularly among the Cuban youth (he was a geography teacher prior to the Cuban Revolution).

Antonio Núñez Jiménez was an important figure in the history of Cuban speleology. This importance was recognized by fellow cavers up north. In August 1993, Núñez Jiménez was selected as NSS Honorary Member, and invited to attend that year's convention. Unfortunately, his US visa was denied. It is likely that Núñez's prominent role in politics during and after the Revolution did not help the visa process: He was president of the newly constituted Academy of Sciences which included a Department of Speleology (1962 – 1972), the first director of the Institute of Agrarian Reform (1959 – 1962), Cuban ambassador to Perú (1972 – 1978), and deputy of Cuba's National Assembly (1962 – 1993). This prominence benefited the development of Cuban speleology. In fact, both Fidel and Raul Castro are SEC members. It was actually during the SEC's 20th anniversary celebration that Castro made the famous proclamation: "*The future of our homeland is necessarily a future of men of science.*" The legacy of Núñez Jiménez's work in speleology and beyond continues through

the Fundación Antonio Núñez Jiménez de la Naturaleza y el Hombre (Antonio Núñez Jiménez Foundation of Nature and Mankind or FANJ). We will make reference to this organization further since it played a prominent role in the planning and acquisitions of necessary permissions from the Cuban government itinerary of our trips in 2014 and 2016.

The story of caves in Cuba, and the development of speleology, for that matter, is not limited to the SEC. From the start, Cuban caves, which are spread over 70% of the country, played an important part in history, a role that predates the Cuban Revolution.

The indigenous Taino culture used caverns as sites for rituals and later as hideouts during the Spanish conquest. Likewise, African slaves and their descendants used caves and even extended passages as ways to escape their owners. During the independence war against Spain, and again during the Revolution against the Batista regime, caves were critical rebel hideouts and weapon storage sites. This last chapter in the cultural history of caves in Cuba led to recognition

Jim Patera



Barbara Schaefer in The Gran Caverna de Santo Tomás. The cave system consists of 7 main levels and 46 km of explored passages.



Jim Patera

The larger of two crabs seen in Gran Caverna de Santo Tomás. This one was about 8 inches in size and was found about 200 feet from the entrance.



Jim Patera

The upper parts of this mogote are in the highly fractured Guasasa Formation. The extensive solution pockets assist in the erosion of the cliff face and is probable evidence of previous cave passage.



Jim Patera

Stalactites and bee hives hang from the ceiling of the main entrance to the Majaguas-Cantera System, Pinar del Río Province. A view from inside the cave is featured on this issue's back cover.

of speleology by the Cuban Revolutionary leadership. In turn this recognition elevated Cuban speleology in the international arena of cave science in the Americas and beyond.

The Cuban Speleological Society, founded in January 15, 1940, was the first national speleological society in the Americas. And yet, it did not start out as Cuba's umbrella organization representing all national cavers. There were other speleological groups that arose in Cuba during the 1950s and 1960s, independent of the SEC. It was in the 1970s that the SEC gained the role as national coordinator of Cuban speleological activity. Currently, over 100 groups of speleologists located throughout the country have SEC affiliation. Most of the 15 provinces in Cuba have speleology clubs. These clubs, in turn, are tied (closely or loosely, depending on the province), to provincial committees. The heads of the committees represent these clubs at the national level. Individuals and caving groups can be members of the SEC. There are some professors in the SEC that teach cave geology and karst hydrology. Some of these professors also work as government consultants on energy and conservation projects both in Cuba and abroad.

This background emphasizes that there is a long history of speleological exploration and research in Cuba. Even with the economic challenges that the country continues to face, there remains an active Cuban speleological community. If you are interested in caving in Cuba, it is imperative that you connect with local cavers (we offer some information for this at the end of the article). The key to doing speleological research is establishing the proper links with Cuban counterparts. They will help provide the necessary Cuban visas and related paperwork. More importantly, it

is our Cuban friends who will be able to best assess how and where to put our willingness to contribute to Cuban speleology to use.

Because of the US-imposed embargo on Cuba (which is still in effect as of this writing), contact between US and Cuban cavers has been very limited. However, by the early 1990s, a number of US cavers started to formalize a long-lasting and valuable collaboration with their Cuban counterparts. The story of one of these major collaborations, which centers on over 15 years of work in the region of Caguanes in the Sancti Spiritus province, is laid out in detail in the volume titled *Caves of Sancti Spiritus, Matanzas, and Pinar del Río* edited by Joel Despain (2017). If you are interested in caving in Cuba, this will be a worthy place to start reading (refer to the end of the article for more details). It is particularly valuable because it includes articles by Cuban speleologists, the volume is in both Spanish and English, and has stunning photography.

