

# 2017 Sistema Cheve Expedition

## *Executive Summary*

### Introduction:

Sistema Cheve (the general term for the collection of caverns in the Cuicatlán, Oaxaca district of the Sierra Juárez in southern Mexico) is one of the world's great cave systems. While the entrances to these caves have likely been known for thousands of years to the indigenous Cuicatec, what lies deep inside only began to be revealed in 1986, when modern cave explorers first visited the massive entrance of Cueva Cheve. Year by year, pieces of this amazing subterranean puzzle have been put in place through the efforts of more than 16 expeditions, many lasting up to three months during the spring dry season in efforts to explore a single cave. Sistema Cheve is so vast that it passes under six different municipalities. But it is depth that makes Sistema Cheve extraordinary: it is the world's deepest known karst hydrologic system. A dye trace in 1990 showed it to have a depth of nearly 2,600 meters (8,530 feet). The current limit of human exploration was reached in 2003 at a depth of 1,484 meters (4,869 feet) at a distance of 10 kilometers (6.2 miles) from the nearest entrance.

The southernmost entrance to the system is Cueva Cheve<sup>1</sup>, situated in a ponderosa pine forest at nearly 3,000 meters elevation above sea level. The northernmost entrance is Cueva de la Mano<sup>2</sup>, at the bottom of the Santo Domingo Canyon, nearly 20 kilometers away in straight-line distance. Water that enters Cueva Cheve flows to the springs at Cueva de la Mano. It is believed that water entering all of the caves in a zone 7 kilometers wide between these two locations eventually drains to Cueva de la Mano. The primary objective of all exploration in this area is to prove a humanly passable link between all these caves.

In terms of sheer technical remoteness and difficulty underground, Cheve has no equal. Just to reach the present limit of exploration more than 3 kilometers of rope will need to be rigged on more than 120 vertical pitches and three underground camps need to be established – with 8 to 12 hours of rugged subterranean travel between each camp. Furthermore, caves do not run in straight lines underground – they follow faults and fissures dictated by geology. Thus even though the surveyed length of the known parts of just the largest of these caverns – Cueva Cheve – has a length of 26 kilometers (see table), the horizontal projection on the surface comprises less than 20% of the overland distance to the springs at Cueva de la Mano. It is entirely possible that a complete traverse could see explorers on a one-way subterranean journey approaching 100 kilometers in length, a level of remoteness without equal on Earth.

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1 17°51'52.79"N, 96°47'40.28"W

2 18°01'35.69"N, 96°49'21.13"W

Presently there are four independent very large and deep caverns inside the mountain that have already achieved worldwide recognition on the basis of their own statistics:

Name	Depth (meters)	Length (meters)
Cueva Cheve	1,484	26,194
Cueva Charco	1,278	6,710
Sistema (Ozto) J2	1,229	14,840
Cueva de la Mano	180	10,841

The table presents only the largest of the known caves. It is important to point out that no one has found a definitive ending to any of the large caves that compose Sistema Cheve – the limits of human endurance and technology have always been the factors that have stopped progress. It is, in fact, this persistent failure to find the ends of these caves that serves as a call to some of the world’s greatest cave explorers to come try their luck and see if they can be the ones to solve the riddle once and for all. In this sense, the teams that explore Sistema Cheve today are no different from the teams that attempted to be the first to scale Mount Everest nearly 100 years ago or those who ultimately were the first to explore Antarctica. It is the absolute challenge – to both physical endurance and to the mind to figure out a way to solve the problem of linking all of these pieces together to form the world’s deepest cavern – that is the attraction. In the case of Sistema Cheve that challenge is far more difficult than the ascent of any mountain on Earth because it involves so many different disciplines – from explorer, to climber, to diver, to cartographer, and even to photographers who must find ways to light places that are forever dark. In a sense, Sistema Cheve is the ultimate physical and psychological frontier on Earth in 2017. It is an analog for the remoteness and difficulties that will need to be overcome as humanity expands eventually into the Solar System in the next century.

