

# 19TH INTERNATIONAL SYMPOSIUM ON VULCANOSPELEOLOGY

CATANIA 28th AUGUST - 3rd SEPTEMBER 2021



[www.19isvetna.com](http://www.19isvetna.com)



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## WELCOME TO CATANIA



Dear friends,

I wish you all a very warm welcome to Sicily, to Catania and to the 19th International Symposium on Vulcanospeleology (ISV).

It has been more than 20 years since an ISV was convened in this historic and dynamic city but over the years, Catania has hosted more ISVs than anywhere else. This is no coincidence.

Catania is draped around the base of Mt Etna, the highest and most active - and also one of the most famous - volcanoes in Europe. The city's culture and history, its geography, its food and wine traditions, and the recreational pursuits of its residents have all been indelibly linked to the vagaries of the omnipotent 'Mungibeddu', as the locals call the mountain. With its dramatic volcanic setting and the welcoming attitude of its residents, it is little wonder that Catania has been such a popular location for ISVs.

Mungibeddu has forged a tenacious resilience into Catanese culture. This determination to bounce back from disappointments and challenges also pervades the Gruppo Grotte Catania (GGC), the organisers and key hosts of this ISV. In the early months of 2020, a series of minor eruptions near the Mungibeddu summit simultaneously excited and worried intending participants and GGC members alike. If the eruptions continued, there was a chance of a spectacular show for visitors but there was also the possibility of impacting on planned excursion activities. The eruptions continued into March, but as the month progressed, members of the GGC and the Commission on Volcanic Caves became more concerned about a different type of eruption; the Corona virus pandemic.

In early April last year with the pandemic rapidly spreading around the world, GGC in consultation with the Commission, bravely decided to postpone the ISV for 12 months. This early decision greatly assisted many intending participants in revising

their travel plans. As it happened, staging the ISV in August-September last year would have been impossible. Throughout the remainder of 2020 and into 2021, GGC continued to refine the ISV program and also make modifications in the light of the ever-changing Covid situation and government responses to the pandemic.

On behalf of all ISV participants, I wish to acknowledge the sustained efforts of GGC members to make this 19th ISV a reality. In particular, I thank the key members of organising committee Dr. Andrea Belfiore, the GGC Chairman, Dr Carmelo (Mel) Bucolo, the immediate past Chairman of GGC, Dr Giuseppe Priolo and Roberto Conti for their ongoing commitment as events have unfolded over the last three years. Without them, and the wider GGC membership, this ISV would not have been possible.

I sincerely hope that everyone attending the 19th ISV in Catania has an interesting and rewarding time, is able to fully experience the local volcanic terrain and its caves, meets up with old friends, makes many new friends and makes the most of the opportunity to enjoy the local food and wine. On behalf of all Commission members who, because of Covid, are unable to attend in person, I thank GGC for their recent efforts to enable online participation in the symposium program. As I am among the members who would dearly like to be physically present in Catania, but simply cannot because of travel restrictions and vaccine and other Covid-related complications, I will be watching on with interest.

**John Brush, Chairman, Commission on Volcanic Caves, International Union of Speleology**





Dear caving friends,

as Chairman of the Gruppo Grotte Cai Catania I am pleased to join in the organization of the 19<sup>th</sup> International Symposium on Volcano speleology which will take place in Catania from Saturday 28 August to Friday 3 September 2021.

Sicily is the largest island in Italy and in the Mediterranean; it is a surprising land, rich in history and traditions, in which art and culture are intertwined with a spectacular natural environment. There are many reasons to visit Sicily: a beautiful coast, picturesque fishermen villages, a green and flourishing countryside, high mountains, and impressive volcanos.

On the eastern side of the island, not far from the strait of Messina, is Mt. Etna, the highest active volcano in Europe. Over the centuries its eruptions have modified the slopes of the mountain drawing spectacular views of lava and ice, now protected by a vast natural park, open to visitors thanks to countless nature trails.

Mt. Etna is rich both in fracture caves and lava tunnels which were formed during the periods of eruptive activity as a consequence of the cooling of the outermost layer of the eruptive flow. The length of the caves varies greatly, from few meters to over a kilometer. Many of the horizontal caves can be visited easily. When you visit a cave, besides the excitement of descending into the “underworld” of the volcano, you can also understand some of its dynamics and some of its interesting features. Mt. Etna and its caves are waiting for you to surprise you with the wonders of our island. The coronavirus (SARS -CoV-2) has changed our daily habits, like a hug or a handshake. I hope that this Symposium, in addition to being an international event, can also be the dawn of a new period of normality in which warm human relations are re-established.

Our caving group is doing its best to make this happen and we are confident that the bad times will be over soon.

**Dr. Andrea Belfiore, Chairman, Gruppo Grotte Catania**



UNIVERSITÀ  
degli STUDI  
di CATANIA

Ladies and gentlemen, dear participants,

it is with great pleasure that, on behalf of the Rector of the University of Catania, we welcome all of you to the XIX Symposium on Volcano-Speleology.

A special thank goes to Dr. Giuseppe Priolo for inviting us and for all efforts made for organizing this important international meeting whose success is also testified by the great number of participants.

We are really honored that Catania, which hosts the oldest Sicilian university and is located at the foot of the highest active volcano in Europe, was enthusiastically chosen the organization committee.

This conference is an important opportunity for many researchers from all over the world for comparing and sharing their knowledge on several topics, particularly interesting for the volcanological and speleological scientific community.

Finally, Mt. Etna and the old city of Catania are waiting you for a visit. We hope that your staying in Sicily will be great, and we are sure that the meeting will be fruitful.

Thank you-all for your participation and enjoy the meeting and the city as well.

Rosolino Cirrincione

Carmelo Ferlito

Gian Pietro Giusso del Galdo

Carmelo Monaco



## **SYMPOSIUM PROGRAM – SUMMARY**

More information on starting and finishing times is included in the detailed program information elsewhere in this booklet

### **SATURDAY AUGUST 28<sup>TH</sup>**

All day For all participants, complementary transportation from the airport to the hotels.

Afternoon Opening of the exhibition:  
“The Fingal cave, between history and legend”

### **SUNDAY AUGUST 29<sup>TH</sup>**

All day **PRE-SYMPOSIUM EXCURSION:** MT. ETNA GEOLOGY an overview of the volcano guided by a geologist, with stops at the most significant points (all day).

Evening **Welcome party** (Scammacca’s Farm)

### **MONDAY AUGUST 30<sup>TH</sup>**

Morning **Symposium opening and institutional work sessions**  
(University of Catania – Geological Faculty)

Afternoon **Catania’s natural and cultural heritage**  
Katane: the Greek and Roman city (guided trip)

Evening **Recent discoveries** video presentations (GGC Arena)

### **TUESDAY AUGUST 31<sup>ST</sup>**

Morning **Symposium lectures & work sessions**  
(University of Catania – Geological Faculty)

Afternoon **Catania’s natural and cultural heritage**  
The City revives after the 1669 earthquake & the  
“Catanese” Baroque

Evening **Participants’ video or slide** contributes (GGC Arena)

All day                    **Taormina and Alcantara Gorges**                    Guided tour

**WEDNESDAY SEPTEMBER 1<sup>ST</sup>**

Morning                    **Lectures and conclusion of work sessions**  
**Meeting of the UIS Commission**  
(University of Catania – Geological Faculty)

Afternoon                    **Catania’s natural and cultural heritage**  
Historical Museum of the Landing in Sicily 1943 and  
Cinema Museum or Guided tour of the Botanical Garden.

Evening                    **Gala Banquet** in a typical Sicilian restaurant

All day                    **Syracuse and Noto** Guided tour

**THURSDAY SEPTEMBER 2<sup>ND</sup>**

All day                    **GENERAL EXCURSION** – Visit of the “**Valle del Bove**”  
(for all participants).

Evening                    **Sicilian “granita” time** (GGC Terraces)

**FRIDAY SEPTEMBER 3<sup>RD</sup>**

All day                    **CAVES OF MT. ETNA** – Visit of some Etna’s caves:  
Grotta Catanese I (half day), Grotta Intralio (half day),  
Grotta di Serracozzo (full day), Grotta di Piano Porcaria  
(full day), with the support of GGC speleologists. (Caves  
do not require climbing gear).

Afternoon                    Closing of the exhibition:  
“**The Fingal cave, between history and legend**”

Evening                    **Closing ceremony and Farewell party** (GGC Terraces)

## ORGANIZATION COMMITTEE

Prof. Gianpietro Giusso del Galdo<sup>1</sup>

Prof. Rosolino Cirrincione<sup>1</sup>

Prof. Carmelo Monaco<sup>1</sup>

Dr. Roberto Conti<sup>2</sup>

Mr. Umberto Marino<sup>3</sup> (Chairman CAI Catania)

Dr. Giuseppe Priolo<sup>4</sup> (Chairman CAI CCST)

Dr. Andrea Belfiore<sup>5</sup> (Chairman GGC)

## SCIENTIFIC COMMITTEE

Prof. Carmelo Ferlito

Prof. Rosario Grasso

Prof.ssa Emilia Poli Marchese

Prof. Blasco Scammacca

Dr PhD Salvatore Caffo<sup>6</sup>

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<sup>1</sup> Università degli Studi di Catania (UNICT)

<sup>2</sup> Commission on Volcanic Caves, International Union of Speleology (CVC UIS)

<sup>3</sup> Club Alpino Italiano – Sezione dell’Etna (CAI Catania)

<sup>4</sup> Club Alpino Italiano – Commissione Centrale per la Speleologia e il Torrentismo (CAI CCST)

<sup>5</sup> Gruppo Grotte Catania CAI Sezione dell’Etna (GGC)

<sup>6</sup> Parco dell’Etna – Dirigente Vulcanologo



## LOCAL INFORMATION

Catania was founded in the 8th century BC by Chalcidians, a Greek population coming from Thrace. In 1434, the first university in Sicily was founded in the city. In the 14th century and into the Renaissance period, Catania was one of Italy's most important cultural, artistic and political centres.

The city is well known for its history, culture, architecture and gastronomy. Its old town, on account of its spectacular baroque architecture, is a World Heritage Site, protected by UNESCO.

In the next page you can find the city map with the evidence of the places connected with the Symposium.

### A REGISTRATION DESK (GGC HEADQUARTERS)

CLUB ALPINO ITALIA – Sez. ETNA /

GRUPPO GROTTA CAI CATANIA

Via Messina 593 a - Ognina - Catania CT

### B SYMPOSIUM VENUE (CATANIA UNIVERSITY)

Università di Catania – ex Department of. Science

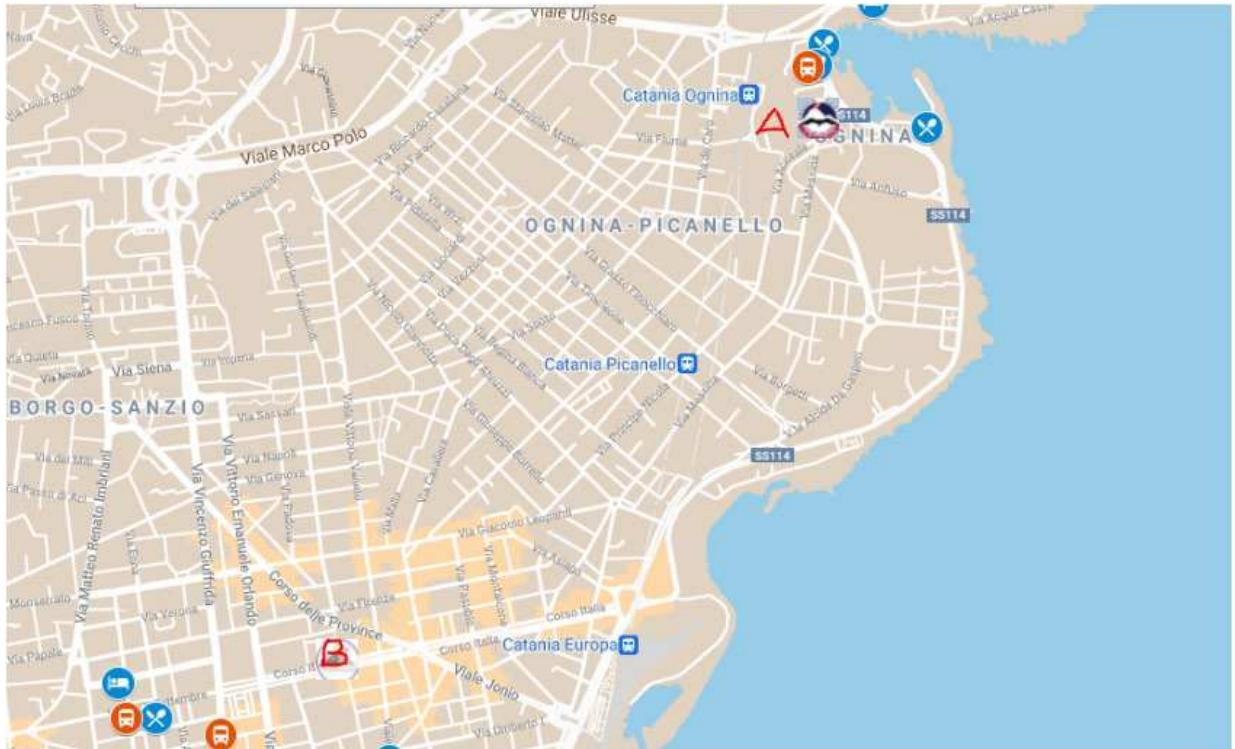
Corso Italia, 55 - Catania CT

### C EXHIBITIONS (SAN NICOLO' L'ARENA)

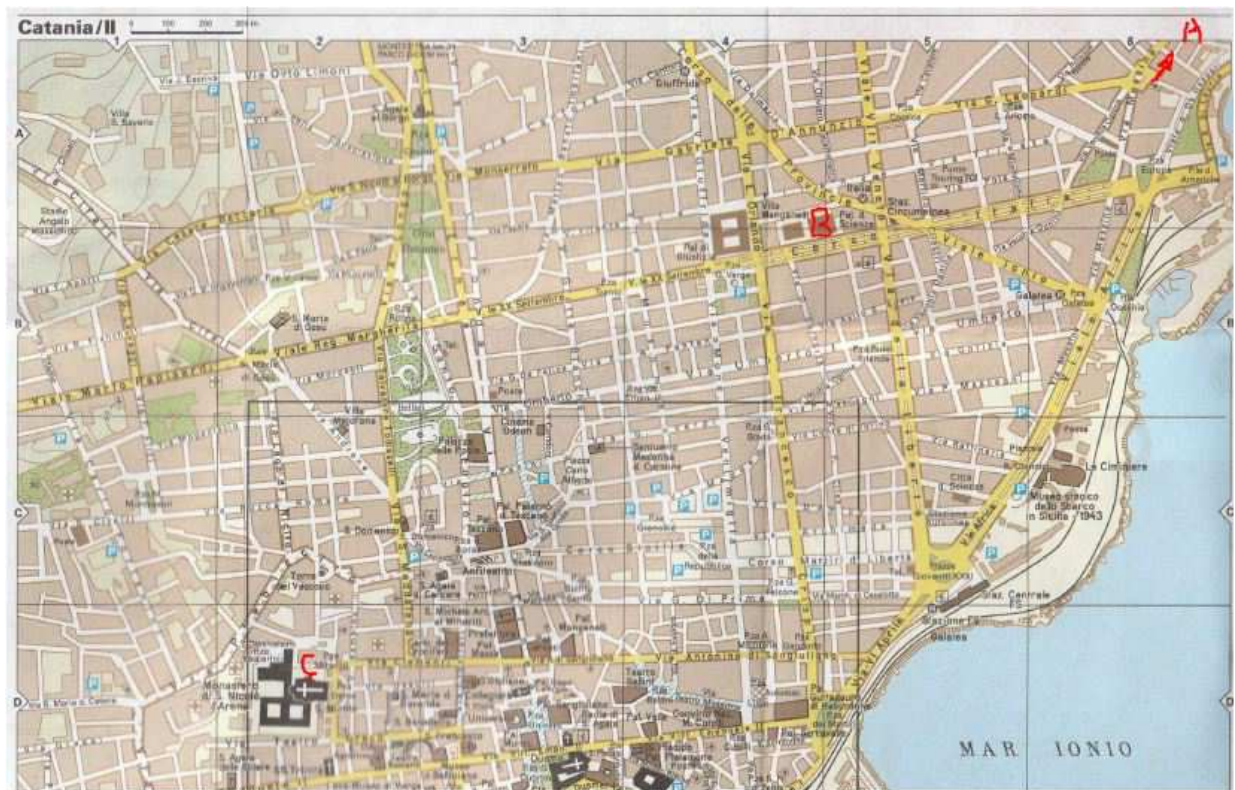
Chiesa di San Nicolò l'Arena

Piazza Dante Alighieri, 12 - Catania CT

The three places are connected by a metro line (blue stops on the map) and some public bus lines. A minibus service from the GGC Headquarters in Ognina and the Symposium Venue will be assured free of charge by GGC.



City of Catania (Ognina department)



Town center map

## REGISTRATION

**SATURDAY AUGUST 28<sup>TH</sup> & SUNDAY AUGUST 29<sup>TH</sup>**

The registration desk of the Symposium is open at GGC Headquarters from 9:00 am to 7:00 pm.

**MONDAY AUGUST 30<sup>TH</sup> to WEDNESDAY SEPTEMBER 1<sup>ST</sup>**

An information desk will be present near the entrance of the Symposium Venue at Catania University.