The 2014 and 2016 visits were "people-to-people" trips organized by US caver and karst geologist Dwight Deal and his wife Mary, through their travel company Focused Tours. Although these trips were not speleological expeditions per se, they were invaluable opportunities of exchange that may lead to increased understanding and collaboration between cavers of the two countries. Already three Cuban cavers have been guests at the last two NSS conventions (Angel Graña at the 2015 Missouri NSS Convention and Esteban Grau and Osmany Rodriguez at the 2016 Nevada NSS Convention). From a traveler's standpoint, the US sanctioned "people-to-people" travel to Cuba was a good way to become introduced to the country. The "people-to-people" structure of the Focused Tours trips also meant that we interacted with Cuban

state agencies that would not happen on a purely caving expedition. With an open and inquisitive mind, such "people-to-people" trips can be interesting opportunities to gauge the changing dynamics of geopolitics and tourism in Cuba. It was also great to be able to get such a broad overview of cave and karst exploration and conservation issues in several areas of the country.

The December 2014 Trip

Our group of 24 gathered in Cancún, México for the short flight to Havana on December 5th. At José Martí International Airport we had no problem getting through immigration and customs. Once we cleared customs, we met Amircal Salerno Llanes (or Cal), our fabulous guide and interpreter for the duration of the trip. He, and bus driver Angelito Abraham, were our constant companions during the following 10 days in Cuba. Both are employees of Amistur Cuba, the tourism branch of the Instituto Cubano de Amistad Entre los Pueblos (the Cuban Institute for Friendship with the Peoples, or ICAP). Founded in December of 1960, just shy of the first anniversary of the Cuban Revolution, this organization was created to expand ties with the citizens of countries around the world, particularly if these citizens and their countries supported the Revolution. From the airport, we checked in at the seaside Copacabana Hotel. No, we did not rough it on this trip. Our organizers ensured a comfortable and pleasant time in Cuba, which provided fascinating insights into the changing tourist landscape in the island.

Our first full day began with a visit to the Fundación Antonio Núñez Jiménez de la Naturaleza y el Hombre (FANJ). The organization's main headquarters is located in the back of the home of the late Núñez Jiménez and is a must visit for cavers interested in



Maria Perez and David Worthington with unique mushroom-shaped formations in Cueva Santa Catalina (Jim Patera).

learning about an important part of the history of Cuban speleology. After visiting FANJ, we took a walking tour of Old Havana.

The next morning, we were on our way to Viñales, one of the two cave areas that we would visit. Viñales is in Pinar del Rio province in western Cuba. In Pinar del Rio, the group visited La Escuela Nacional de Espeleología “Antonio Nuñez Jiménez” near the town of Viñales. This school was established in 1984, and served, primar-



Jim Patera

Maria Perez and other mushroom formations suspended above a floor in Santa Catalina

ily, to educate and train men and women doing military service on the science and practice of speleology. Eduardo López Montealto, the current director of the school, greeted us there. The school is on the edge of the Viñales National Park, a classic tropical karst area characterized by square-topped limestone towers called “mogotes.” These features have steep sides and are covered with dense vegetation, royal palms (the national tree of Cuba), and large ceiba trees that have trunks covered with claw-like thorns. The mogotes contain numerous caves, and many entrances are visible in the cliffs. Steep terrain and formidably armored plant life make it difficult to reach many of the entrances.

Our visit to La Escuela Nacional de Espeleología included several trips into La Gran Caverna de Santo Tomás. Getting to the cave was very convenient. A couple of its entrances are just a short walk from the Escuela. Yerandi Rivera Cabrera and Isbert Triguero Carrasco, both part of the school staff and experienced cavers, were our guides. Cueva Santo Tomás has 46 km of mapped passages, numerous entrances, and passages on eight levels. It was formed by epigenetic processes (produced by acids near or at the surface) similar to karst areas of the eastern and central midcontinent of the US. Developed in mogotes in the Sierra del Quemado, near the town of Viñales, the cave was long known by local inhabitants. Early on the cave was used as a refuge by Cuba’s aboriginal people. After the Spanish invasion, maroons (runaway slaves) and later guerrillas during Cuba’s wars for independence, hid in the dark passages. There are even pictures of Fidel Castro taken in the cave during the Cuban Revolution.

Starting in 1954, the exploration and study of the Gran Caverna de Santo Tomás was conducted in four main stages. The first extended from 1954 to of January 1, 1959, the day the rebels ousted Batista from government. The second stage continued from 1959 to the founding of the National School of Speleology in 1984. From 1984 until 1993 was the third phase with the fourth going from 1993 to 1997. We also

stopped at the nearby Cueva del Indio that has been commercialized by the Cuban government. It contains extensive dripstone displays as well as aboriginal rock art.

We also spent a day at Sistema Majaguas-Cantera in the Sierra de los Organos, about one hour by bus from Viñales. Our guide was Evelio Balado Piedra, a geological engineer and expert speleologist. Balado is a tall (194 cm (6’ 4”)) lean man with a quiet demeanor, sonorous voice, and a wry sense of humor. He was the treasurer of the SEC at the time (the Cuban cavers had elections of their governing board in January 2017). His commentary during our trip added immensely to our knowledge of Cuban caves, geology, and life in Cuba in general. He, along with Angel Graña (vice-president of the SEC) accompanied us through the entire duration of our trip.