#### Recent Explorations:

As early as 1990 exploration was halted temporarily in Cueva Cheve due to the discovery of an underwater tunnel – known as *Sump 1* – at the 1,362-meter-depth level and 9 kilometers from the entrance. Just to reach that point required 3½ days of subterranean travel and three subterranean camps. The first attempt at finding a way through *Sump 1*, in 1991, failed when the lead diver followed an obvious north-trending route into a narrow fissure that was too tight to pass. It was only realized afterwards that a fault intersected that location and that the actual way onward was backwards, under the tunnel that explorers had followed from the entrance.

In 2003 a four-person diving team (supported by a team of 60) returned, successfully passed the 140-meter-long *Sump 1*, and discovered a kilometer-long section of large river canyon passage beyond *Sump 1*. This ended at a second, 280-meter-long underwater tunnel – *Sump 2* – beyond which was a boulder pile, from an ancient collapse, that blocked human passage but through which the river flowed. The brief inspection by the two lead divers concluded that there was no way on. However, there

are three large waterfalls that enter the cave along the stream passage between the two sumps. One of these is more than 60 meters in height and crashes into an 80-meter-long lake. There was no time to investigate these waterfalls in 2003 as the discovery of the way through *Sump 1* and the river canyon beyond occurred late in the expedition. The presence of these waterfalls is significant. Sistema Cheve is known, through 3D mapping, to have been formed on at least three different levels as the subterranean river cut down through various stratigraphic layers over the course of millions of years. The active river today is the lowest level. Some 40 to 50 meters vertically above that is a level where difficult but passable tunnels exist. Most importantly, however, at an elevation between 70 to 100 meters above the river there exist “fossil” (old, dry) tunnels of gigantic proportions. Because Sistema Cheve is highly fault-controlled – that is, it tends to follow large-scale cracks in the limestone strata created when the Sierra Juárez was pushed up from the Gulf of Mexico – these upper level passages tend to lie directly above the river passage. A waterfall, then, is a geologic “drill” that creates an access path between layers.

#### Plans for 2017:

Thus, the primary objective in 2017 will be to establish subterranean Camp 4 beyond *Sump 1*, to scale these waterfalls, and, hopefully, to reacquire the high-level dry “borehole” (caver jargon for very large passage) last seen just north of Camp 3. If successful it will be our further objective not only to explore this overhead tunnel deeper into the mountain, but also to connect it to dry (air-filled) cave upstream of *Sump 1*, thus bypassing the need for diving and allowing for all team members to participate in deeper explorations. A breakthrough of this nature could lead to rapid extension of the main cave – Cueva Cheve – to depths in excess of 2,000 meters as well as seeing the possible linkage of other large cave systems. We are expecting that the teams sent to Camp 4 will see continuous underground stays of 30 days or longer before cycling out with replacement teams. The duration of the expedition is designed to allow three independent pushes from Camp 4 by four-person diving/climbing teams. The remainder of the 65-person support team will be staged at various camps throughout the cave to transport food and materiel to *Sump 1* in support of the climbing effort beyond *Sump 1*.

We are optimistic regarding our chances for success. Since 2003 there have been dramatic advances in technology. Techniques for scaling subterranean domes have improved to where a 60-meter ascent in a single day is possible. Diving technology has given us closed-cycle life support (rebreathers) weighing less than 15 kilograms yet providing for six hours of underwater time. We now custom-mix underground food provisions to match proven ultramarathon diets. And camping equipment and clothing have reduced in size and weight and are more tolerant of cold, wet conditions. The team is extraordinarily experienced, and represents the best expeditionary cave

explorers from 11 nations<sup>3</sup>. From February 10<sup>th</sup> through May 10<sup>th</sup> 2017 this team will take on one of the greatest exploration challenges remaining on Earth.

2017 Sistema Cheve Expedition Management Team:

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<sup>3</sup> United States, Poland, Sweden, Canada, UK, Lithuania, Mexico, Russia, Slovenia, Romania, Switzerland