### **Important Information for Registrants**

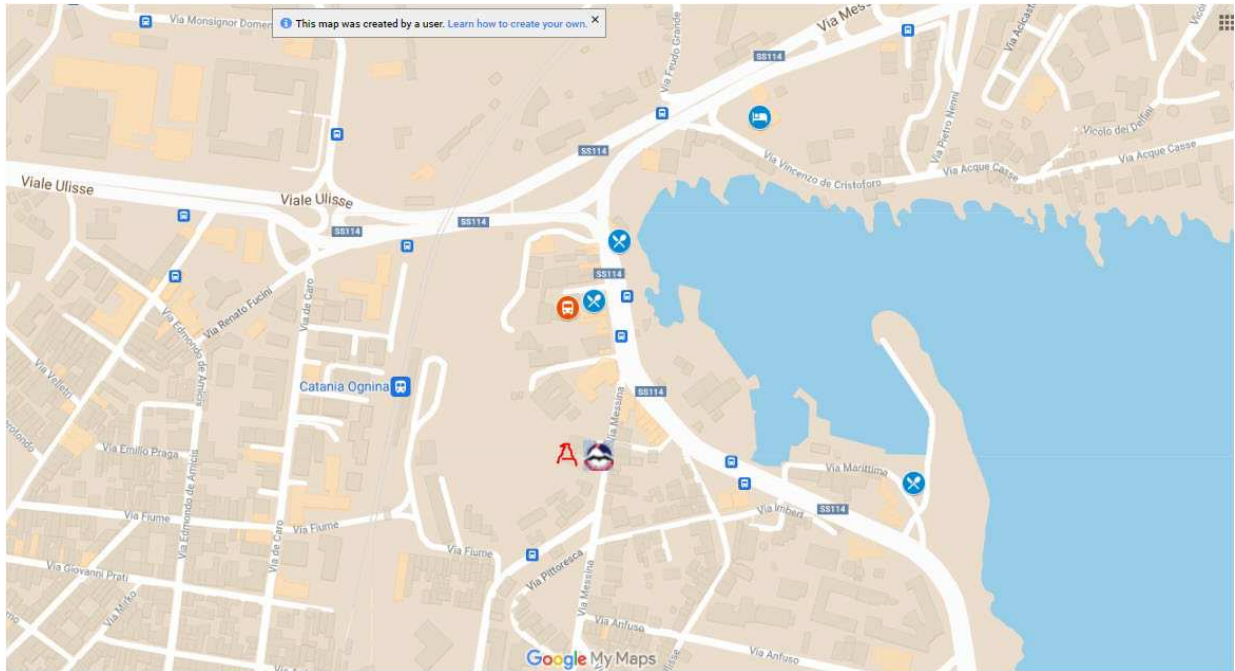
There is no hard copy version of the registration form.

All registration is required to be via the Symposium website registration page. Only students can fill out the enrollment form directly at the registration desk. For details about the registration fees, please refer to the fourth circular of the Symposium on the website <https://www.19isvetna.com/>

All people wishing to participate in the Symposium must present themselves at the registration desk to complete their registration process and to undergo the Covid prevention procedures (please, see the Covid paragraph on the fourth circular for more details).

Nobody will be admitted to the symposium unless they can show a recent negative Covid test or a vaccination certificate indicating the type of vaccine used and the date/dates of the shots (EG European Green Pass).

After the check, admitted members will receive a personal identification badge that will be checked at the entrance of each event connected with the Symposium.



### Map of the Ognina Area

- A REGISTRATION DESK (GGC HEADQUARTERS)
- CLUB ALPINO ITALIANO Sez. Etna
- GRUPPO GROTTA CAI CATANIA
- Via Messina 593 a – Ognina - Catania CT



## EXHIBITION

### The Fingal cave, between history and legend

During the annual meeting of the Italian Speleological Society held on November 27<sup>th</sup> 2020, Michele Sivelli, trustee of the Franco Anelli Italian Speleological Documentation Center at the University of Bologna (in short the Center), announced the acquisition of a very rare volume, dating from 1831, dedicated to the cave of Fingal.

The title of the book is *L'Ile de Staffa et sa grotte basaltique* by Panckoucke CLF, Paris 1831; it is a book completely dedicated to the cave, illustrated by large engravings (see fig. 1), that was published in Paris in the same year in which the great English painter William Turner completed the famous painting that made this cave famous all over the world.

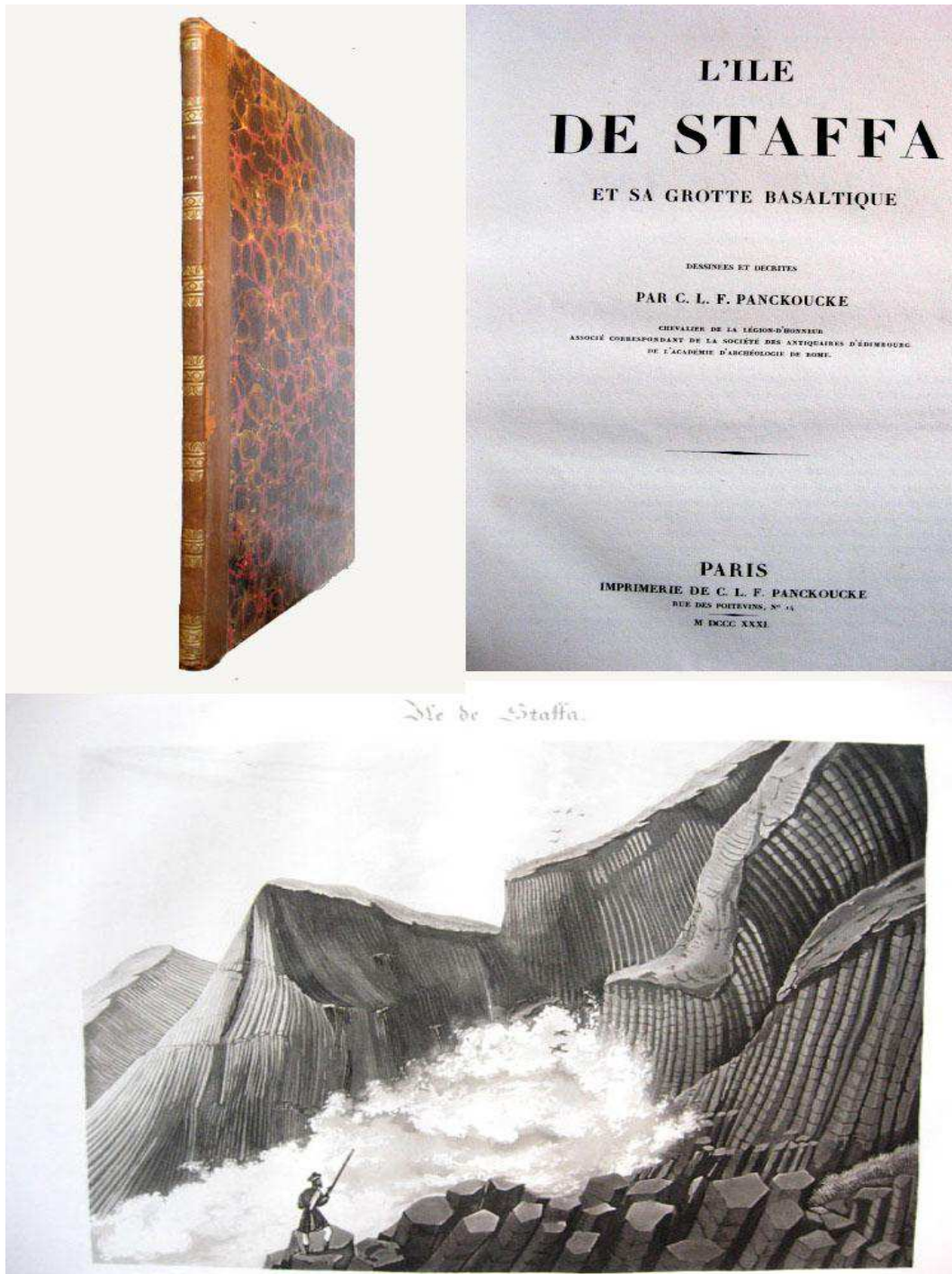
Due to its resemblance to the “Grotta delle Colombe” near Aci Trezza, today destroyed by storm surges, the Fingal cave had already been mentioned in 1999 during the 9th International Congress on Vulcanospeleology, in Catania, in two presentations by Giuliano Perna and Giancarlo Santi. For the next edition of the Symposium, the Center is planning to prepare an iconographic exhibition on this cave, the most represented in the world, on which the Library in Bologna has several publications and a vast collection of splendid antique prints, and now also the very rare book that more than any other describes it from a historical and iconographic point of view. The inauguration will be attended by Professor Paolo Forti, former director of the Center, who has worked hard to reach the acquisition of the very rare volume.

As many of you will remember, Fingal's Cave is located on the Isle of Staffa off the coast of Scotland. The main feature of this cave is that it has been completely excavated in the columnar basalt by the incessant action of the sea that developed a sub-horizontal floor, consisting of the bases of the

truncated and removed columns, just above the current high tide level. It is therefore a small coastal cavity, like many others all over the world, yet, as Professor Forti wrote in an article of the year 2000 on the magazine *Speleologia* "... the eternal human imagination has transformed it into one of the most famous and well-known in the world ". The first description of the island of Staffa and the Cave of Fingal was made by the naturalist Joseph Banks, who became famous for following Captain Cook on his first tour around the world between 1768 and 1771. Not only explorers or scientists visited Staffa and its caves, but also great writers and poets like the writer Sir Walter Scott who went to Staffa in 1810 and 1814 and dedicated a poem to the island and the cave of Fingal. Also Queen Victoria entered the Fingal Cave in 1847, with the royal family and all the retinue, and left a passionate description of the cave in her diary. Giulio Verne visited Staffa in 1859 and, a few years later, set one of his novels (The green ray) there. Although it was probably the most famous and well-known cave of the time, very few visitors had the opportunity to see it directly on account of the difficulties of docking: as a matter of fact the stormy sea prevents visitors from reaching the island of Staffa for many months a year. This is probably the reason why this cave has become the most represented through prints and paintings; the very famous one by the great English painter William Turner, dated 1831, was completed in the same year of the publication of the ancient volume just purchased by the Center.

Together with this rare book, many other rare "pieces" that are in the availability of the Franco Anelli Italian Speleological Documentation Center will be on show in the exhibition set up for IVS19. The visit is free for all participants of the Symposium.

Roberto Conti

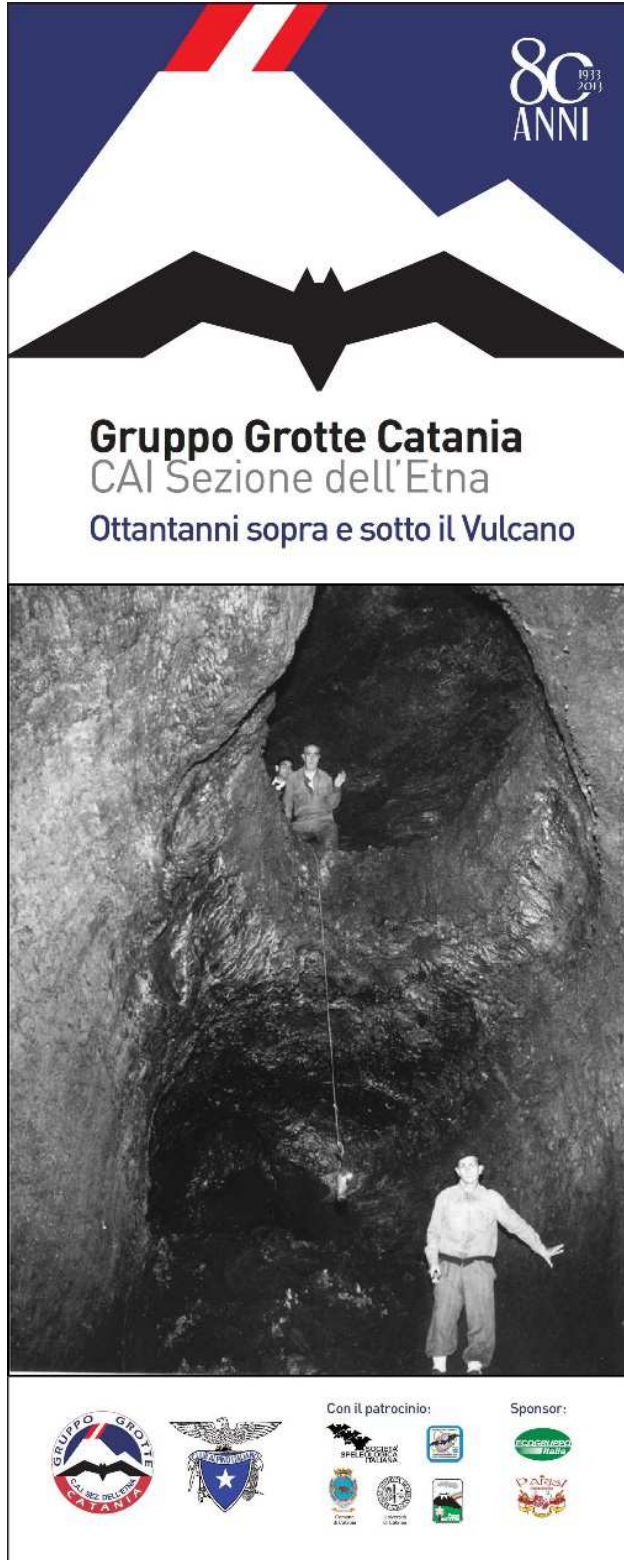


LOCATION OF THE EXHIBITION:

Chiesa di San Nicolò l'Arena  
Piazza Dante Alighieri, 12, 95124 Catania CT  
Open 9AM–6:30PM Sunday 9AM–1PM

EXHIBITION

Gruppo Grotte Catania, 80 years of Speleology



Speleology in Catania was born in the last year of 19th Century. The historical archive of the Catania CAI section preserves some documents of its origin.

But the history of the Grotte Group begins with the work of Francesco Miceli: the first document is dated 1933.

The exhibition tells this story with a collection of images and documents, from 1933 to this day.

EXHIBITION

Personal exhibition of Prof. Carlos D'Agostino

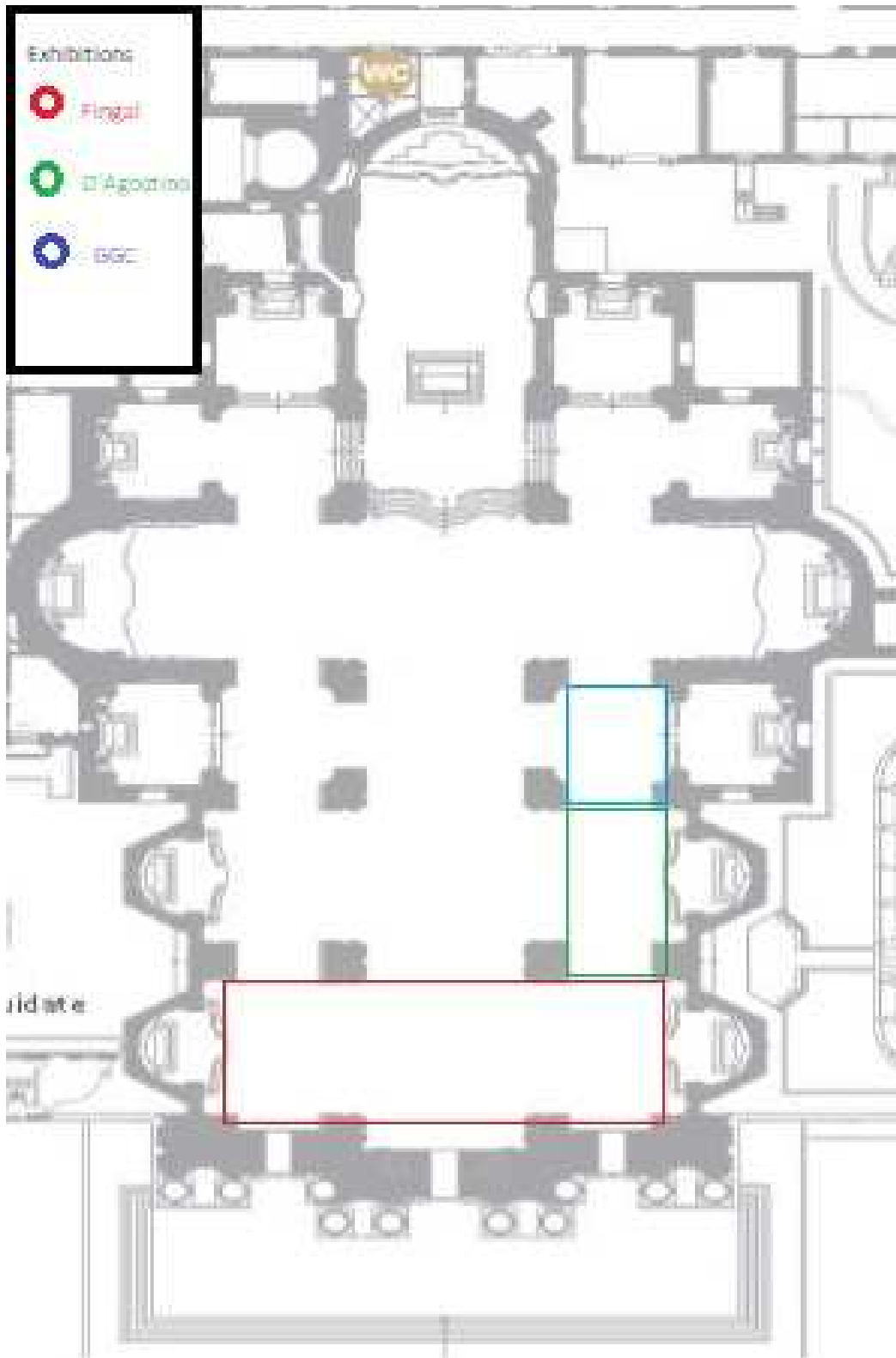
Carlos D'Agostino was born in Argentina and in that part of the world he learned about Speleology.

His paintings, made with different techniques, are full of his love for nature. Etna is one of the nymphs that inspired him.