To get to Majaguas-Cantera, we walked about 2 km through tobacco farms and fields. We ate lunch in the spacious and impressive entrance and then visited a small part of the 33.5 km of passages and galleries that make up this system. A smaller group delved deeper into the system with Balado, a trip that required wading in water that was waist deep for some of our group, but almost armpit-deep for others. The streams and pools are home to several types of cave-adapted creatures, including crabs and catfish. The interconnecting caves developed on several levels. In addition there is a nearby cave, with 10 km of passage, which is probably part of the Majaguas-Cantera system that has not yet been connected.

After our short stay in the Viñales area we headed east to Matanzas where we visited three caves: Cuevas de Bellamar, Cueva Santa Catalina, and Cueva Ambrosio.



Jim Patera

Alan Montemayor in Cueva Humbolt in the Caguanes region



Jim Patera

Alan Montemayor in Cueva Santa Catalina

Bellamar, located in the outskirts of the city of Matanzas, became a draw for tourists in the early 1860s, making it Cuba's oldest commercial cave. It now has 24 km of mapped passages. Bellamar appears to be of polygenetic origin, developed in an uplifted marine terrace comprised of well-consolidated Miocene limestone. Although early development of Bellamar may have involved mixing of fresh and saline water, fresh groundwater flowing north from a large recharge area inland is dissolving limestone today. The entrance to Bellamar is located within a building that houses both a ticket

office and small museum. Visitors descend a short concrete staircase to the developed area where tourists view some of the spectacular speleothems, many composed of coarsely crystalline calcite.

In the early 1990s, Cuban cavers discovered a new section in Bellamar, finding passages with many beautiful pools and walls lavishly decorated with white to transparent, coarsely crystalline speleothems, which attest to the purity of the Miocene limestone from which they were derived. It is worth noting that the discovery of this new section happened during Cuba's so-called "Special

Period", which followed the collapse of the Soviet Union in 1991 and the end of Soviet support to the island. What followed were several years of severe shortages of everything from food to medicines. During this time period, the US also intensified its political and economic pressures on the island with regime change as its goal.

It is in this historical context that we can better appreciate how important cave exploration was to cavers in Cuba. For some like Esteban Grau of Matanzas, going underground with friends was an opportunity to forget about hunger and politics above ground. For those who missed his presentations at the 2016 Ely Convention, Esteban has and continues to play important roles in Cuban speleological leadership. He was until recently the SEC Vice-Secretary. This past January he was elected Treasurer of the organization. Within Matanzas, he is president of the Grupo Espeleológico Felix Rodriguez de la Fuente and of the Speleological Committee of the province. Since 2003, he has collaborated with the Italian Speleological Society on a major project to capture in 3D Cuba's speleological heritage. Esteban credits the beautiful images of Bellamar for changing the minds of state representatives and developers who were planning the construction of a major housing complex over the new part of the cave. Today, the area over the cave has been set aside in the Jardines de Bellamar Preserve, dedicated to sustainable living and ecologically sensitive farming methods. It has been designed to protect the delicate cave system.

While in Matanzas, we also visited Cueva Santa Catalina, a cave with 13 km of known passage and numerous skylights and entrances. Cueva Santa Catalina is one of several caves in the Matanzas area formed by polygenetic action (more than one process acting over time). The main entrance to Cueva Santa Catalina is located in limestone laid down about two million years ago, in shallow marine and fresh water marshes which date back to the Lower Pleistocene period. Currently the area is covered by a forest of young trees, vines, and underbrush growing on an uplifted marine terrace almost totally devoid of organic matter.

In addition to the common stalactites and stalagmites, Cueva Santa Catalina is known in the speleological world for its exotic and complex mammillaries, tower cones, folia, and the very rare 'Stone Mushrooms'. We witnessed these rare formations in the section of the cave known as 'The Reign of Stone Mushrooms'. In the middle of the room tower three surprisingly large stone mushrooms. Standing next to one of them, looking quite small, was Dr. Will White. He was looking up at the underside of one of the mushroom caps about 70 cm above his



Jim Patera

Looking out one of the entrances of the Boquerones cave system into a karst canyon

head. Elsewhere in the room one could see many other mushroom-shaped formations; several stood over 3 m tall, while others were much shorter.

It was easy to see why these formations were called mushrooms. Most of them had rounded caps up to 2 m in diameter, with some being larger. The rounded tops of the mushrooms seem to flow over the edge of the cap, like blown snow hanging over the edge of a roof. The stems of the three mushrooms in the middle of the room were approximately a meter in diameter, but other mushrooms elsewhere were larger. It was easy to make a correlation between the tops of the mushroom caps, the shelfstone ledge along the wall, and a previous water level.

In 2016, Tomaso Bontognali and colleagues published a study of the mushroom speleothems in Cueva Santa Catalina (Bontognali et al., 2016). They concluded that these speleothems mainly consist of calcite and aragonite that formed during four phases of an evolving cave environment. The stipe (stem) of the mushroom is comprised of a stalagmite surrounded by calcite rafts that were subsequently encrusted by mammillaries. The caps of the mushrooms are similar to stromatolites of microbial origin that occur in marine environments, except that they form in the absence of light.

Cueva Santa Catalina also contains very large and spectacular folia, which were the primary focus of a 2015 article by D'Angeli, Grau, and their colleagues (D'Angeli et al., 2015). The largest of these formations resemble bell canopies and have perfectly formed smaller folia nested inside on the downward-facing, concave surfaces. The origin of folia is a debated subject, although most workers believe they form at or very near the water table or pool level. The folia in Cueva Santa Catalina are certainly among

the largest and most perfectly developed examples in the world.

In 1996, Cueva Santa Catalina was declared a National Monument by the Cuban government for its exceptional speleothems and its historical value. The area is under the care of rangers who tend to trails and plant life and prevent unauthorized entry into the cave.

The next cave we visited was Cueva Ambrosio, a small commercial cave on the Varadero peninsula. The cave has a few stalactites, but most people visit the cave because it contains 47 red and black, pre-Columbian pictographs. There are several skylight entrances that dimly illuminate much of the cave, as well as an active colony of Jamaican fruit bats that kept visitors company while they examined the artwork.

Dwight also took us to Cueva Ambrosio because it is a great example of a flank margin cave. Cueva Ambrosio is simple and is the type of cave that John Mylroie described in the Bahamas and other Caribbean islands. This type of cave forms at the interface within the carbonate rock between the salt water saturated zone and an overlying fresh water lens that "floats" on top of the sea water. The mixing zone between the two layers of water is acidic and is where dissolution takes place. Initially, flank margin caves are isolated. As they grow and intersect, a maze-like complex of cavities with limited vertical extent may develop. They lack features associated with flowing water, such as wall scallops. In the Caribbean, flank margin caves are typically developed in young, poorly consolidated, carbonate rock that has never been deeply buried. Flank margin caves are formed along the seacoast where saltwater and freshwater mix, the halocline. They have been given the flank margin name because they develop along the flanks of islands, at the margins of freshwater lenses.

Flank margin caves share features associated with hypogenic caves (formed by acid water rising from below) such as Carlsbad Cavern. The Cuban caves we visited typically had cusped walls and dead-end passages. The many vertical entrances appear to be vertical shafts and breached bell holes exposed by erosion of overlying carbonate rock. Horizontal entrances were formed by erosion of the hillsides. The diurnal rise and fall of sea level (tides) had little or no effect on cave development, but larger fluctuations of up to 100 m during interglacial periods, or due to tectonic uplift, had a significant effect on the development of levels in some flank margin caves. A number of US cavers working on coastal karst credit Núñez Jiménez for his pioneer work in explaining the flank margin cave phenomenon.

During our days in the Matanzas province, we interacted with SEC president

Travel to Cuba

As noted, our trips to Cuba qualified under the "people-to-people" category under the General License, as defined by the Department of Treasury's Office of Foreign Assets Control. Aside from "people-to-people", there are other kinds of travel to Cuba that are allowed under the General License that remain in compliance with the embargo. You can find more information about these categories at <https://www.treasury.gov/resource-center/sanctions/Programs/pages/cuba.aspx>. President Obama expanded these categories and as of this writing these categories have not changed. If you are seriously considering travel to Cuba, make sure to get the OFAC Cuba Sanctions updates. Contacting an experienced travel agency such as Marazul is also very helpful. If caving is part of your plan in Cuba, make sure to contact the Sociedad Espeleológica de Cuba, unless your caving plans will be strictly limited to guided cave trips. As of this writing (May 2017) we await the launch of an updated SEC website with contact information of the SEC leadership and the presidents of all provincial committees. Be on the lookout for that since cave exploration in the country requires government permits that can only be obtained through national speleological representatives, all of them affiliated with the SEC.

Research on Cuban-US Caver Collaborations

María Alejandra Pérez (NSS#53594) has an ongoing project on the history of collaborations between Cuban and US cavers since 1940 until the present. She is interested in figuring out what factors have led to the success of these collaborations, and what we can learn from them. This work is supported by the National Science Foundation (#1431278). If you have been or have tried to go caving in Cuba, and would like to learn more about her project, please contact her at maria.perez@mail.wvu.edu. An anthropologist by training, Pérez is Assistant Professor in the Department of Geology and Geography at West Virginia University.

Alejandro Romero Emperador, who traveled from his home in the south-central Cuban city of Sancti Spiritus. There he also works as FANJ delegate of the province, directing the regional FANJ museum. He has been actively leading collaborative caving projects with the US cavers since the 90s. While in Matanzas we also met Ercilio Vento Canosa. A few of us took advantage of some free time to meet with him in downtown Matanzas. Aside from being a caver, Ercilio is a medical doctor, forensic anthropologist, artist, and most recently, a member of the Cuban National Assembly. In addition to all of that, Ercilio was SEC president after the death of Núñez Jiménez. Vento Canosa is a fascinating Renaissance man who happens to be *the official* Matanzas historian. We were fortunate to get a brief tour of the city with him.