During the period of the exhibition the author will make some portraits of the visitors.



Exhibitions MAP



## EXCURSIONS

### SUNDAY AUGUST 29<sup>TH</sup>

**PRE-SYMPOSIUM EXCURSION: MT. ETNA GEOLOGY** an overview of the volcano guided by a geologist, with stops at the most significant points

9:00 am Start from GGC Headquarters.

6:00 pm End of the excursion at GGC Headquarters.

Bring good shoes, sun cream and a hat.

Water and food will be provided from the organizers.

Don't forget your camera.

### WELCOME PARTY (Scammacca's Farm)

7:30 pm meeting of the participants at the GGC Headquarters  
Transfer to Scammacca's Farm by minibus

11:00 pm Return to Catania by minibus

## EXCURSION

### GEOLOGICAL TOUR OF MT. ETNA

The purpose of this excursion is to provide participants with a first-hand geographical and geological overview of the Etna volcano. The excursion will be led by the senior geologist Dr. Giuseppe Priolo and will last a whole day.

A circular bus tour is planned on the mountain slopes (see following map), stopping at the most significant points in the history of volcano eruptions.

Lunch is included in a typical mountain lodge; return on time to attend the welcome party.

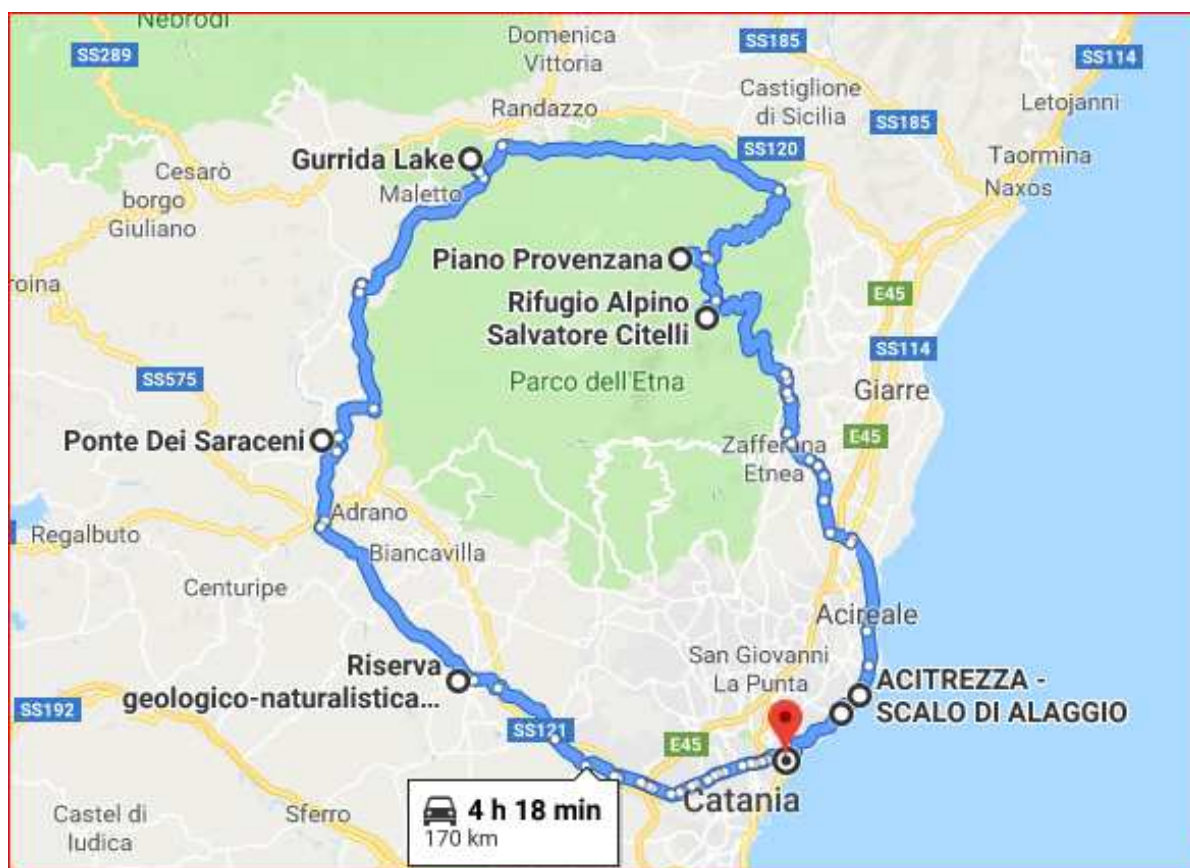


Figure 3: Geological Tour of Mt. Etna, route



## EXCURSION DETAILS

Start: 09:00 am from GGC Headquarters

### 1<sup>st</sup> geological stop

*Acicastello and Acitrezza*: the first time of Etna, submarine eruptions and oldest Etna's activities.

### 1<sup>st</sup> gastronomic stop

*Zafferana Etnea*: a typical Etna's snack.

### 2<sup>nd</sup> geological stop

*Piano Provenzana, Linguaglossa*: Etna, the 2002 eruptive theatre, lava flow and secondary cones.

### 2<sup>nd</sup> gastronomic stop

*Rifugio Citelli, Sant'Alfio* ([www.rifugiocitelli.it](http://www.rifugiocitelli.it)): lunch on the border of a crater rim (01:00 pm).

### 3<sup>rd</sup> geological stop

*Gurrida lake, Randazzo*: it was created when an eruption of Etna in 1536 blocked part of the course of the Flascio river.

### 4<sup>th</sup> geological stop

*Simeto lava gorges and Saracen's bridge, Adrano*: an ancient bridge climb over the lava riverbed of Simeto river.

### 5<sup>th</sup> geological stop

*Salinelle dei Cappuccini, Paternò*: the Etna secondary volcanic activity: small mud volcanoes on the slopes of Mt. Etna.

End: 06:00 pm at GGC Headquarters.

## SCAMMACCA'S FARM

The Scammacca's Farm is a typical example of Catania farm. The old building (A.D. 1710) dominates the citrus plots and the other crops surfaces.

Blasco Scammacca ([www.blasco.scammacca.name](http://www.blasco.scammacca.name)): speleologist, diver, professor at Catania University, is happy to host the welcome party of the Symposium.

The menu of the party is based on typical Sicilian dishes, cooked by Fratelli Vescera srl ([www.francescovescera.it](http://www.francescovescera.it)) accompanied by the wines of Mandrarossa ([www.mandrarossa.it](http://www.mandrarossa.it)), with the aims to make you fall in love with Sicilian aromas and flavors.



(

## THE SYMPOSIUM

The 19th ISV will take place in the prestigious setting of the University of Catania, in the middle of the city.

The lectures will be held in the historical building of the geological Faculty starting at 9 o' clock from Monday August 31 to Wednesday September 2.

On Wednesday, at the end of the lectures, in the same room there will be the annual meeting of the UIS Commission on Volcanic Caves.

All the work sessions and the commission meeting will take place via web link with all those who have registered as online members.

The official language of the Symposium is English. There will be no simultaneous translation service for the speeches.

The address of the Geological Faculty is

UNIVERSITA' DI CATANIA

Corso Italia, 55, Catania CT



## INDICATIONS TO SPEAKERS

All the work sessions and the commission meeting will take place via web link with all those who have registered as online members.

The official language of the Symposium is English. There will be no simultaneous translation service for the speeches.

Each oral communication will be allotted a total of 20 minutes, plus another 10 minutes for questions and answers.

To avoid excessive interruptions and facilitate those following the online session, all questions from the audience must be asked at the end of the presentation. Online participants can submit their questions using the session specific "chat".

Speakers are asked to have any digital presentation material ready to be uploaded prior to the session. PowerPoint and PDF are the preferred file formats.

## MONDAY AUGUST 30<sup>TH</sup>

### DAILY SCHEDULE

| Time                | <i>Author, Lecture</i>  |
|---------------------|---|
| 09:30 <sub>am</sub> | Opening of the Symposium  |
| 10:00 <sub>am</sub> | <i>Kempe S.</i> – Evolution of Lava tubes   |
| 10:45 <sub>am</sub> | Coffee break  |
| 11:00 <sub>am</sub> | <i>Ferlito C.</i> – Geology of the Etna Volcano   |
| 11:05 <sub>am</sub> | <i>Author, Lecture</i> – 1 <sup>st</sup> Session:   |
| 11:50 <sub>am</sub> | <i>The Grotta del Gelo (Etna): a volcanic cold trap ice cave</i> – G. Giudice, F. Leone, L. Randazzo, G. Raciti, M. Messina, S. Petralia, E. Finocchiaro (live) |
| 12:10 <sub>am</sub> | <i>Estimation of the formation temperature of lava stalactite inside the cavity of lava tree mold void</i> - Tsutomu Honda (web)                                |
| 12:30 <sub>am</sub> | Catania Heritage Presentation   |
| 01:00 <sub>pm</sub> | Lunch time  |
| 03:00 <sub>pm</sub> | Katane: the Greek and Roman city<br><i>Exploring the remains of the first settlements</i>   |

### EVENING SCHEDULE at GGC Arena

|                     |  |
|---------------------|--|
| 09:00 <sub>pm</sub> | <i>P. Forti</i> – Presentation of the book FINGAL'S CAVE (web) |
| 09:30 <sub>pm</sub> | <i>GGC et al.</i> - Recent discoveries (video and slides)      |

ABSTRACT

I Session: Rheology and Geomorphology of volcanic caves

- *The Grotta del Gelo (Etna): a volcanic cold trap ice cave – G. Giudice, F. Leone, L. Randazzo, G. Raciti, M. Messina, S. Petralia, E. Finocchiaro*
- *Estimation of the formation temperature of lava stalactite inside the cavity of lava tree mold void - Tsutomu Honda*



Description: Grotta del Gelo, Mt. Etna

Author and year: Scammacca, 1971.

## **THE GROTTA DEL GELO (ETNA): A VOLCANIC COLD TRAP ICE CAVE**

**GAETANO GIUDICE<sup>1\*,2</sup>, FRANCESCO LEONE<sup>2</sup>, LUCA RANDAZZO<sup>2</sup>, GUIDO RACITI<sup>2</sup>,  
MARIANNA MESSINA<sup>2</sup>, SALVATORE PETRALIA<sup>2</sup>, ELVIRA FINOCCHIARO<sup>2</sup>**

*<sup>1\*</sup>Corresponding author: Istituto Nazionale di Geofisica e Vulcanologia (Osservatorio Etneo), Piazza Roma 2, Catania, gaetano.giudice@ingv.it*

*<sup>2</sup>Centro Speleologico Etneo, Via Valdisavoia 3, Catania*

### **Abstract**

The Grotta del Gelo is probably the best known volcanic cave of Mount Etna because of the fascination exercised on visitors by the perennial ice inside it, rather unusual at its latitude and in strong contrast with the arid environment of the large lava field in which it opens. A very popular destination for hikers, with the increase in visits has also grown the concern of environmentalists and scientists for the effects of human presence on the conservation of the glacial mass. The variability of the seasonal phenomena of glacial speleothems formation and fusion and the lack of systematic instrumental observations of the ice mass evolution have given rise, over time, to the belief that the ice mass end was forthcoming. In 1981 the cave was at risk to be covered by a lateral eruption and, being in the neighbors of the area where the eruptive fissures opened, it is plausible that the cave was interested by an increase in geothermal flow and that the qualitative observations, reporting the partial melting of the ice mass, were correct. Instrumental studies have begun since the 1990s and, through various phases, the number of measured parameters has increased, up to the monitoring carried out since the end of 2013, employing staff, equipment, and instruments of CSE and INGV. Thanks to the agreement signed between Ente Parco dell'Etna and Centro Speleologico Etneo in 2017, additional instrumentation requirements were met, and the monitoring activity is still carried on.

Since the end of 2013 the temperature inside the cave and externally near the entrance was monitored continuously, even with some limitation caused by fault of sensors. Each year from spring to autumn, the evolution of the glacial surface was monitored systematically, and a meteorological station was placed in the neighbors of the cave to collect rain, wind, and barometric data beyond the temperature. After seven years of monitoring a preliminary analysis of data allows to confirm the cold trap model for the dynamic of ice formation and the role of autumnal rainfalls as the main cause of ice melting. It results an average loss of ice

at a rate of about 6 m<sup>3</sup> per year with one exceptional build up event in the 2014 Winter and increasingly destructive events in the recent Autumns.

Even if the results suggest that the glacial deposit is mainly endangered by meteorological changes caused by the global warming, the exhortation is that hikers approach the visit to the cave in the most respectful way avoiding to contribute to accelerate the ice melting.

### **Riassunto**

La Grotta del Gelo è probabilmente la più nota grotta vulcanica dell'Etna per il fascino esercitato sui visitatori dalla presenza di ghiaccio perenne al suo interno, piuttosto insolito alla sua latitudine ed in forte contrasto con l'ambiente arido del vasto campo lavico in cui si apre. Meta molto ambita per gli escursionisti, con l'incremento delle visite è cresciuta anche la preoccupazione di ambientalisti e studiosi per gli effetti della presenza umana sulla conservazione della massa glaciale. La variabilità dei fenomeni stagionali di formazione e fusione degli speleotemi glaciali e la mancanza di osservazioni sistematiche strumentali sull'evoluzione della massa glaciale hanno contribuito a far sorgere, nel tempo, la credenza che la fine della massa di ghiaccio fosse imminente. Nel 1981 la grotta rischiò di essere coperta da un'eruzione laterale le cui fratture eruttive si aprirono nell'area circostante. In quella occasione può avere risentito di un incremento del flusso geotermico e quindi le osservazioni qualitative di un parziale scioglimento del ghiaccio potrebbero essere state fondate. Studi strumentali sono cominciati a partire dagli anni Novanta e, attraverso varie fasi, si è incrementato il numero di parametri misurati, fino al monitoraggio condotto a partire da fine 2013, impiegando personale, mezzi e strumentazione di CSE e INGV. Grazie alla convenzione sottoscritta tra Ente Parco dell'Etna e Centro Speleologico Etneo nel 2017 si è fatto fronte a ulteriori esigenze di strumentazione e l'attività di monitoraggio continua ad essere condotta sino ad oggi.

Dalla fine del 2013 la temperatura all'interno della grotta ed esternamente nei pressi dell'ingresso è stata monitorata con continuità, seppure con qualche limitazione dovuta a guasti dei sensori. Inoltre, ogni anno, dalla primavera all'autunno, l'evoluzione della superficie glaciale è stata monitorata sistematicamente e una stazione meteorologica è stata posizionata nelle vicinanze



della grotta per raccogliere i dati di piovosità, vento, umidità e pressione oltre alla temperatura.

Dopo sette anni di monitoraggio una analisi preliminare dei dati permette di confermare il modello a trappola fredda per la formazione del ghiaccio e il ruolo delle piogge autunnali come principale causa della fusione del ghiaccio. Risulta una perdita media di ghiaccio ad un tasso di circa 6 m<sup>3</sup> l'anno con un evento eccezionale di incremento della massa glaciale nell'inverno del 2014 e una serie di eventi sempre più distruttivi negli autunni recenti.

Anche se i risultati sembrano indicare che il deposito glaciale è prevalentemente messo a rischio dai cambiamenti meteorologici causati dal riscaldamento globale, l'esortazione agli escursionisti è che si accostino alla visita nella maniera più consapevole e rispettosa per evitare di contribuire ad accelerare la fusione del ghiaccio.

**Key words:** Grotta del Gelo, ice, freezing, melting, cooling, monitoring



Description: *The Grotta del Gelo entrance in Spring*

Author and year: *Luca Randazzo, 2015*



Description: *Tunnel under the ice in 1990*

Author and year: *Gaetano Giudice, 1990*

## **Estimation of the formation temperature of lava stalactite inside the cavity of lava tree mold void**

**Tsutomu Honda<sup>1</sup>**

<sup>1</sup>(NPO Vulcano-Speleological Society, Japan), mer4beau939tha@gmail.com

### **Abstract**

In order to understand the igneous activity of lava flow, it is essential to know the temperature at which the cavity and void of lava tree mold was formed. From the pitch of the lava stalactite which could be formed on the inner surface of the cavity associated with the void of lava tree mold, the lava surface tension, which is one of the lava physical properties, could be obtained. Then, the lava temperature could be estimated from the temperature dependent data of the surface tension of the lava. The research results regarding the lava tree mold for the old historical lava flow (erupted about 1000 years ago) of Mt. Fuji are mentioned.

### **Riassunto**

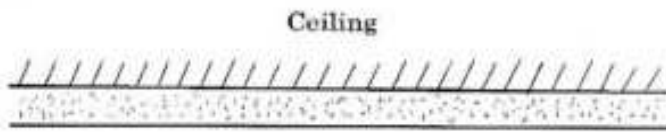
Per comprendere l'attività ignea della colata lavica, è essenziale conoscere la temperatura alla quale si è formata la cavità e il vuoto della muffa dell'albero lavico. Dal passo della stalattite lavica che potrebbe formarsi sulla superficie interna della cavità, si potrebbe ricavare la tensione superficiale della lava, che è una delle sue proprietà fisiche.

Quindi, la temperatura della lava potrebbe essere stimata basandosi sui valori, dipendenti dalla temperatura, della tensione superficiale della lava.

Vengono citati i risultati della ricerca sulle grotte di scorrimento contenute in una vecchia colata lavica (eruttata circa 1000 anni fa) del Monte Fuji.