Another of the Matanzas highlights was experiencing a block party organized by the Committee for the Defense of the Revolution (CDRs) in one of the Matanzas neighborhoods. This event, which our Amistur guide Cal introduced to us as an opportunity to "meet the people", was as enjoyable as it



The Viñales Valley is made up of predominately limestone of Jurassic and early Eocene deposits which have been lifted and twisted by plate movements.

was interesting. We found it fascinating to visit the small neighborhood and to talk and dance with the people who live there. Some of the community children put together a dance routine, followed by food and more dancing. The experience was interesting because it provided a glimpse of current and changing roles of CDRs within Cuban society. The history of these organizations is quite complex and at times controversial, since they represented the deep polarization of community life following the triumph of the Cuban Revolution. To critics of “people-to-people” trips, the inclusion by ICAP of these events in the itineraries of its visitors is only further evidence of the political agenda of the Cuban state through ICAP. Whatever your take, we enjoyed having an opportunity to interact with members of this community, something we would not have done otherwise.

Back in Havana, we wrapped up our time in Cuba with a visit to the historically prominent Hotel Nacional, followed by a visit to the neighborhood and home of Gaudí-inspired Cuban artist José Rodríguez Fuster. We ended our trip with a stop at the SEC’s main headquarters, and ICAP. At this last stop we listened to a talk by ICAP’s US specialist on US-Cuban relations. For those of us interested in better understanding the inner workings of the complex relation of US-Cuban history and tourism, that last ICAP visit was a valuable experience. And what a coincidence it was! Less than 24 hours after our ICAP lecture, prisoners in both countries were released and the Obama administration announced relaxation of the sanctions against Cuba. We like to think that speleo-diplomacy played some role in the extraordinary turn of events that now have Cuba front and center of US foreign relations!

The February 2016 Trip

After the success of the December 2014 trip, Dwight and Mary were at it again planning a second trip with a somewhat different itinerary. Because of this, there were a number of people from the first trip eager to join again. Some of us made it, some of us didn’t. The 2016 itinerary did not head west to Pinar del Río but instead turned east to Matanzas and then south to the town of Sancti Spiritus, the home of the then SEC president Alejandro Romero Emperador. A number of members of this trip were very interested in cave restoration and conservation techniques. Thus, we focus on this topic in the following notes.

Like the first group, time in Matanzas included Cueva Ambrosio, Santa Catalina, and Bellamar, along with a fascinating stop at the perm-a-culture Jardines de Bellamar Preserve above the Bellamar cave system.

Upon first entering Cuevas de Bellamar, there is a concrete platform in a large room where the tourist and the off-trail routes divide. We noticed that large formations have a slight green algae tinge due to the artificial lights. We descended two or three flights of stairs and ladders to the lower levels of the non-tourist route, following old 1920s era electrical lighting wires. Some old Edison-like bulbs were observed still attached to the wires.

The cave is filled with many white flowstone and drapery formations. Passages appeared to be phreatic, being more oval and round than joint controlled. We visited an area where there is pencil graffiti on the formations, and there was a discussion with Esteban Grau and Evelio Balado about the best way of removing the marks. Pencil marks on flowstone are some of the most difficult graffiti to remove because graphite is not soluble. In these caves it was noted that there is a high rate of calcite deposition due to the high solubility of the cap rock. In

one area we saw almost 10 cm of calcite on an artificial wire fence that was installed 100 years ago. There was the discussion about what was considered historically significant and should not be removed. There are many formations that have been broken by tourists, yet the pieces remain in situ. Because all the sections were present with Esteban Grau we puzzled all the pieces back together again, managing to completely rebuild the formation. Satisfying our curiosity we then dismantled it carefully and laid it on the cave floor.

We also visited Cueva Santa Catalina, which we describe in detail in the previous 2014 trip section, with its five levels of passage. There was one area with formation drapery vandalism breakage. Lynn Kleina found many pieces that fit back on the wall and restoration methods were discussed.

From Matanzas, the group headed southeast to the small town of Sancti Spiritus. The first stop was the Sancti Spiritus FANJ museum where Alejandro Emperador gave a presentation describing ongoing scientific research in caves in Cuba. While at the museum we had the opportunity to meet Luis Olmo Jaz, Osmany Rodriguez, Ernesto Jiménez, and Eduardo Velazquez, all part of the Grupo Samá. This caving club has been very active in the exploration of nearby caves and has collaborated over the years with US cavers.

From Sancti Spiritus we headed to Cueva Boquerones, which required crossing a river and hiking up a hill for about 1 km. It took us 45 minutes to arrive at cave entrances. Large rooms were connected with large passages and big formations. The Boquerones Cave System, (*boquerón* is ‘hollow’ in Spanish) is one of the 49 caves that have been protected by the Cuban government within the Buenavista Biosphere Reserve. Designated in 2000 by UNESCO because of its scientific and historical significance, the Buenavista Biosphere Reserve covers 313,500 hectares (774,675 acres). The reserve encompasses a wide range of ecosystems from coral reefs and mangrove swamps in the North all the way down to jungles and caves to the South. Situated between the cities of Sancti Spiritus, Florence, and Cambas, the cave system is located in the Sierra Jatibonico Mountains bordering the town of Sancti Spiritus. The Jatibonico Mountains were formed when the Caribbean plate collided with the North American plate and is comprised of mainly lake and shallow marine deposited limestone during the Cretaceous period.

The entrance to Boquerones appears to be part of an old cave passage eroded by an intermittent stream which still cuts through the drainage. Above the entrance were numerous bubble-like voids, some large

and some small, which made the limestone look like the proverbial Swiss cheese. Many graffiti names covered the walls around the entrance, some of which appeared to be drawn by carbide lights while others looked to be newly painted with an ugly red paint. We were told that the new names had appeared recently, after the opening of a new tourist camp a few meters up the road from the trailhead. The cave is reported to be made up of several different levels, one of which was said to be a part of the historic underground course of the North Jatibonico River. Our Cuban guide referred to this part of the main passage as being a fossilized river. A map of the cave gave the impression of a spongework-like pattern with many interconnected short passages that formed a maze of the whole Boquerones system.

In areas near the canyon entrances there was a lot of rather new graffiti painted on the walls (dates of 1994). Unfortunately, some of this new graffiti cut across some historically important 1895 dates that are concurrent with Cuba's war with Spain. This cave is one place where rebels hid during that time. During an afternoon dedicated to talks with Alejandro Romero, there was a discussion on how to preserve and restore this area. Doug Soroka presented conservation techniques that could be used in these projects.

After Boquerones, we visited the caves of Caguanes National Park. We took an hour-long ride through cattle grazing country on the back of a 1960 Soviet 2.5-ton troop transport to get to the caves. Caguanes caves are difficult to visit and require either a high clearance vehicle or horses capable of traversing 2 km of water-filled roads. The park is an area of coastal keys where there are many islands that contain sea and flank margin caves. Our first stop was Cueva Humbolt, which has a very large entrance and lots of walking passage. It is highly decorated with primary and secondary speleothems and has one of the best exhibits of soda straw formations in Cuba. During guano mining a geode-like room was opened, revealing formations as thin as 0.5 cm and 10 to 20 cm in length.

Our second stop was Cueva Ramos, which has some of the best pictographs seen on this trip. There were many other examples which time and location did not allow us to visit, but we were asked to maintain our scientific interest in these drawings. One of the drawings, the shield logo, is estimated to be 5,000 years old. This pictograph is remarkable because Núñez Jimenez saw similar logos in caves he visited during his 1987-1988 canoe expedition, through the Amazon basin and across the Caribbean. These Cuban pictographs are the best preserved and, because of their

remoteness, they remain undisturbed. The pictographs have been recorded by artists and photographers, but unfortunately the ability to evaluate using UV and modern digital photo manipulation to observe faded details is unavailable to the Cuban scientists. We also observed the 'Star and Spacecraft' drawing. For some space alien groups, this drawing represents positive proof of extra terrestrial visits to this planet. We were told that this is one of the most photographed pictographs in the park.

Our last stop was Cueva Los Chivos, a multi-entrance flank margin cave with many trees growing through skylights. The roots of one of these trees resembles a harp, thus its nickname, El Arpa. We also witnessed the remnants of a bed frame which was used by Cuban troops during the US-Cuban missile crisis in 1962.

After pushing the 1960s vintage troop transport to get it started, our group reunited in town at the regional cave house of the Grupo Samá.

The rest of the trip was non-cave related except for a visit to the SEC headquarters in Havana. There, cavers from Havana, Artemisa, and Pinar del Río presented their scientific work to us. This was mostly in the fields of archaeology and exploration in the western part of the island.

A Collaborative Effort

Our hosts during both trips were high-level representatives of the SEC and the FANJ. We note here the leadership positions everyone had at the time of the two trips (these positions have recently changed since the SEC had its board of directors elections in January of 2017). Key people that facilitated our visit and travels include Angel Graña González (Vice President of SEC and of the FANJ) and Alejandro Romero Emperador (SEC President and FANJ delegate in Sancti Spiritus). Alejandro was key to the 2016 trip as an interface between the FANJ, the SEC, and the Cuban government. Evelio Balado Piedra (SEC Treasurer and geological engineer) was our man on the ground, sharing his cave and karst expertise in and out of caves. As noted earlier, Esteban Grau Gonzales-Quevedo, a resident of Matanzas and Vice-Secretary of the SEC, shared the research he and his Cuban and international colleagues are doing in Cueva de Bellamar and elsewhere (Grau has recently been elected the new SEC treasurer). Our visits to Matanzas would have been incomplete without meeting Ercilio Vento Canosa, past president of the SEC and a member of the Cuban Parliament. There are many other Cuban speleologists whom we met and helped us during our visits, including Rafael Rubio Muiñas (President of the Grupo Barrera and member of the SEC-Havana), Carmen