**Key word:** Lava tree mold, Lava stalactite, Lava temperature

**Instability of liquid layer attached on the ceiling**

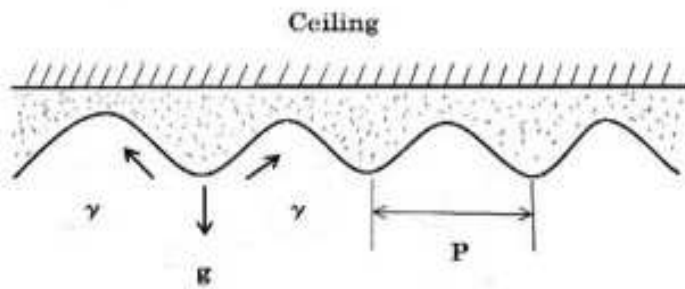


Liquid layer attached on the surface of ceiling

**(A) Initial stable state of liquid layer**



(b)



**(B) Onset of instability of liquid layer**

(a)



(c)

Fig.3 (a) Analysis model, (b) Lava stalactite on the ceiling of the cavity of lava tree mold, (c) Lava ribbed wall of the cavity of lava tree mold

## TUESDAY AUGUST 31<sup>ST</sup>

### DAILY SCHEDULE

Time Author, Lecture

09:10<sub>am</sub> Author, Lecture – 1<sup>st</sup> Session:

09:15<sub>am</sub> *Descriptive note on some volcanic cases surveyes in thre transcaucasian regione of the Republic of Armenia.* – Ruggieri R., Davtyan S. R., Shaihinyan S. M., Ingallinera A., Orsini R., Agosta G. (live)

09:35<sub>am</sub> *Geoheritage assessment of lava tube caves on Jeju Island, Korea* - Kyung Sik Woo, Lyoun Kim, JongHee Lee (web)

09:55<sub>am</sub> *Spatial distribution characteristics of the Nâm B'Lang Volcano lava tube system, Dak Nong UNESCO Global Geopark, Vietnam* - Ton Thi Ngoc Hanh, Vu Van Tu, Bui Thanh Ha, Pham Duc Anh, Ho Tien Chung, Tran Tan Van (web)

10:15<sub>am</sub> *Interesting morphologies in a small lava tube in the lava flow of "Piano Cannelli", Mt. Etna.* - Priolo G., Raciti S. and Ragusa M.

10:35<sub>am</sub> Coffee break

10:50<sub>am</sub> *Grasso. R.* – The life in the volcanic caves

11:40<sub>am</sub> Author, Lecture – 2<sup>nd</sup> Session:

11:45<sub>am</sub> *Mico-Speleologic finds on Mt. Etna's volcanic caves* – Vasquez G., Bucolo C., Musumeci E.

12:05<sub>pm</sub> *Lavas pahoehoe y fauna endémica de cavernas basálticas en Payunia, Malargüe, Mendoza, Argentina Pahoehoe lava and endemic fauna of basaltic caves in Payunia, Malargüe, Mendoza, Argentina* –Benedetto C. – D'Agostino C.

12:25<sub>pm</sub> *Shedding light on long-eared bats (Plecotus spp.) from Sicily: more complex than we thought* –Ancillotto L., Galimberti A., Bucolo C., Musumeci E.

01:00<sub>pm</sub> Lunch time

03:00<sub>pm</sub> The City revives after the 1669 earthquake & the “Catanese”  
Baroque. - A wonderful walk in the centre of the town

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PARTNERS PROGRAM

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**TAORMINA AND ALCANTARA GORGES** Guided Tour (see page x)

10:00<sub>am</sub> Start from GGC Headquarters

06:00<sub>pm</sub> End at GGC Headquarters

**EVENING SCHEDULE at GGC Arena**

09:00<sub>pm</sub> Participants contributes (video or slides) at GGC Arena

ABSTRACT

I Session: Rheology and Geomorphology of volcanic caves

- *Descriptive note on some volcanic cases surveyes in thre transcaucasian regione of the Republic of Armenia.* – Ruggieri R., Davtyan S. R., Shaihinyan S. M., Ingallinera A., Orsini R., Agosta G. (live)
- *Geoheritage assessment of lava tube caves on Jeju Island, Korea* - Kyung Sik Woo, Lyoun Kim, JongHee Lee (web)
- *Spatial distribution characteristics of the Nâm B'Lang Volcano lava tube system, Dak Nong UNESCO Global Geopark, Vietnam* - Ton Thi Ngoc Hanh, Vu Van Tu, Bui Thanh Ha, Pham Duc Anh, Ho Tien Chung, Tran Tan Van (web)
- *Interesting morphologies in a small lava tube in the lava flow of "Piano Cannelli", Mt. Etna.* - Priolo G., Raciti S. and Ragusa M.

i

## **DESCRIPTIVE NOTE ON SOME VOLCANIC CAVES SURVEYED IN THE TRANSCAUCASIAN REGION OF THE REPUBLIC OF ARMENIA**

**R. Ruggieri<sup>1</sup>, S. R. Davtyan<sup>2</sup>, S. M. Shaihinyan<sup>3</sup>, A. Ingallinera<sup>1</sup>, R. Orsini<sup>1</sup>, G.  
Agosta<sup>1</sup>**

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*<sup>2</sup>Yerevan State University Republic of Armenia,*

*<sup>3</sup>NUACA Yerevan, Republic of Armenia*

### **Abstract**

As part of an international research agreement, called "Armenia Karst Project", set up between the Armenian Speleological Center and the CIRS - Hyblean Center of Speleo-Hydrogeological Research of Ragusa, in the years 2016 to 2019, four research campaigns are carried out with the aim of studying both the surface and hypogean karst morphologies and the caves of volcanic origin present in different geographical contexts of the Republic of Armenia. In this regard, in the last three campaigns, thirteen caves of different volcanic genesis have been surveyed, of which: one in the District of Lori Marz in the north-eastern sector of the country; three in the volcanic district of the Sisian Region in the southern sector, and nine in the south-east of the country, in the region of Syunik. The latter located in a spectacular natural landscape with spiers and pinnacles, in the old Town of Goris, carved in the pyroclastic volcanic material, were used since the Stone Age, in medieval times and up to the last decades of the last century, both as dwellings and for the shelter of animals. With this report one describes the speleometric and morphogenetic features of the aforementioned caves, for some of which, due to the remarkable landscape and historical-anthropic context in which they are located, an enhancement and safeguarding action is proposed.

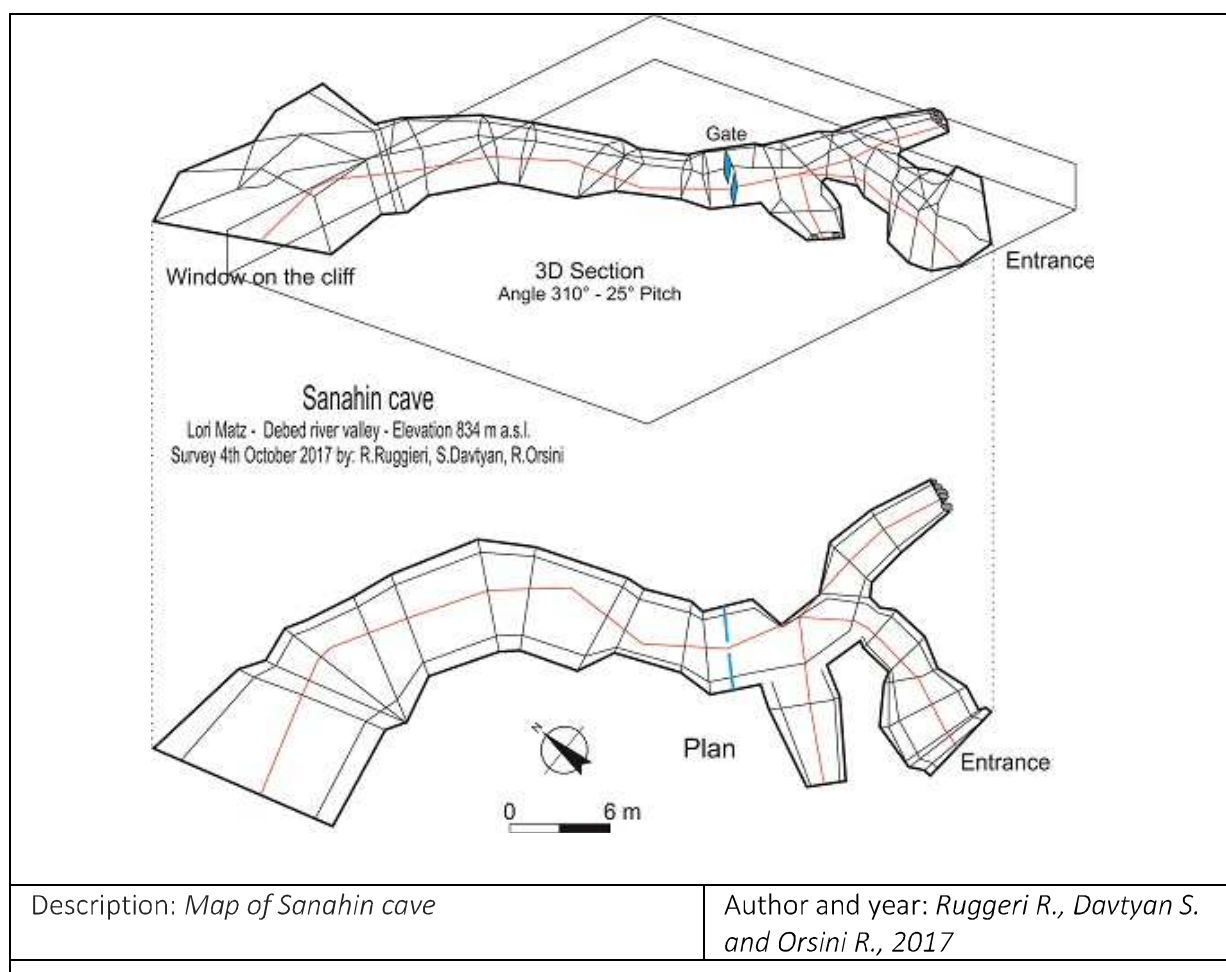
### **Riassunto**

Nell'ambito di un accordo di ricerca internazionale, denominato "Progetto Armenia Karst", instaurato tra il Centro Speleologico Armeno e il CIRS - Centro Ibleo di Ricerche Speleo-Idrogeologiche di Ragusa, negli anni dal 2016 al 2019, vengono svolte quattro campagne di ricerca con lo scopo di studiare le morfologie carsiche superficiali e ipogee nonché le grotte di origine vulcanica presenti in diversi contesti geografici della Repubblica di Armenia. A tal proposito, nelle ultime tre



campagne sono state censite tredici grotte di diversa genesi vulcanica, di cui: una nel Comune di Lori Marz nel settore nord-orientale del paese; tre nel distretto vulcanico della Regione di Sisian nel settore meridionale, e nove nel sud-est del Paese, nella regione di Syunik. Queste ultime situate in uno spettacolare paesaggio naturale di guglie e pinnacoli, site nel centro storico di Goris, scolpiti nel materiale vulcanico piroclastico, furono utilizzate fin dall'età della pietra, in epoca medievale e fino agli ultimi decenni del secolo scorso, come abitazioni e per il ricovero degli animali. Con questa relazione si descrivono le caratteristiche speleometriche e morfogenetiche delle suddette grotte, per alcune delle quali, per il notevole contesto paesaggistico e storico-antropico in cui si trovano, si propone un'azione di valorizzazione e salvaguardia.

**Key words:** Armenia, Lori Marz, Goris, volcanic caves.





Description: *Sanahin cave, main gallery of the cave*

Author and year: *Ruggeri R., 2017*

## **GEOHERITAGE ASSESSMENT OF LAVA TUBE CAVES ON JEJU ISLAND, KOREA**

**KYUNG SIK WOO<sup>1</sup>, LYOUN KIM<sup>2</sup>, JONGHEE LEE<sup>2</sup>**

*<sup>1</sup>Department of Geology, Kangwon National University, Chuncheon, Gangwondo, Korea*

*<sup>2</sup>Cave Research Institute of Korea, Chuncheon, Gangwondo, Korea*

### **Abstract**

Recognition of geoheritage values and conservation of their geodiversity elements are largely neglected in protected areas. Geoheritage comprises the elements of the Earth's geodiversity that are considered to have significant value for intrinsic, scientific, educational, cultural, aesthetic and ecological reasons and therefore deserving conservation for the benefit of future generations. Some geodiversity elements can be quite dynamic, representing ongoing Earth's surface processes to form long-term geological products. It is almost impossible to protect all the significant geological sites legally due to high development pressure. Also, unlike biodiversity and ecosystem, geodiversity constituents tend to be more durable, thus last much longer as outcrops but they are non-renewable. It is thus very important to assess and select geoheritage sites scientifically. Scientific investigation of caves have been seriously conducted in the past, however geoheritage assessment of caves has been largely neglected among scientific community. Korean Government has investigated geoheritage values of caves since 2001, but most investigation has been concentrated on limestone caves in the Korean Peninsula. Jeju Island has formed by volcanic activities on continental shelf by fissure-type eruption during the Quaternary, and became an island due to sea-level rise during the Holocene. Basaltic lava mostly has formed volcanic rocks on Jeju Island and produced numerous lava tube caves. It is known that more than 150 lava tube caves are present.

This study provides the scientific basis for geoheritage assessment of lava tube caves in Jeju Island. Basic 6 criteria used here are (1) representativeness, (2) rarity, (3) distribution, size, and diversity of internal micro-topographic features and speleothems (lava and secondary speleothems), (4) presence of special environments (i.e., lakes) or special features (sediments, guano deposits with secondary minerals, etc.), (5) dimension of caves, and (6) integrity (preservation

state, intactness). Based on assessment data, four categories are classified: (1) Type A = national monument, (2) Type B = provincial monument, (3) Type C = caves with potential geoheritage values, thus necessary for conservation, and (4) Type D = caves without geoheritage values, thus not necessary to be protected. Type A and B are evaluated subjectively by speleologists based on one or more criteria, whereas Type C and D are classified based on quantitative and cumulative assessment data of six criteria.

### **Riassunto**

Il riconoscimento dei valori del geopatrimonio e la conservazione dei loro elementi di geodiversità sono ampiamente trascurati nelle aree protette. Il geopatrimonio comprende gli elementi della geodiversità terrestre ritenuti di rilevante valore per ragioni intrinseche, scientifiche, educative, culturali, estetiche ed ecologiche e quindi meritevoli di conservazione a beneficio delle generazioni future. È quasi impossibile proteggere legalmente tutti i siti geologici significativi a causa dell'elevato sviluppo. È quindi molto importante valutare e selezionare scientificamente i siti di geopatrimonio. Le indagini scientifiche sulle grotte sono state in passato valide, tuttavia la loro importanza nel contesto del geopatrimonio è stata ampiamente trascurata dalla comunità scientifica. Il Governo coreano ha studiato i valori del geopatrimonio delle grotte dal 2001, ma la maggior parte delle indagini si è concentrata sulle grotte calcaree nella penisola coreana. L'isola di Jeju si è formata da attività vulcaniche sulla piattaforma continentale da eruzioni di tipo fissurale durante il Quaternario divenendo un'isola a causa dell'innalzamento del livello del mare durante l'Olocene. La lava basaltica costituisce le rocce dell'isola di Jeju e ha prodotto oltre 150 grotte di scorrimento lavico. È noto che sono presenti più di 150 grotte a tubi di lava.

Questo studio fornisce la base scientifica per la valutazione del geopatrimonio di grotte di scorrimento lavico nell'isola di Jeju. I 6 criteri di base utilizzati sono: (1) rappresentatività, (2) rarità, (3) distribuzione, dimensione e diversità delle caratteristiche microtopografiche interne e degli speleotemi (lave e speleotemi secondari), (4) presenza di ambienti speciali (cioè, laghi) o caratteristiche particolari (sedimenti, depositi di guano con minerali secondari, ecc.), (5) dimensione delle grotte e (6) integrità (stato di conservazione, integrità). Sulla base dei dati di valutazione, vengono classificate quattro categorie: (1) Tipo A =

monumento nazionale, (2) Tipo B = monumento provinciale, (3) Tipo C = grotte con potenziali valori di geopatrimonio, quindi necessario per la conservazione, e (4) Tipo D = grotte prive di valori di geopatrimonio, quindi non necessariamente protette. I tipi A e B sono valutati soggettivamente dagli speleologi sulla base di uno o più criteri, mentre i tipi C e D sono classificati in base a dati di valutazione quantitativi e cumulativi di sei criteri.

**Key words:** lava tube, volcanic cave, Korea, geoheritage.

## **SPATIAL DISTRIBUTION CHARACTERISTICS OF THE NÂM B'LANG VOLCANO LAVA TUBE SYSTEM, DAK NONG UNESCO GLOBAL GEOPARK, VIETNAM**

**TON THI NGOC HANH<sup>1</sup>, VU VAN TU<sup>1</sup>, BUI THANH HA<sup>2</sup>, PHAM DUC ANH<sup>2</sup>, HO TIEN CHUNG<sup>3</sup>,  
TRAN TAN VAN<sup>3</sup>**

<sup>1</sup>*Dak Nong UNESCO Global Geopark, Dak Nong province*

<sup>2</sup>*Department of Natural Resources and Environment, Dak Nong province*

<sup>3</sup>*Vietnam Institute of Geosciences and Mineral Resources (VIGMR), Email:  
trantv@gmail.com*

### **Abstract**

News on the discovery of the volcanic lava tube system around the Nâm B'Lang (Chu B'luk) Volcano, Daknong Geopark has been reported recently by many domestic and international media. Several exploration expeditions have been conducted by international researchers such as Tsutomu Honda et al. (2013-2014), Michael Laumanns et al. (2014-2017).

During the inventory of geoheritage and preparation of the dossier of the Daknong Geopark to UNESCO in 2018, VIGMR carried out another extensive survey and paid attention to the spatial distribution characteristics of these lava tubes, their identification signs on the ground surface and their development and connectivity underground.

In total about 50 lava tubes have been mapped, but the findings of these studies show a considerable potential for searching and discovering more new lava tubes. Interestingly, other related research by Vietnamese archeologists found lots of evidence of pre-historic human settlements insides these tubes, making them even more valuable for science and education. The discovery and research of the Nâm B'Lang Volcano lava tube system open great opportunity for other conservation and tourism promotion related activities of the Geopark.

### **Riassunto**

Le notizie sulla scoperta del sistema di tubi di lava vulcanica intorno al vulcano Nâm B'Lang (Chu B'luk), Daknong Geopark, sono state riportate di recente da molti media nazionali e internazionali. Diverse spedizioni esplorative sono state condotte da ricercatori internazionali come Tsutomu Honda et al. (2013-2014), Michael Laumanns et al. (2014-2017).

Durante l'inventario del geopatrimonio e la preparazione del dossier del Daknong Geopark all'UNESCO nel 2018, VIGMR ha effettuato un'altra vasta indagine e ha prestato attenzione alle caratteristiche di distribuzione spaziale di questi tubi di lava, ai loro segni di

identificazione sulla superficie del suolo e al loro sviluppo e connettività sotterraneo. In totale sono stati mappati circa 50 tubi di lava, ma i risultati di questi studi mostrano un notevole potenziale per la ricerca e la scoperta di nuove gallerie di scorrimento.

È interessante notare che altre ricerche correlate degli archeologi vietnamiti hanno trovato molte prove di insediamenti umani preistorici all'interno di questi tubi, rendendoli ancora più preziosi per la scienza e l'istruzione.

La scoperta e la ricerca del sistema di tubi lavici del vulcano Nâm B'Lang aprono grandi opportunità per altre attività legate alla conservazione e alla promozione turistica del Geoparco

**Key words:** lava tube, volcanic cave, Vietnam, geopark.

## **INTERESTING MORPHOLOGIES IN A SMALL LAVA TUBE IN THE LAVA flow of “Piano Cannelli”, Mt. Etna.**

**PRIOLO G.<sup>1\*</sup>, RACITI S.<sup>2</sup> AND RAGUSA M.<sup>3</sup>**

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<sup>2</sup>*Gruppo Grotte Catania del Club Alpino Italiano Sezione dell’Etna, Milo (CT), via G. Marconi, 1/E*

<sup>3</sup>*Gruppo Grotte Catania del Club Alpino Italiano Sezione dell’Etna, San Giovanni la Punta (CT), via Rosario Nicosia, 56/b, rag.mar@gmail.com*

### **Abstract**

On the Mt. Etna, Pedara’s territory, in the location called *Passo Cannelli*, stay some volcanic caves. One of these, a small lava tube, was baptized *Grotta dei Rovi a Piano Cannelli*, contain an interesting morphology: some, small, blind holes on the floor, the sides and the roof.

The observation of these peculiar morphologies has defined an hypothesis: they are a small stone guns generated to the carbonize of bushes of *Genista aetnensis*.

The bushes were englobed to the lava flow. These have been consumed with an anoxic combustion of wood, giving life at the stone guns. These are oriented due to the original geometry of the branches.

Inside the cave secondary crystallizations were sampled which, the mineralogical classification is in progress.

### **Riassunto**

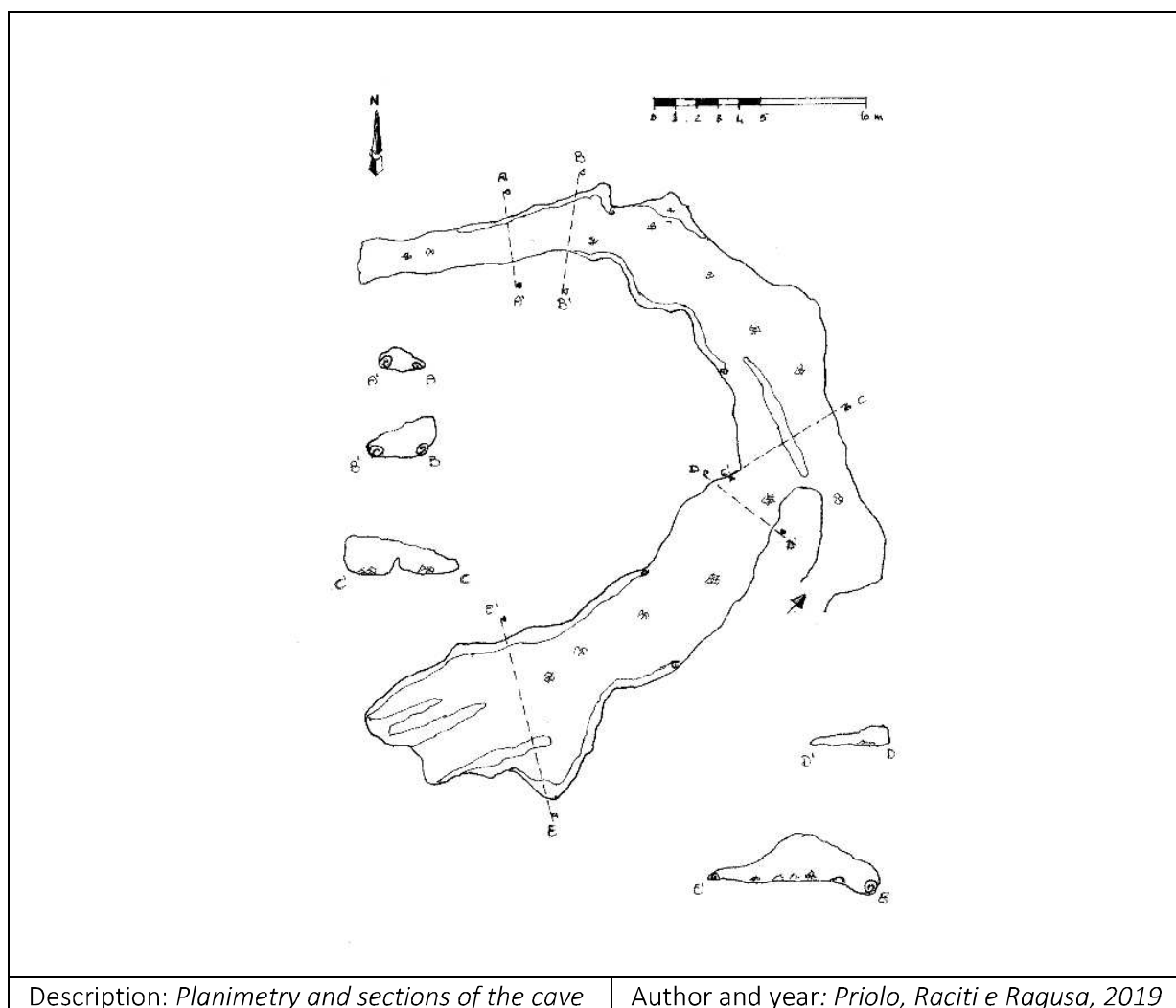
Sull’Etna, nel territorio di Pedara, in località Piano Cannelli, alcuni anni fa ci è stata segnalata la presenza di alcune cavità: Le esplorazioni effettuate hanno consentito di identificare due cavità, una di queste, battezzata Grotta dei Rovi a Piano Cannelli, se pur di modeste dimensioni è risultata estremamente interessante a causa di alcune morfologie riscontrate sia sul pavimento che sulle pareti e sulla volta.



Si tratta di alcuni incavi, a fondo cieco che risultano isorientati a coppie. Lo studio geometrico delle forme e l'osservazione delle morfologie hanno portato all'ipotesi illustrata in questo lavoro. Gli oggetti osservati sarebbero il risultato della carbonizzazione di piante arbustive, probabilmente Ginestra dell'Etna (*Genista aetnensis*) che essendo coinvolte dal flusso lavico sono state carbonizzate lasciando l'impronta sulle parti della galleria di scorrimento. Al momento del ricoprimento, la volta, le pareti e il pavimento, presentavano condizioni di fluidità minori quindi una reologia inferiore rispetto alla parte centrale del flusso all'interno del tubo di lava.

All'interno della grotta sono state campionate cristallizzazioni secondarie le cui determinazioni mineralogiche sono in corso.

**Key words:** lava tube, volcanic cave, stone guns, Etna.



Description: *Planimetry and sections of the cave*

Author and year: *Priolo, Raciti e Ragusa, 2019*



Description: *The small stone guns in the lava tube*

Author and year: *Raciti, 2019*

II Session: Botany and Biology in the volcanic caves

- *Mico-Speleologic finds on Mt. Etna's volcanic caves* – Vasquez G., Bucolo C., Musumeci E.
- *Lavas pahoehoe y fauna endémica de cavernas basálticas en Payunia, Malargüe, Mendoza, Argentina Pahoehoe lava and endemic fauna of basaltic caves in Payunia, Malargüe, Mendoza, Argentina* –Benedetto C. – D'Agostino C.
- *Shedding light on long-eared bats (*Plecotus spp.*) from Sicily: more complex than we thought* –Ancillotto L., Galimberti A., Bucolo C., Musumeci E.



Description: *Plecotus spp.* in a Mt. Etna cave

Author and year: Priolo G., 2013

## MICO-SPELEOLOGIC FINDS ON MT. ETNA'S VOLCANIC CAVES

VASQUEZ GIANRICO <sup>1</sup>, BUCOLO CARMELO <sup>2\*</sup>, MUSUMECI ELISA <sup>2\*</sup>

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[\\*Corresponding author](#)

### Abstract

This study has the purpose to create a systematic framework of the fungal species found inside the lava flow caves of Etna. Afterwards, this study offers a detailed mapping of every single finding in the geographic and environmental context of the volcano Etna. The ecological role and modality of growth of the sporophores are important in this process to discover the ecological niche and the procurement capacity for every single species considering them into parasitism, symbiotic and saprothophy relationship.

The peculiarity of some fungi is that they grow "head down" and they "instinctively" try to find an "erect" position, the easiest and the most logical way to put the cap in the best condition to disperse the spores, according to the gravitropism.

### Riassunto

Il seguente studio si pone come obiettivo l'inquadramento sistematico delle specie fungine individuate all'interno delle gallerie di scorrimento lavico (grotte vulcaniche) dell'Etna. Ne segue una mappatura dettagliata di ogni singolo ritrovamento nel contesto geografico e ambientale etneo. Particolare attenzione viene posta al ruolo ecologico e alle modalità di crescita dei singoli sporofori individuandone la nicchia ecologica e le capacità di approvvigionamento delle singole specie, delineandole all'interno del parassitismo, della simbiosi micorrizica o del saprotrofismo. La particolarità di alcuni funghi è che crescano a "testa in giù", cercando "istintivamente" di trovare una posizione "eretta", la via più semplice e logica per mettere il cappello nella migliore condizione per poter disperdere le spore, secondo le leggi del geotropismo gravitazionale.

**Key words:** Fungi, Etna, volcanic caves, gravitropism, depigmentation, environment.

*Xerocomus* sp



Description: *To achieve perfect positioning of their tubes in boleti for spore dispersal, fruiting bodies of higher fungi rely on the omnipresent force gravity. Only accurate negatively gravitropic orientation of the fruiting body cap will guarantee successful reproduction. Most likely every hypha in the transition zone between the stipe and the cap region is capable of sensing gravity.*

Author and year: Vasquez G., 2001

**PAHOEHOE LAVA AND ENDEMIC FAUNA OF BASALTIC CAVES IN PAYUNIA,  
MALARGÜE, MENDOZA, ARGENTINA\***

**BENEDETTO CARLOS<sup>1</sup> AND D'AGOSTINO CARLOS<sup>1,2</sup>**

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\*Originally published in English in Newsletter 77 – UIS Volcanic Caves Commission)

**Abstract**

The importance of having discovered, in the volcanic district of Payunia, the most extensive flows of pahoehoe lavas on the planet is once again highlighted, which although they have not yet been explored stereologically, the bibliography was updated, and studies emerge that allow dating some from them.

Pahoehoe formations were studied from 3.8 million years to -10,000 years (Pliocene to Pleistocene). The recent discovery of a new family of troglobitic arachnids in a lava tube in the region is very relevant.

Chronology of the main scientific studies carried out in a basaltic area that includes three Argentine provinces

**Riassunto**

Questo lavoro è il resoconto della ricerca svolta nel distretto vulcanico di Payunia, caratterizzato dai più estesi flussi di lave pahoehoe del pianeta. Le formazioni pahoehoe studiate sono datate da 3,8 milioni di anni a -10,000 anni (dal Pliocene al Pleistocene).

La recente scoperta di una nuova famiglia di aracnidi troglobi in un tubo di lava nella regione è molto rilevante.

Si riporta inoltre la cronologia dei principali studi scientifici condotti in un'area basaltica che comprende tre province Argentine

**Key words:** troglobitic arachnids, biospeleology, volcanic cave, lava tube, Argentina



**Fig 1.** *Otilioleptes marcelae* gen. nov., sp. nov. Paratype male (FML-OPIL 00218), dorsal view. Photo: Abel Pérez-González.

<https://doi.org/10.1371/journal.pone.0223828.g001>

## **SHEDDING LIGHT ON LONG-EARED BATS (*PLECOTUS* SPP.) FROM SICILY: MORE COMPLEX THAN WE THOUGHT**

**ANCILLOTTO L.<sup>1</sup>, GALIMBERTI A.<sup>2</sup>, BUCOLO C<sup>3\*</sup>, MUSUMECI E.<sup>3\*</sup>**

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### **Abstract**

Cryptic species represent a major challenge in biodiversity assessments, due to the difficulties in detect and correctly identify such taxa, particularly when species recognition is based solely on morphological characters. Bats have a long history of research efforts in Europe, and yet knowledge on the bat fauna of Sicily is scarce.

Palaearctic long-eared bats from the genus *Plecotus* have traditionally represented a conspicuous challenge to bat specialists, due to their complex biogeographical and phylogenetic histories, paired by a marked phenotypic resemblance across most species. As such, molecular tools for species identification are a fundamental step to shed light on species identity, particularly when more than one species occur in sympatry.

Here we review the literature on the presence of three *Plecotus* bats from Sicily, reporting new records for two species (*P. austriacus*, *P. auritus*), revealing the importance of molecular identification when these species are found. Among these new findings, we report on the phenology and roost use by the first documented colony of brown long-eared bats (*Plecotus auritus*) from Sicily, occupying a crevice within a volcanic cave on Mount Etna.

### **Riassunto**

Le specie criptiche rappresentano la più grande sfida nella valutazione della biodiversità a causa delle difficoltà nel riuscire a localizzare e identificare tali taxa, in particolar modo quando il riconoscimento delle specie si basa esclusivamente sui caratteri morfologici.



I pipistrelli sono da diversi anni protagonisti di una ingente mole di ricerche in Europa ma, ad oggi, è ancora scarsa la conoscenza della chirotterofauna in Sicilia.

La classificazione degli orecchioni del Paleartico, discendenti dal genere *Plecotus*, hanno da sempre rappresentato una dura prova per i chirotterologi, a causa della complessità della loro storia biogeografia, e filogenetica e per le marcate somiglianze fenotipiche tra la maggior parte delle specie. Per questo motivo gli strumenti molecolari per identificare le specie sono un elemento fondamentale per far luce sull'identità delle stesse, in particolare quando più di una specie si presenta in simpatria.

In questo studio abbiamo esaminato la letteratura sulla presenza dei tre pipistrelli del genere *Plecotus*, provenienti dalla Sicilia, riportando nuove testimonianze per le due specie (*P. austriacus*, *P. auritus*), sottolineando l'importanza dell'identificazione da un punto di vista molecolare quando si rilevano le due specie. Tra queste nuove scoperte, forniamo dati sulla fenologia e sulla presenza del roost della prima colonia di orecchione bruno (*Plecotus auritus*), documentata in Sicilia, occupante una fessura all'interno di una grotta vulcanica, sull'Etna.

**Key words:** bats, molecular identification, volcanic caves, Etna, Catania.





## WEDNESDAY SEPTEMBER 1<sup>ST</sup>

### DAILY SCHEDULE

Time Author, Lecture

09:10<sub>am</sub> Author, Lecture – 3<sup>rd</sup> Session:

09:15<sub>am</sub> *Al-Fahda Flow, Pyroduct and Archaeology, Jordan* – Stephan Kempe & Ahmad Al-Malabeh (live)

09:35<sub>am</sub> *The Key Geoheriage Area: A potential new IUCN program on geoheritage conservation* – Woo, Kyung Sik (web)

09:55<sub>am</sub> *The Grotta Di Salvo, an oldies lava tube on the Sud side of Mt. Etna: notes of morphology and archeological aspects.* – Bucolo Carmel, Musumeci Elisa, Priolo Giuseppe (live)

10:15<sub>am</sub> The first census of volcanic caves in Pantelleria - Bucolo Carmelo, Musumeci Elisa, Belfiore Andrea, Fonseca Fulvio (live)

10:35<sub>am</sub> *The Grotta del Faggio, another, interesting, cave on the Sciara del Follone lava flow, Mt. Etna (Italy)* – Gullotto V., Priolo G., Raciti. S., Ragusa. M., Schilirò A., Tosto E. (live)

10:55<sub>am</sub> Coffee break

11:10<sub>am</sub> Presentation of the General Excursion & caving excursions

11:25<sub>am</sub> Author, Lecture – 4th Session:

11:30<sub>am</sub> *The Grotta della Cisterna, San Giovanni Galermo-Catania (Italy)* - Gaetano Giudice, Francesco Politano, Alfio Cariola, Salvatore Tomasello (live)

11:50<sub>am</sub> “Ghiara” quarries on Etna: examples inside and outside urban environment (Catania, Sicily) – Gaetano Giudice, Francesco Politano, Alfio Cariola (live)

12:10<sub>am</sub> *Down the crater from Empokles to Arni* – Franz Lindenmayr (live)

- 12:30<sub>pm</sub> *Lineri Quarry: a resource for the inhabitants of Misterbianco after the 1669 eruption, the 1693 earthquake and the postwar*  
- Bucolo Carmelo, Belfiore Andrea, Cantone Giuseppe
- 12:50<sub>pm</sub> The Piano Noce cave: from vandalism to dignity - Bucolo Carmelo, Caltabiano Francesco, Russo Sebastiano
- 13:10<sub>pm</sub> Proposal of ISV 20 in Dak Nong UNESCO Global Geopark, Vietnam
- 01:30<sub>pm</sub> Lunch time
- 02:00<sub>pm</sub> UIS COMMISSION MEETING
- 03:00<sub>pm</sub> Options:  
a) Historical Museum of the Landing in Sicily 1943- Cinema Museum  
b) Guided tour of the Botanical Garden

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PARTNERS PROGRAM

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**SIRACUSA AND NOTO** Guided Tour (see page xx)

- 10:00<sub>am</sub> Start from GGC Headquarters
- 06:00<sub>pm</sub> End at GGC Headquarters

**EVENING PROGRAM**

- 08:00<sub>pm</sub> **Gala Banquet** in a typical Sicilian restaurants

ABSTRACT

III Session: Exploration and Topography

- *Al-Fahda Flow, Pyroduct and Archaeology, Jordan* – Stephan Kempe & Ahmad Al-Malabeh
- *The Key Geoheriage Area: A potential new IUCN program on geoheritage conservation* – Woo, Kyung Sik
- *The Grotta Di Salvo, an oldies lava tube on the Sud side of Mt. Etna: notes of morphology and archeological aspects.* – Bucolo Carmelo & Musumeci Elisa, Priolo Giuseppe
- *The first census of volcanic caves in Pantelleria* - Bucolo Carmelo, Musumeci Elisa, Belfiore Andrea, Fonseca Fulvio
- *The Grotta del Faggio, another, interesting, cave on the Sciara del Follone lava flow* – Gullotto V., Priolo G., Raciti. S., Ragusa. M., Schilirò A., Tosto E.