Julia Sánchez (SEC Secretary, SEC-Havana), María Luz Labrada Cortez (manager of the SEC headquarters and recently elected SEC secretary), Jean Robaina Sánchez (Grupo Origen and President of the Speleological Committee of Artemisa Province), Jorge F. Garcel Dóminguez (archaeologist with the Ministry of Culture and President of the Speleological Committee of Mayabeque), Divaldo Gutiérrez Calvache (President of the Speleological Committee of Havana and new SEC president since January 2017), Hilario Carminate Rodríguez (President of the Speleological Committee of Pinar del Río), Luis Olmo Jaz (Grupo Samá - Sancti Spiritus), Osmany Rodríguez Pino (Grupo Samá - Sancti Spiritus), Ernesto Jiménez Sánchez (Grupo Samá - Sancti Spiritus), Eduardo Velazquez (Grupo Samá - Sancti Spiritus), Abel Hernández Muñoz (biologist and author), Yuliet Sánchez Sánchez (caver and translator), Rolando Valdéz Lleó (Grupo Ciego de Ávila), Sergio Fernandez Errio (Grupo Ciego de Ávila), Juan Carlos Montero (Grupo Ciego de Ávila), and Alfredo Diaz Romero (Grupo Ciego de Ávila).

At the closing event of the February 2016 trip, Dwight Deal received special recognition for his promotion of friendship and scientific exchange between the NSS and SEC. The Executive Committee awarded him Socio Fraternal membership in the SEC. In his acceptance, Dwight praised all of the work done by American cavers who have spent years of effort at great personal expense to develop on-going caver-to-caver working relationships with Cuban speleologists. Their maps and reports were prominently displayed at the FANJ headquarters and the Caver House in Sancti Spiritus. It is these explorers and scientists who are the real ambassadors between American and Cuban cavers.

Finally, we want to highlight two organizations that were instrumental in coordinating both of our trips: the Eco-Cuba Network and the Marazul Travel Agency. Eco-Cuba is a 20 year-old collaboration between US and Cuban environmentalists, which promotes environmental interchange between the USA and Cuba and works within both countries to implement the ideas generated by the Network. Marazul was founded in 1979 to facilitate visits to Cuba by Cuban Americans. The agency specializes in arranging charters to Cuba.

Cueva Santa Catalina speleothem references:

Bontognali, T.R.R., D'Angeli, I.M., Tisato, N., Vasconcelos, C., Bernasconi, S.M., Gonzales, E.R.G. and De Waele, J., 2016. Mushroom speleothems: Stromatolites that formed in the absence of phototrophs: *Frontiers in Earth Science* 4:49, doi: 10.3389/feart.2016.00049
D'Angeli, I.M., De Waele, J., Ceballo Melendres,

Cubans to NSS Conventions 2015-2016

Dwight Deal

O., Tisato, N., Sauro, F., Grau Gonzales, E.R., Bernasconi, S.M., Torriani, S., and Bontognali, T.R.R., 2015, Genesis of folia in a non-thermal epigenic cave (Matanzas, Cuba), *Geomorphology* 228, 526-535. doi: 10.1016/j.geomorph.2014.09.006

Some Recommended Readings:

The authors have put together a list of readings in English for those of you interested in learning more about Cuban caving and Cuba more generally. The list is far from comprehensive, but it is a start.

Caves of Sancti Spiritus, Matanzas, and Pinar del Rio edited by Joel Despaigne and available online at calizamedia.net.

Seale, Larry D., Limaris R. Soto, Lee J. Florea, and Beth Fratesi. "Karst of western Cuba: observations, geomorphology, and diagenesis." In *12th Symposium on the Geology of the Bahamas and other Carbonate Terrains*. 2004.

Parise, Mario, and Manuel Valdes Suarez. "The show cave at 'Gran caverna de Santo Tomás' (Pinar del Rio province, Cuba)." *Acta carsologica* 34, no. 1 (2016). This is an introduction to Viñales and Matanzas.

LeoGrande, William M., and Peter Kornbluh. *Back channel to Cuba: The hidden history of negotiations between Washington and Havana*. UNC Press Books, 2015

Frank, Marc. *Cuban Revelations: Behind the Scenes in Havana*. University Press of Florida, 2013

For an excellent recounting of the events leading up to the normalization of U.S. - Cuba relations (and enough history to put them in context), we recommend the series of 9 New York Times editorials starting on October 11 and culminating on December 17, 2014.