## **FAHDA FLOW, PYRODUCT AND ARCHAEOLOGY, JORDAN**

**KEMPE STEPHAN<sup>1</sup> AND AL-MALABEHAHMAD<sup>2</sup>**

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### **Abstract**

The Harrat Al Shaam, the lava deserts of Jordan, is a vast lava field, in which we have explored and surveyed 23 lava caves with a total added length of 3164 m, as yet.

One of the latest eruptions, a fissure eruption, created a 32 km long lava field, the Al-Fahda lava flow, covering 227 km<sup>2</sup>. In the north, the field is up to 24 km wide, while towards the south the flow becomes restricted to one flow-lobe. This field, in contrast to the surrounding underlying lava flows, has developed only a marginal morphological drainage network. Within the flow, we have explored and surveyed Al-Fahda Cave, the longest lava cave yet discovered in Jordan. It is 924 m long, accessible through two entrance collapses. This cave represents the main pyroduct that served for the subsurface transport of lava from the vents to the flow front. Both ends of the cave are plugged by loess, washed-in from the surface. Human occupation left stacked walls and a large pile of rocks (“The Monument”) of unknown ages. A clay lamp documented use of the cave in Byzantine times.

The cave was used by hyenas, wolves and porcupines as dens all the way to their uphill and downhill ends. These left both their feces as well as bones of their prey. Two decayed hyena or wolf corpses were found at the ends. A 6.3 km long, undated channel was dug in the intention to use the cave as a temporary cistern. The surface of the flow field also features numerous archeological remains, the most specular are three groups of 98 (from E to W: 63, 27 and 8, respectively) Neolithic gazelle traps termed “desert kites” due to their similarities with children kites from the air.

### **Riassunto**

L'Harrat Al Shaam, i deserti lavici della Giordania, sono un vasto campo di lava, in cui abbiamo esplorato e rilevato 23 grotte con una lunghezza totale, a oggi, di 3164 m.

Una delle ultime eruzioni, un episodio fissurale, ha creato un campo lavico lungo 32 km, il flusso lavico Al-Fahda, che copre 227 km<sup>2</sup>. A nord, il campo è largo fino a 24 km, mentre verso sud il flusso si restringe assumendo una forma lobata. Questo campo, in contrasto con le colate laviche precedentemente messe in posto, ha sviluppato solo una rete di drenaggio morfologica marginale.

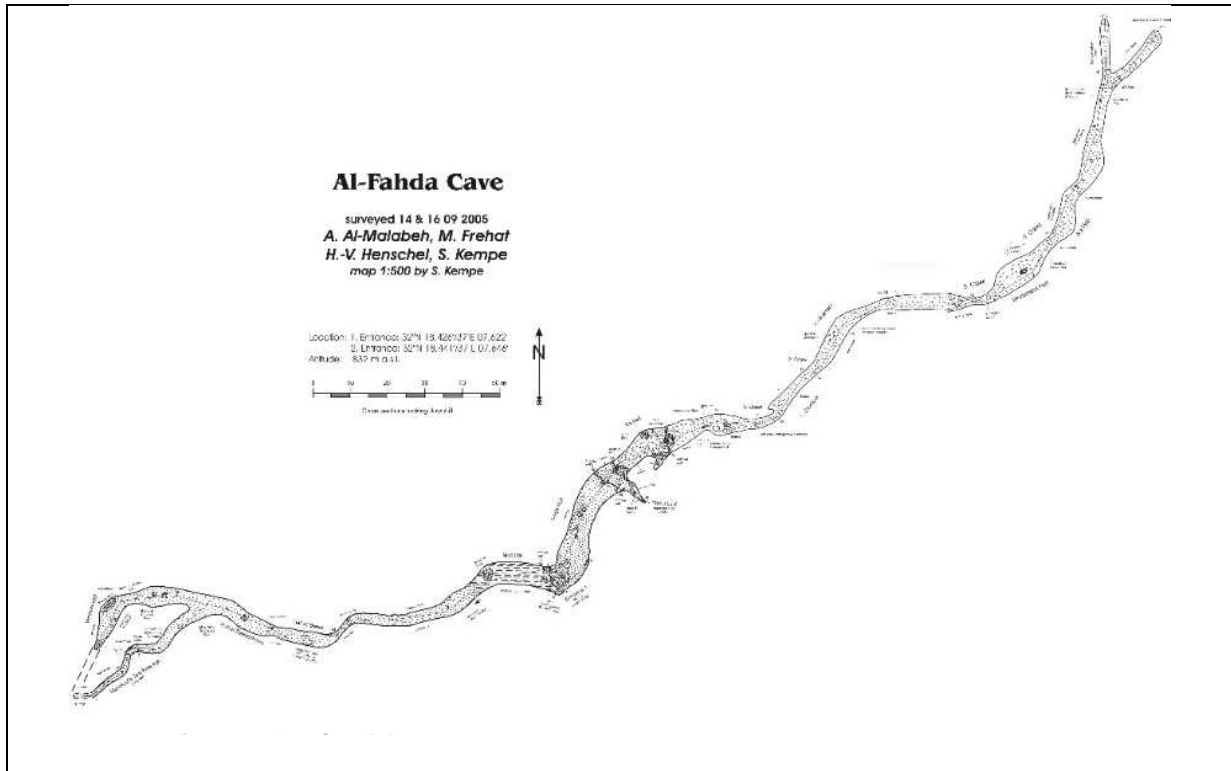
All'interno del flusso, abbiamo esplorato e osservato la grotta di Al-Fahda, la più lunga grotta di lava mai scoperta in Giordania. È lungo 924 m, accessibile attraverso due crolli d'ingresso. Questa grotta rappresenta il principale apporto sotterraneo della lava dalle bocche al fronte di colata. Entrambe le estremità della grotta sono tappate da loess, ablato dalla superficie. L'occupazione umana ha lasciato muri accatastati e un grande mucchio di rocce ("Il Monumento") di età sconosciute. Una lucerna in argilla documenta l'uso della grotta in epoca bizantina.

La grotta era frequentata da iene, lupi e istrici che vi hanno costruito le loro tane, per tutta la sua interezza. Questi frequentatori hanno lasciato sia le loro feci che le ossa della loro preda. Alle estremità sono stati trovati due carcasse di iena o di lupo in decomposizione.

Un canale non datato lungo 6,3 km è stato scavato con l'intenzione di utilizzare la grotta come cisterna temporanea.

La superficie del campo lavico presenta anche numerosi resti archeologici, i più peculiari sono tre gruppi di 98 (da E a O: 63, 27 e 8, rispettivamente) trappole neolitiche a gazzelle chiamate "desert kites" per le loro somiglianze agli aquiloni fatti volare dai bambini

**Keywords:** Jordan, lava caves, pyroducts, Al-Fahda flow field, archeology, human usages, hyena, desert-kites



Description: *Al-Fahda Cave, map*

Author and year: Kempe S. et al, 2005



Description: *Breakdown blocks, supplemented anthropogenically by slabs of lining, dubbed "the Monument". M. Frehat and A. Al-Malabeh for scale.*

Author and year: Kempe S., 2005



## **THE KEY GEOHERITAGE AREA: A POTENTIAL NEW IUCN PROGRAM ON GEOHERITAGE CONSERVATION**

**WOO, KYUNG SIK<sup>1</sup>**

*<sup>1</sup>Department of Geology, Kangwon National University, Chuncheon, Gangwondo 24341, Republic of Korea; Chair, IUCN WCPA Geoheritage Specialist Group*

### **Abstract**

Geoheritage can be categorized into local, national, and international values and needs to be conserved for future generations because geosites cannot be restored once damaged. Thus, statutory protection measures and effective management of geosites must be established in each country. Unfortunately, the necessity for the conservation of geoheritage is not yet sufficiently recognized at national and international levels, compared to ecological and biodiversity values.

So far, there is no initiative to promote geoheritage management under international nature conservation policies. Despite the UNESCO's international designations (World Heritage Sites and Global Geoparks) that recognise geoheritage, too many potential geosites representing the 4.6 billion years of the Earth history and evolution of life have been neglected and are being destroyed.

Therefore, a new programme – Key Geoheritage Area (KGA) – has been suggested in the last two years, correspondent to the Key Biodiversity Areas already running under IUCN.

The KGA should be primarily based on the scientific value of geological features. For an effective KGA designation, objective geological contexts with appropriate criteria should be developed, such as representativeness, rarity, and integrity. The expectation is that this new programme will contribute to conserve geoheritage worldwide. The KGA is a proposal that is being worked inside the WCPA's Geoheritage Specialist Group (IUCN) but it will need the collaboration of other relevant organisations such as IUGS, ProGEO, and IAG, after its full adoption by IUCN.

## Riassunto

Il geopatrimonio può essere classificato in valori locali, nazionali e internazionali e deve essere conservato per le generazioni future perché i geositi non possono essere ripristinati una volta danneggiati. Pertanto, in ogni paese devono essere stabilite misure di protezione legale e una gestione efficace dei geositi. Sfortunatamente, la necessità della conservazione del geopatrimonio non è ancora sufficientemente riconosciuta a livello nazionale e internazionale, rispetto ai valori ecologici e di biodiversità.

Finora, non esiste alcuna iniziativa per promuovere la gestione del geopatrimonio nell'ambito delle politiche internazionali di conservazione della natura. Nonostante le designazioni internazionali dell'UNESCO (World Heritage Sites e Global Geoparks) che riconoscono il geopatrimonio, troppi potenziali geositi che rappresentano i 4,6 miliardi di anni della storia della Terra e dell'evoluzione della vita sono stati trascurati e vengono distrutti. Pertanto, negli ultimi due anni è stato suggerito un nuovo programma – Key Geoheritage Area (KGA) – corrispondente alle Key Biodiversity Areas già in esecuzione nell'ambito dell'IUCN.

Il KGA dovrebbe essere basato principalmente sul valore scientifico delle caratteristiche geologiche. Per una designazione KGA efficace, dovrebbero essere sviluppati contesti geologici oggettivi con criteri appropriati, come rappresentatività, rarità e integrità. L'aspettativa se questo nuovo programma contribuirà a conservare il geopatrimonio mondiale.

Il KGA è una proposta che viene elaborata all'interno del Geoheritage Specialist Group (IUCN) del WCPA, ma richiederà la collaborazione di altre organizzazioni pertinenti come IUGS, ProGEO e IAG, dopo la sua piena adozione da parte dell'IUCN.

**Keywords:** Korea, lava caves, geopark, geoheritage

## **THE GROTTA DI SALVO, AN OLDIES LAVA TUBE ON THE SUD SIDE OF MT. ETNA: NOTES OF MORPHOLOGY AND ARCHEOLOGICAL ASPECTS.**

BUCOLO CARMELO<sup>1</sup>, MUSUMECI ELISA<sup>1</sup> AND PRIOLO GIUSEPPE<sup>2</sup>

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### **Abstract**

The Mt. Etna, the highest active volcan of Europe, amount many volcanic cave: lava tubes and fractur caves. The Grotta Di Salvo is an interesting sample of lava tube, born in very old lava flow, is made of two level of lava tubes.

The principal lava tube, other the typical morphologies enclosed many, interesting, archaeological finds.

### **Riassunto**

L'Etna è il vulcano attivo più alto d'Europa con una cospicua presenza di grotte vulcaniche sia di scorrimento lavico che di frattura. La Grotta di Salvo, sita nel territorio di Belpasso (CT), si aggiunge all'elenco delle nuove grotte scoperte sull'Etna con particolari ritrovamenti al suo interno quali un frammento di selce e molti cocci ceramici di vari periodi archeologici. Lo studio, oltre a descriverne gli aspetti vulcanologici e morfologici, aggiunge un ulteriore tassello nella ricostruzione della storia del nostro territorio.

**Key words:** cave, lava tube, archeology, bronze age, Catania, Etna.



Description: Sezione trasversale della sala d'ingresso con caratteristici livelli sovrapposti.

Author and year: Bucolo Carmelo 2021

## THE FIRST CENSUS OF VOLCANIC CAVES IN PANTELLERIA

**BUCOLO C.<sup>1</sup>, MUSUMECI E.<sup>1</sup>, BELFIORE A.<sup>1</sup>, FONSECA F.<sup>2</sup>**

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### Abstract

The island of Pantelleria is located in the Sicily Channel Rift Zone (SCRZ) and represents the emerged tip of an underwater volcano complex with 72% lying below sea level, down to a depth of about 1200 m. Its origin is linked to the Pantelleria graben, one of the three main tectonic depressions of the NW-SE trending extensional area in the SCRZ. The rifting process has been active since the Late Miocene, accompanied by widespread volcanic activity mainly concentrated on the islands of Pantelleria and Linosa and the Bannock Seamount.

The last episode of eruptive activity, occurring in 1891, 5 Km NW offshore North of Pantelleria, showed that the volcanic activity is still present in the submerged part of the island.

To date, the volcanism of Pantelleria is still on-going with the presence of a natural spa, thermal springs, fumaroles, that are located along the main tectonic structures.

The island is famous for its beautiful landscapes with native flora and fauna, but especially for the typical buildings created by the man like the 'panteschi' and 'dammusi' gardens.

Even if the inhabitants know the existence of some caves, the territory has not been entirely explored yet. The purpose of this work is to discover the caves and conduct a census of all the caves in the island like lava flow caves and fracture caves.

## Riassunto

L'isola di Pantelleria si trova nel rift del Canale di Sicilia, e rappresenta la punta emersa di un complesso vulcanico, con il 72% del complesso sotto il livello del mare, fino a una profondità di circa 1200 m. La sua origine è legata al graben di Pantelleria, una delle tre principali depressioni tettoniche dell'area estensionale ad andamento NW-SE nel rift del Canale di Sicilia. Il processo di rifting è attivo fin dal Miocene superiore, accompagnato da una diffusa attività vulcanica concentrata principalmente nelle isole di Pantelleria e Linosa e nel Bannock Seamount. L'ultimo episodio di attività eruttiva, avvenuto nel 1891, 5 Km NW al largo di Pantelleria, ha mostrato che l'attività vulcanica è ancora presente nella parte sommersa dell'isola.

Ad oggi il vulcanismo di Pantelleria è ancora in atto con la presenza di un centro termale naturale, sorgenti termali, fumarole, che si trovano lungo le principali strutture tettoniche.

L'isola è conosciuta per i bellissimi paesaggi con flora e fauna endemica ma soprattutto per le strutture tipiche del luogo create dall'uomo quali giardini panteschi e dammusi. Pur conoscendo, da parte degli isolani, la presenza di alcune grotte, il territorio non è del tutto stato esplorato. Scopo del lavoro è quello di conoscere e censire le grotte presenti nell'isola quali grotte di scorrimento lavico e grotte di frattura.

**Key words:** volcanic cave, lava tube, fracture, volcanic island, Pantelleria, Trapani.



Description: *Cross section of a lava flow cave*

Author and year: *Bucolo C. 2021*

## **THE GROTTA DEL FAGGIO, ANOTHER, INTERESTING, CAVE ON THE SCIARA DEL FOLLONE LAVA FLOW, MT. ETNA (ITALY)**

**GULLOTTO V<sup>1.</sup>, PRIOLO G.<sup>2\*</sup>, RACITI S.<sup>3</sup>, RAGUSA M.<sup>4</sup>, SCHILIRÒ A.<sup>5</sup>,  
TOSTO E.<sup>6</sup>**

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### **Abstract**

During his trekking of the northern side of Etna, Vincenzo Gullotto, revived and began the explorations of an unknown cave to which he gave the name of Grotta del Faggio, making himself involves account of the importance of the discovery discovered by the friends of the Gruppo Grotte Catania to complete the exploration and carry out topographic surveys (2014).

The cave develops inside the lavas of 1614-1624 and presents interesting morphologies and a conspicuous planimetric development.

This work illustrates the topographical survey and the main morphologies through a rich iconographic set.

### **Riassunto**

Durante le sue escursioni lungo il versante Nord dell'Etna, Vincenzo Gullotto, riveniva e dava inizio alle esplorazioni di una grotta non conosciuta al cui diede il nome di Grotta del Faggio. Resosi conto dell'importanza della cavità scoperta



coinvolgeva gli amici del Gruppo Grotte Catania per completare l'esplorazione ed effettuare i rilievi topografici realizzati nel 2014.

La cavità si sviluppa all'interno delle lave del 1614-1624 e presenta interessanti morfologie e un cospicuo sviluppo planimetrico. In questo lavoro viene illustrato il rilievo topografico e tramite un ricco corredo iconografico le morfologie principali.

**Key words:** lava tube, volcanic cave, Etna



Description: *Grotta del Faggio, Blister and refusion stalactite*

Author and year: *Priolo G., 2014*



Description: *Grotta del Faggio, overlap lava tubes near the exit*

Author and year: *Priolo G., 2014*

IV Session: other

- *The Grotta della Cisterna, San Giovanni Galermo-Catania (Italy) - Gaetano Giudice, Francesco Politano, Alfio Cariola, Salvatore Tomasello*
- *“Ghiara” quarries on Etna: examples inside and outside urban environment (Catania, Sicily) – Gaetano Giudice, Francesco Politano, Alfio Cariola*
- *Down the crater from Empokles to Arni – Franz Lindenmayr*
- *Lineri Quarry: a resource for the inhabitants of Misterbianco after the 1669 eruption, the 1693 earthquake and the postwar - Bucolo Carmelo, Belfiore Andrea, Cantone Giuseppe*
- *The Piano Noce cave: from vandalism to dignity - Bucolo Carmelo, Caltabiano Francesco, Russo Sebastiano*

## **THE GROTTA DELLA CISTERNA, SAN GIOVANNI GALERMO-CATANIA (ITALY)**

**GIUDICE G.<sup>1\*,2</sup>, POLITANO F.<sup>2</sup>, CARIOLA A.<sup>2</sup>, TOMASELLO S.<sup>2</sup>**

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*<sup>2</sup>Centro Speleologico Etneo, Via Valdisavoia 3, Catania*

### **Abstract**

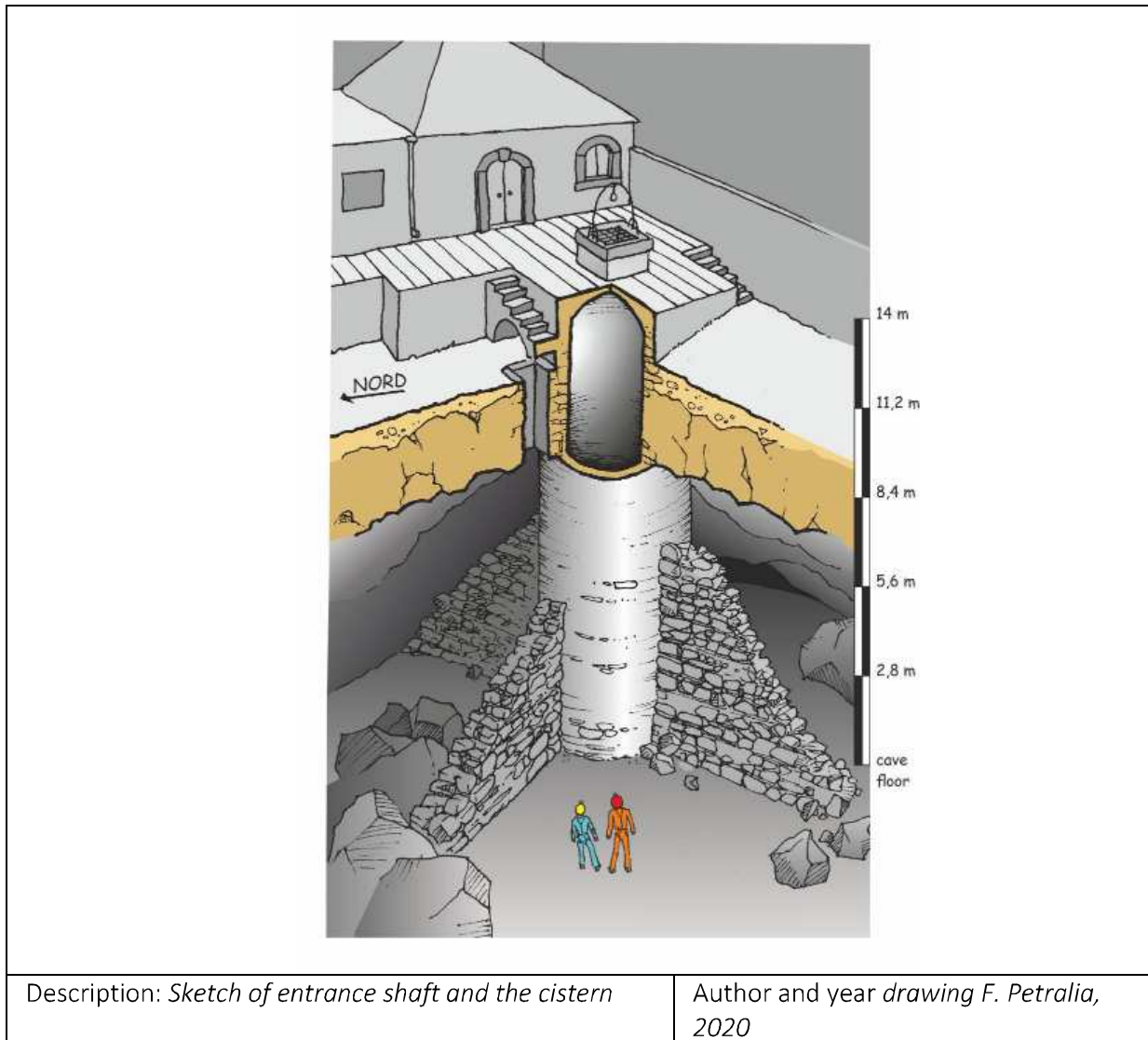
This work describes one of the lava tube of Etna with the largest size of gallery, sometimes more than 20 meters wide, recently discovered with amazement and explored in San Giovanni Galermo, a quarter of Catania, used as bomb shelter during World War II. The cave opens inside the lava della Carvana, a prehistoric lava flow north-west of Catania town, and at the moment is surveyed for more than 200 m in length. The cave houses a singular cistern, dated 1882. It is not so common to see the external body of an underground cistern, because the external surface of the walls is usually in direct contact with the ground that hosts it, or because in other soils (especially calcareous) the walls of the container are hewn out of the rock itself, and then plastered. In the case described here, instead, the underground body of the cistern seen from inside the cave looks like a huge circular tower, about ten meters high, outside of which, buttresses built with lava stone and mortar are visible. Inside the cave, drains, debriefs and pollutions are present, probably coming from old entrances now obstructed, but also pottery and stones from various periods, the oldest probably from the Bronze Age, and some stones enclosures delimiting sectors, still under study.

### **Riassunto**

Questo lavoro descrive una delle grotte laviche di scorrimento dell'Etna con la più grande sezione di galleria, in alcuni punti con più di 20 metri di larghezza, recentemente scoperta con stupore ed esplorata a San Giovanni Galermo, un quartiere di Catania, utilizzato come rifugio antiaereo durante la seconda guerra mondiale. La grotta si apre all'interno della Lava della Carvana, una colata lavica preistorica a nord-ovest della città di Catania, ed è attualmente rilevata per oltre 200 m. La grotta ospita all'interno una singolare cisterna, datata 1882. La

particolarità dell'opera consiste soprattutto nel fatto che di norma le cisterne sono scavate nella roccia che le contiene, mentre questa poggia sul pavimento della grotta lavica che la ospita, è stata costruita dal basso verso l'alto, e le sue pareti esterne sono ben visibili dall'interno della grotta. Nella grotta sono presenti in vari punti scarichi di liquami, acque bianche e detriti vari, questi ultimi provenienti da antichi ingressi oggi ostruiti, inoltre sono stati rinvenuti anche reperti ossei e ceramici ascrivibili a diverse epoche, i più antichi risalenti probabilmente all'Età del Bronzo, e alcune strutture di delimitazione degli ambienti ancora allo studio

**Key words:** Cistern, Lava tube, San Giovanni Galermo, Bomb shelter, Etna





Description: *The large lava tube near the entrance and the cistern body view from west side*

Author and year *Fiorenzo Fiorenza, 2020*

## **“GHIARA” QUARRIES ON ETNA: EXAMPLES INSIDE AND OUTSIDE URBAN ENVIRONMENT (CATANIA, SICILY)**

**GAETANO GIUDICE<sup>1\*,2</sup>, FRANCESCO POLITANO<sup>2</sup>, ALFIO CARIOLA<sup>2</sup>**

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<sup>2</sup>*Centro Speleologico Etneo, Via Valdisavoia 3, Catania*

### **Abstract**

This work describes the discovery, exploration and survey of a couple of quarries used to extract the so called “ghiara” from below old lava flows. These are particular artificial caves, mostly driven into oblivion, diffused in the underground of Catania (in some cases used as refuge during World War 2) and on Etna’s surroundings. The *ghiara* or red sand is a sandy matter, with pozzolanic properties, produced by a thermal metamorphism process due to the contact of paleo-soil with active lava flows. This sand was mixed with the lime in order to obtain ordinary mortars, which were widely used in the building industry as a binder, and for the preparation of the external plaster which gave the characteristic pink color to historical buildings in the town. The extraction of this material was done by excavating labyrinths of narrow galleries, but also large rooms consolidated by pillars made of collapsed rocks. The search for these quarries, which began with the exploration of the underground of the city of Catania, was then extended to the entire Etna area with unexpected results both in terms of quantity and quality. In this work we will mention the peculiar characteristics of the extracted material, the gravel, its geogenesis and its use in construction, and then describe the method of excavation of the quarries and their diffusion in the city and in the Etna area. The study of two quarries falling in different areas of the territory and under different lava flows will also be presented: the "Grotta Lucente" quarry, located in a semi-peripheral area of the municipality of Catania, under a secondary branch of the lava flow of 1669, and the "Cava dell'Istrice", located near the village of Pedara, in the Tardereria district, extended under the Colata di Montarello of the 1270 eruption.

## Riassunto

Il Centro Speleologico Etneo (CSE) svolge ormai da diversi anni ricerche finalizzate alla conoscenza e allo studio di un particolare tipo di cavità artificiale presente sotto le colate laviche etnee, e dalla quale in passato si estraeva un materiale sabbioso, noto come sabbia rossa o ghiara. Questa sabbia rossa ha caratteristiche pozzolaniche e si forma per azione di colate laviche sul terreno preesistente. Nell'area etnea la ghiara era largamente utilizzata negli edifici storici mista a calce per ottenere malte, e per la preparazione dell'intonaco esterno che ha conferito il caratteristico colore rosato agli edifici storici. L'estrazione di questo materiale avveniva scavando labirinti di anguste gallerie, ma anche grandi ambienti consolidati da pilastri costruiti con le rocce di crollo. La ricerca di queste cave, iniziata con l'esplorazione del sottosuolo della città di Catania, si è poi estesa all'intera area etnea con risultati inaspettati sia in termini di quantità che di qualità (Bonaccorso & Lo Giudice, 1999). In questo lavoro citeremo le caratteristiche peculiari del materiale estratto, la ghiara, la sua geogenesi e il suo utilizzo in edilizia, per poi descrivere il metodo di scavo delle cave e la loro diffusione in città e nel territorio etneo. Verrà inoltre presentato lo studio di due cave ricadenti in zone diverse del territorio e sotto diverse colate laviche: la cava "Grotta Lucente", situata in una zona semiperiferica del comune di Catania, sotto un ramo secondario della colata lavica del 1669, e la "Cava dell'Istrice", situata nei pressi del paese di Pedara, in contrada Tarderia, estesa sotto la Colata di Montarello dell'eruzione del 1270.

**Key words:** Ghiara, Cave, Lava flow, Catania, Underground, Etna.





Description: *Cava "Grotta Lucenti" – the entrance*

Author and year: *Gaetano Giudice, 2019*



Description: *Cava dell'Istrice – the entrance*

Author and year: *Giuseppe Conti, 2020*

## **DOWN THE CRATER, FROM EMPOKLES TO ARNI**

**LINDENMAYR FRANZ**

*Lindenmayr Franz, FLindenmayr@gmail.com, Verein für Höhlenkunde in Munich*

### **Abstract**

I want to present in 9 examples from history and literature different human approaches to volcano craters and abysses, concentrating mainly on the descent into them.

### **Riassunto**

Voglio presentare, in 9 esempi tratti dalla storia e dalla letteratura, i diversi approcci umani ai crateri e agli abissi vulcanici, concentrandomi principalmente sulla discesa in essi.

**Keywords:** volcano craters, vertical volcanoanthropospeleology, decent technics

## **LINERI QUARRY: A RESOURCE FOR THE INHABITANTS OF MISTERBIANCO AFTER THE 1669 ERUPTION, THE 1693 EARTHQUAKE AND THE POSTWAR**

**BUCOLO CARMELO<sup>1</sup>, BELFIORE ANDREA<sup>1</sup>, CANTONE GIUSEPPE<sup>1</sup>**

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### **Abstract**

The 1669 eruption was one of the most catastrophic lava flow that stroke 16 districts in Catania, including Misterbianco. The inhabitants of this small town, among the sciaras of Lineri's area, have been able to exploit the territory digging long and crooked caves of ghiara from which they could extract the red sand. It is called "ghiara" and is a sand of a typical red colour obtained by heating the paleosol in contact with the lava. It was used in the construction industry to obtain the cements to create the plasters for the outsides, "half plaster" for the interior plasters and "battume" to waterproof the coverings.

### **Riassunto**

L'eruzione del 1669 è stata una delle colate laviche più catastrofiche che ha colpito 16 comuni catanesi tra i quali Misterbianco. La popolazione misterbianchese, tra le sue sciare del territorio di Lineri, ha potuto sfruttare al meglio il territorio scavando lunghe e tortuose cave di ghiara dalle quali veniva estratta la rena rossa. Chiamata "ghiara" è una sabbia dal tipico colore rosso ottenuto da un processo di riscaldamento del paleosuolo a contatto con la lava soprastante e veniva utilizzata in edilizia per ottenere le malte per la formazione di intonaci per esterni, del "mezzo stucco" per gli intonaci interni e del "battume" per l'impermeabilizzazione delle coperture.

**Key words:** ghiara, quarry, eruption of 1669, Misterbianco, Etna.



Description: *a round room with some stones obtained by the excavating. They are used to create columns and small walls.*

Author and year: *Bucolo C. 2020*

## THE PIANO NOCE CAVE: FROM VANDALISM TO DIGNITY

**BUCOLO CARMELO<sup>1</sup>, CALTABIANO FRANCESCO <sup>2</sup>, RUSSO  
SEBASTIANO<sup>2</sup>**

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<sup>2</sup> Sicilywalking, Acireale, Via Rapallo n.4, [nello.russo81@gmail.com](mailto:nello.russo81@gmail.com)

### Abstract

Typical lava flow cave with speleothems located on the North-East side of Etna at 1,195 meters above the sea level and in the Piedimonte Etneo territory. Unfortunately, the cave has been damaged by vandals, therefore it is possible to see many inscriptions written with sprays on its interior walls. This cave has become sadly famous to the public for a massive spread of pictures showing the above-mentioned acts of vandalism. The goal of this project is to give back to this cave its dignity and original beauty after being profaned and defaced for too long. The purpose is to make the Piano Noce Cave known to everybody for its geological and biological features of huge naturalistic value rather than for the human damages.

### Riassunto

Tipica grotta di scorrimento lavico situata sul versante nord est dell'Etna a quota 1195 m.s.l.m. e ricadente nel territorio di Piedimonte Etneo, con tipici speleotemi. Purtroppo la grotta è stata oggetto di vandalismo in quanto all'interno è possibile osservare sulle pareti tantissime scritte riportate con bombolette spray. Tale grotta si è resa tristemente nota al pubblico a causa della divulgazione massiva di foto riportanti i suddetti atti vandalici. In questo progetto si vuole dunque ridare dignità ad una grotta profanata e deturpata, rendendola nota a tutti per gli aspetti geologici e biologici di grande valore naturalistico, piuttosto che per le nefandezze dell'uomo.

**Key words:** cave, lava tube, conservation, Catania, Etna.



Description: *Detail of the final part of cave with some inscriptions on the inner walls*

Author and year: *Privitera Angelo 2019*

## GALA BANQUET

The Mt. Etna rose from the sea over 500.000 years ago. The Gala Banquet of 19th Symposium will have a lovely location: a typical Sicilian restaurant along the sea side. The better site for the more important gastronomic appointment of Symposium.

On the north side of Capomulini Gulf, at Al Mulino restaurant, Alfio and his staff will suggest an appetizing dinner based on sea food: starters, pasta, fish, all "watered" with an Etna's wine.

There is also an alternative menu for those that don't love fish, for vegetarians, vegans and others.



The location of Gala Banquet – ph. *G. Priolo*, 2021





## THURSDAY SEPTEMBER 2<sup>ND</sup>

### GENERAL EXCURSION

VISIT OF THE “VALLE DEL BOVE” (for all participants).

09:00<sub>am</sub> Start from GGC Headquarters.

06:00<sub>pm</sub> End of the excursion at GGC Headquarters.

Requirements: good health and good shoes,  
sun cream and hat.

Packed lunch and drinks will be provided by the organizers.

Don't forget your camera.

### EVENING PROGRAM at GGC Arena

09: 00<sub>pm</sub> Sicilian Granita Time  
Your comments on the excursion

## GENERAL EXCURSION – VISIT OF “VALLE DEL BOVE”

Mt. Etna is an active volcano. From the summit craters there is often the emission of gases and steam. During periods of high activity, the hike to the craters is strictly forbidden.

Since the recent eruptive activity of the volcano do not allow us to make the ascent to the central crater, all participants will be taken to the visit of Valle del Bove instead. The Valle del Bove is a big depression on the eastern slope of the volcano where most of the lava flows stop.



*General excursion, route*

The participants will reach the parking place near “Piano dei Pompieri” (Firefighter’s Plain) at 1.850 m a.s.l. by minibus.