The following references are in Spanish only, but they are useful as historical sources of Cuban speleology, particularly centered on the contributions of Antonio Núñez Jiménez. A number of us are also in the process of adding the editions of "El Explorador," the Cuban version of the *NSS News*, to the Karst Information Portal. That material is also in Spanish.

Núñez Jiménez, Antonio. 1990. *Medio siglo explorando a Cuba*. Cuba: Imprenta Central de las FAR.

Núñez Jiménez, Antonio. 1963. *Cuba con la mochila al hombro*. La Habana: Unión de Escritores y Artistas de Cuba.

Núñez Jiménez, Antonio. 1987. *Geografía y espeleología en Revolución*. La Habana: Imprenta Central de las FAR.

The voluminous works of many prominent Cuban karst scientists has also been published, but is beyond the scope of this article.

Over the last 75 years there has been an intermittent series of exchanges between NSS members and members of the Sociedad Espeleológica de Cuba (SEC). Antonio Núñez Jiménez was the father of organized Cuban caving who was awarded the NSS Honorary Membership in 1993. He corresponded with Bill Stephenson, Will White, Brother Nicholas Sullivan and others during the early years of both groups (the SEC is actually older than the NSS). John Cooper talked at length about biological collecting in Cuban caves in the 1950s. There was the ill-fated Nittany Grotto Christmas Expedition in December 1958 just days before Batista fled the country. Since Castro's revolution there have been a number of individual efforts as well as expeditions under the auspices of the NSS Cuban Cave Project organized first by Kevin Downey and later Cyndie Walck that established connections with various local caving groups in Cuba. The Cubans undertook the translation of Art Palmer's **Cave Geology** book into Spanish.

Dwight and Mary Deal traveled to Cuba in January 2013 and began making contact with members of the SEC executive committee, followed by two group trips that introduced 39 U.S. cave scientists and explorers to the Cubans. With communication from Dwight and other NSS cavers involved in Cuban cave projects, international cooperation was increased between NSS and SEC. As a result several Cubans were able to attend NSS conventions: 2015 in Missouri and 2016 in Nevada. Cubans introduced to the NSS include Angel Graña Gonzalez, Esteban Graü Gonzales-Quevedo and Osmany Rodriguez Perez.

From the participation of Cubans, we learned about exploration, archeology and preservation of caves in their country. One dramatic example is the reversal of Cuban government decision-makers in Matanzas when presented with 3-D video documentation by cavers of a cave system that was in jeopardy due to plans for a 30,000-person housing project to be built on top of it. With community input, a new National Protected Area was proposed and approved.

A week at an NSS Convention gave Cubans the opportunity to interact with many NSS members. After the conservation session at Ely, Esteban had long and extensive discussions with leaders in the conservation and restoration movement in the U.S. Among them were Jim Werker and Val Hildreth-Werker, who are exploring with Esteban how to arrange a seminar and workshop in cave conservation and management in Cuba. Doug Soroka and Lynn Kleina had

previously had some hands-on sessions with Esteban at caves he manages in Cuba.

Dale Pate took Esteban on a day-trip to Lehman Caves. With the support and encouragement of Superintendent Steve Mietz, Esteban was briefed by Dale, Resource Chief Tod Williams, and other NPS personnel on the philosophies and techniques used to present and preserve cave resources. Impressed with Esteban's knowledge and commitment to conservation and preservation, the NPS personnel speculated on the possibility of establishing a sister cave relationship between Lehman Caves in Nevada and Cuevas de Bellamar. This idea, of course, has to proceed up the administrative ladder in both countries. The important thing is that Esteban's visit to our convention sparked this idea.

Bringing Cubans to NSS Conventions in the USA presented unusual challenges. The NSS Convention staff, NSS International Fund, Cave Conservancy Foundation, Kettering Foundation, Eco Cuba Network, Planet Savvy, and a number of individual NSS members worked together to make this possible. *Thank you all!*

With the 2016 NSS convention as a model, future exchange individuals will be successful with the following:

- A moderate level of proficiency in English
- Ability to make a presentation on a project or topic in Cuba that is relevant to NSS attendees
- A willingness to meet attendees, socialize, and discuss shared interests in caves and karst
- Have one or more goals in mind that will benefit the work of speleologists in Cuba and seek to learn from NSS experts to accomplish the stated goal(s)
- Intent to gain general knowledge and educational materials to bring back to Cuban speleologists

U.S. counterparts should continue to provide:

- Waived registration fee and additional support, as available
- Local services in transit that welcome our Cuban guest and assist him/her as needed
- Specialized educational opportunities that relate to Cuban interests and goals
- Inclusion in social and group project gatherings
- Provision of educational materials to bring back to Cuban cavers

Right: Pit in the Gouffre, TN. Photo by Ethan Reuter.
Left: Helictites in Cueva de Bellamar, Cuba. Photo by Jim Patera.

Bottom: David Worthington looking back out the main entrance to the Majaguas-Cantera System, Pinar del Río Province, Cuba. Photo by Jim Patera.

September 2017