From that place a long and winding track named “Sentiero della Schiena dell’Asino” will lead us to a panoramic point at 2.050 m a.s.l. where there is the possibility to see the inside of the depression called “Valle del Bove”. From the panoramic point it is possible to see the most spectacular features of the valley: hornitos, lava bridges, a small graben and the little cave called Grotta di Pitagora (Fig. 5).



*Grotta di Pitagora, outside and inside vision -ph G.Priolo, 2014*

*THE SICILIAN GRANITA*



Granita is a semi-frozen dessert made from sugar, water and various flavorings. Originally from Sicily, it is not an ice-cream because it doesn't include milk or cream. The Catania's granita is available in many flavors. The most typical are almonds, black mulberries, coffee, peach, strawberry and other fruit flavors.

Guests can enjoy one of the best slushes on the GGC terrace.

## **FRIDAY SEPTEMBER 3<sup>RD</sup>**

### CAVING EXCURSION

The Organizing Committee selected four caves that are representative of the special features of Mount Etna environment.

Two of them are near the town and can be visited in an half day trip: Grotta Catanese I and Grotta Intralio. If you have more time, you can go to Grotta Catanese first and then visit Grotta Intralio and vice-versa.

The other two are far from the town and to visit them requires a full day: Grotta di Serracozzo and Grotta di Piano Porcaria.

Before the excursions the front desk will collect the names of the preferred visit for each participant in order to organize the trips.

Participants must have their own clothes, gloves and shoes. In order to prevent the spread of White Nose Disease (WND) they must very carefully clean their garments before arriving in Italy even if they were used in an area free from WND.

Helmets lights and gloves can be rented from the GGC caving group. None of the caves need the use of vertical gear.

Participants must have an insurance policy that covers also the rescue in case of accident. For those without suitable insurance, it will be possible to purchase day cover at the ISV.

The exact time of the start and end of each excursion will be communicated during the symposium. All the caving excursion will end in Catania in time to permit participants to get to the Farewell Party.

## CAVING TRIPS

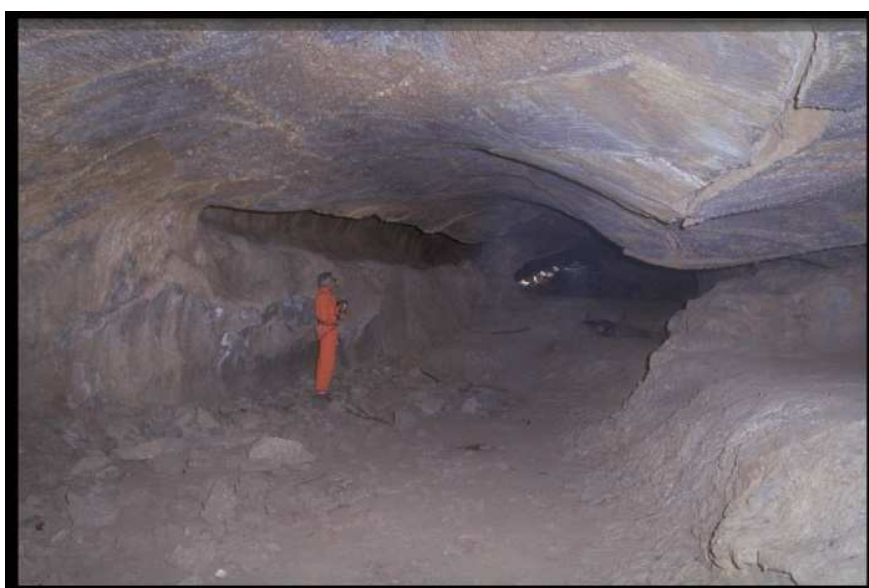
More than 300 volcanic caves are known on Mount Etna, scattered on the slopes of the mountain, from the upper part of the volcanic cones to the dark beaches on the seaside.

The caves of the upper part of the volcano are either very far from the roads or dangerous because of the volcano activity. Moreover, the highest part of the volcano is included in the Park of Etna and the access is subjected to restrictions due to the danger of the volcano itself. For this very reason it is not possible to plan the visit of the highest caves of the Etna this Summer.

For the “caving day” of the Symposium, the organizing team has selected some caves, very representative of Mt Etna caves features, close to the town and easy-to-walk, to permit participants to discover the typical features of the Etna caves.

You can find a description of each cave later in this paragraph. Due to logistical reasons the visit of a cave must be booked in advance at the registration desk.

Finally, near the town of Catania there is an area in which some simple caves have been equipped for educational purposes (Grotte di San Gregorio). The access to this area is possible to all participants during the Symposium days.



*Grotta Micio Conti – Riserva Naturale – ph G. Priolo*

## SELECTED CAVES

The visits of these wild caves are planned on Friday 3<sup>rd</sup> September with the support of the speleologists of Gruppo Grotte Catania.

In accordance with the guidelines for speleological activities during the pandemic period, in each cave can enter only one group of up to 8 people that have to proceed respecting the rules of interpersonal distancing. Vertical gear is not required.

Transportation from Catania to the cave and back to Catania is included. A light meal and some drinks will be given to participants after the visit of the cave.

Here is a short description of the selected caves:

## GROTTE CATANESE

These two caves are in the township of Ragalna. The first one is a lava tube characterized by a room that is among the largest known on Mt. Etna. Passing the entrance, you descend on large collapsed blocks and you immediately find yourself in a vast bell-shaped room. The floor, at the lowest point of the room, is of earth mixed with stones and plant debris. On the south side it rises abruptly until it forms the back wall of the room; the lava appears here with a surface made up of formations of ropes and edges. It is easy to climb up this lava slope until you reach a characteristic hollow almost at the height of the ceiling, from which you dominate the environment. On all walls you can observe a great number of small protruding sheets; on the west side near the entrance there are any shallow grooves, parallel to each other, which abruptly change direction bending downwards at an angle of 140 °. At the foot of the wall, on the south side, the lava formed large blocks that might seem collapsed, but which actually are huge irregularly crumpled sheets. From this first large room the cave continues, through a narrow passage at the base of the east wall, with a tunnel about 70 m long. Some prehistoric human bones and many small ceramic fragments were found in this gallery. Numerous bats of the genera *Myotis* and *Rhinolophus* still inhabit the cavity.

The second cave consists of a single tunnel just over 20 m long. You enter by descending on a chaotic mass of collapsed blocks. The floor, after the first section, appears flat with beaten earth and stones; towards the bottom it is possible to observe lava with a joint surface. On the walls there are numerous sheets of lava of different thickness and folded in various ways. The section of the cave has a characteristic pointed arch shape, but not symmetrical as is normally observed in other cavities. The southwest wall is overhanging while the northeast is an inclined plane on which it is easy to climb.



*Grotta Catanese I – ph. S. Nicoletti, 2021*



### GROTTA INTRALEO

The cave consists of a set of lava flow galleries of various sizes located at different levels and variously oriented. Near the entrance of the northeast gallery there is a small altar. This gallery is about 40 m long. On the opposite side there are three overlapping galleries. The upper gallery is 13 m long. The lower one is about 30 m long; it begins with a slope of large boulders that ends in a large room, several meters high, where you can observe two large lava rolls, among the largest known to us, and numerous large sheets protruding from the walls. The intermediate cavity is the longest of the three branches and begins with a tunnel about 30 m long, over 2 m high, with a flat floor on which two rolls can be seen, smaller than the previous ones but longer. Further on, this gallery is divided into three branches located at different heights. The eastern branch, at a lower altitude, is very short and has an accentuated slope, the central branch is 50 m long and its ceiling is low, so that it is necessary to crawl here and there; in some places it presents domes where it is possible to stand; the floor of this gallery is flat and consists of slag partly welded and partly movable. The third branch has the same configuration of the previous one; in this branch a wedge-shaped boulder, detached from the ceiling, almost completely obstructs the passage, about halfway. The three branches end up with the ceiling and the floor joining together.



*Figure 9: Grotta dell'Intratio, the biggest lava tube - ph. G. Priolo*

### GROTTA DI PIANO PORCARIA

This is an interesting cavity in ancient lavas. The small entrance open on one side of the cavity leads to a first room characterized by massive collapses. Three sections of the tunnel branch off from this first room. The first is oriented towards the west, about fifteen meters long, the floor of which is covered with debris and sand; there are impressive collapses. The vault does not always allow an upright posture and in the terminal part imposes a progression on all fours or even belly to the ground. The second section of the tunnel faces southeast and is about forty meters long. The vault allows the upright posture for a good half of the development while it becomes low, about one meter, in the terminal section. The floor is constantly covered with debris and sand, there are numerous collapses both from the vault and from the walls. In the final section of the tunnel a copious presence of pulmonate molluscs, arthropods and other small species were found. There are numerous root curtains. The third section of the tunnel, oriented to the north, has a development of over eighty meters and a morphologically different aspect from the two previous sections. The first section is broad and morphologically similar to the

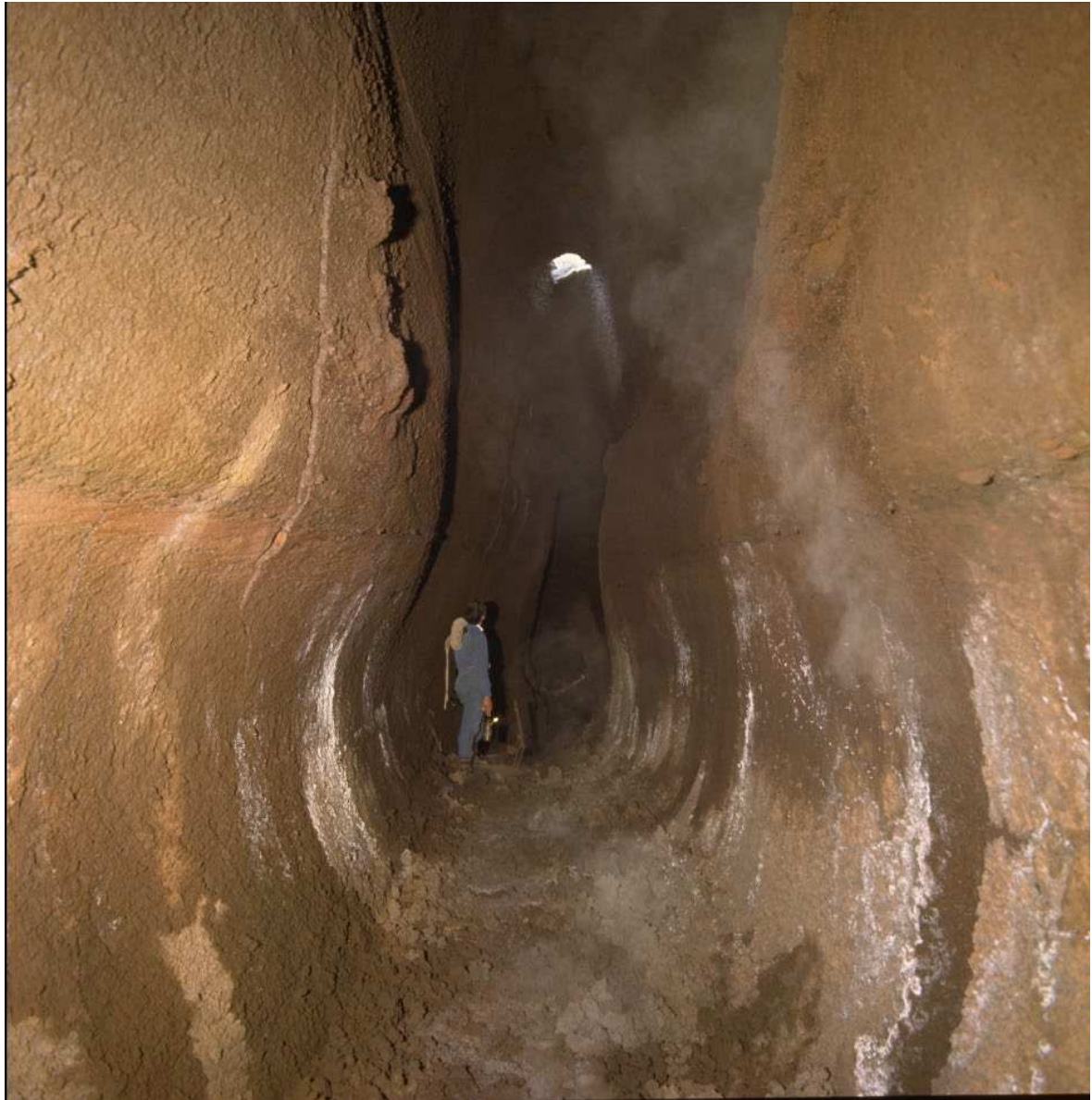
previous ones. At the bottom there is a small gallery whose access is just over sixty centimeters high. From this point on, almost constantly, the height of the vault does not allow an upright posture and one is often forced to proceed on all fours. The heavily bristling scoriae lava floor is only rarely covered with sand or debris. At the end of the gallery there is another narrow transept gallery which extends for over fifty meters both to the west and to the east. The east section becomes so narrow that it is impossible to proceed after about thirty meters.



*Figure 10: Grotta di Piano Porcaria – ph. S. Nicoletti*

### GROTTA DI SERRACOZZO

This cave, in the upstream section, is contained into an eruptive fissure and has a lock-shaped section with a height of several meters and is no more than 3 m wide. Openings can be seen on the vault. The downstream section is a steeply sloping flow tunnel, 350 m long, 2 to 3 meters wide with the floor made up of coriaceous lava. In the first section the walls are opaque but further on they still retain a glassy aspect.



*Figure 11: Grotta di Serracozzo I – ph. B. Scammacca*

## **CLOSING CERIMONIES**

**FRIDAY SEPTEMBER 3<sup>RD</sup>**

06:30<sub>pm</sub> Closing of the exhibition:  
“The Fingal cave, between history and legend”

08:00<sub>pm</sub> Closing ceremony of the Symposium GGC terraces

09:00<sub>pm</sub> Farewell Party at GGC Terraces



## **FAREWELL PARTY**

It is the last meeting before departure. This is the opportunity to take stock of all that this Symposium has given us.

This is a time when resolutions are made for new studies and new explorations, perhaps to be carried out together in the future.

An appetizing dish and a good glass of wine will help remove the sadness that accompanies every farewell.

But this not a goodbye, rather a “see you at the next Symposium”.





## **CATANIA'S NATURAL AND CULTURAL HERITAGE**

Catania was founded in the 8th century BC by Chalcidians, a Greek population coming from Thrace. In 1434, the first university in Sicily was founded in the city. In the 14th century and into the Renaissance period, Catania was one of Italy's most important cultural, artistic and political centres.

The city is well known for his history, culture, architecture and gastronomy. Its old town, on account of its spectacular baroque architecture, is a World Heritage Site, protected by UNESCO.

During the 3 days of the Symposium, in the afternoon, after the morning lectures, short trips will be planned to visit relevant artistic or scenic places. Organizers selected some places that are connected with the volcanic features of its territory.

At the moment the following visits are planned:

### **Katane – the Greek and Roman city**

*Exploring the ruins of the first settlements*

### **The city reconstruction after 1669 earthquake – the Catanese Baroque**

*A wonderful walk in the centre of the town.*

### **Historical Museum of the 1943 landing in Sicily & Cinema Museum**

*A full immersion experience in the time of World War II*

*Enjoy the set of movies setting in the Cinema*

### **Guided tour of Catania botanical gardens**

*Discover all the Etna's endemic species*

### **The caves of San Gregorio**

*The natural reserve is characterized by the presence of numerous lava flow caves in a relatively small area. The reserve was established in order to "preserve and protect the important*

*complex of lava flow caves colonized by cave fauna and bat colonies".*

Participation on some visits could be limited due to logistical reasons; entrance to museums or monuments is to be paid on site and an extra fee might be required to cover transport outside the town.

## TAORMINA AND ALCANTARA GORGES

All day excursion specially organized for accompanying members. Lunch is included.

Taormina is a hill town on the east coast of Sicily. The city is known for the Ancient Theatre of Taormina, an ancient Greek-Roman Theatre still in operation today. Near the theatre, the cliffs that descend to the sea form inlets with sandy beaches. A narrow strip of sand connects to the tiny Isola Bella, which is a natural reserve.

Unique in the Italian and European natural landscape, the Alcantara Gorges are one of the must-seen attractions of Sicily. Located about 20 km from Taormina, the gorges are real canyons made of black lava walls up to 50 metres high, in the typical shape of a prism that the rocks have taken during the cooling process. Within the grooves, the toning and crystal-clear waters of the river Alcantara run surrounded by an unspoiled landscape, with rare flora and fauna. The hidden position of the gorges has protected it; until the fifties in fact this site was completely unknown. The Alcantara Gorges have by now become a famous attraction even beyond national borders, and it is considered one of the most beautiful natural sites in Italy.





## SIRACUSE AND NOTO

All day excursion specially organized for accompanying members. Lunch is included.

Siracusa is a city on the Ionian coast of Sicily. It is known for the ruins of antiquity. The central Archaeological Park of Neapolis encloses the Roman amphitheatre, the Greek Theatre and the Ear of Dionysius, a cave carved into the limestone in the shape of a human ear. The Paolo Orsi Regional Archaeological Museum exhibits terracotta finds, portraits from the Roman period and scenes from the Old Testament carved in white marble.

Noto: This small town in the south-east was founded again in the 1700's. It is the heart and at the same time the starting point for a visit to the valley of the Sicilian Baroque. Its cathedral, also perfectly rebuilt after 10 years of hard work, was included in the UNESCO World Heritage Sites.

Piazza Armerina: The Villa del Casale recognized by UNESCO and included in the "World Heritage", with its 3500 square metres of mosaic floors famous throughout the world, hunting lodge of Massimiliano Ercoleo, is evidence of life in Roman times ...



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## **SYMPOSIUM CONTACTS**

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