

# The Vatnshellir Project - a first for Iceland

Árni B. Stefánsson

## Abstract

Vatnshellir ("Water Cave") in Snæfellsnes, Iceland, is a 205 m long lava cave/tube on three levels. The uppermost part (first level) is the "original" Vatnshellir, from where the farmers at Malarrif, a farm and a lighthouse, 3 km to the SSW, fetched water for their livestock. This part of the cave is partially collapsed, just under the surface and 35 m long.

The lower part is on two levels (floors) and in a surprisingly good condition. It is accessible through a skylight, or funnel, in the downfall basin of Vatnshellir. This part of the cave has been named Undirheimar (Underworld). The middle level (floor) is 12-20 m under the surface and about 100 m long. At the southern end of the middle level is a 12 m high vertical lavafall, leading into the 12 m deeper lowermost level. This part of the cave is about 32 m below the surface, almost horizontal and just over 70 m long. In December 2009 a platform was built over the entrance funnel leading into Undirheimar. In May 2010 an 8 m high spiral staircase was put up, leading into the 100 m long middle floor. This part of the cave was opened to the public on 15 June 2010 as "the first 20 vertical metres of the route to the centre of the earth" (alluding to the fact that Jules Verne placed the start of the journey in this vicinity in his 1864 novel, *Journey to the Centre of the Earth*). In October 2010 a second spiral staircase, now under construction, will provide access down to the lowermost level, to about -32 m. (Then there will be just 6,370 km to go!)

It is an interesting project; the first of its kind in Iceland. It is done with humility, wit, nature protection and service to the community in mind. The mayor of the community, a renowned architect, the head of the ruine (collapsed buildings due to earthquakes, etc) rescue school in Gufuskálar and his son, Lions, some members of the Rotary Club and the rescue squad at Hellissandur are taking part. Among other things some 28 cu metres, or 60 tons of rock, volcanic ash and soil has been hauled from a depth of 10-12 m. The Environmental Institute is financing about 1/3 of the cost, the platform over the funnel and the two spiral ladders, the rest is voluntary labour and donation. Vatnshellir is within the Snæfellsjökull National Park, the park manager and the management have wholeheartedly supported the project from the very beginning.

Four broken spatter stalagmites found in Vatnshellir have been repaired and put back. Vandalism to two of these, The Twins, was in fact the spark that led to the development of the cave into a tourist cave. Replicas of the 37 stalagmites (now all gone) that decorated the end of Borgarhellir in Hnappadalur, when found in 1957, were put up in a sheltered corner in the north end of the middle floor, to give people a feeling of how the great caves, a world that was, once looked.

## Just another cave / Is there something we can do?

### Introduction

This paper was not intended to be one - not in that sense. It is more like a story. It is the latest part of a never-ending story. It came about when Greg Middleton asked me to report what I was doing. You must excuse me talking in first person, it is not that I am so self-centred, (which I am!) or that I am trying to imply I did everything myself (which I did!) – it is just easier that way. I can hardly express my gratitude for the trust I have enjoyed, and for the unselfishness and courage of a great number of people taking decisions and lending a hand, that helped making the Vatnshellir adventure come true. The Vatnshellir project is done with service to nature and that given, service to the community, in mind.

The emphasis is on wit humour and children. On the children who inherit what we adults leave behind. Some of you may not know it, but latest research has shown that no one has left this earth alive, nor has been able to take anything along.

I have been interested in caves since I can remember. I came to love these natural wonders at a very young age and have spent a great deal of my life looking for lava caves, exploring them, thinking himself into them, trying to understand how they are formed. Although not widely distributed I have been writing about them for almost 30 years and through the years contemplating more and more, how on earth to preserve them. At a very young age I learned that the great caves of Hallmundarhraun were being damaged. I listened to how they were damaged. I felt the sorrow of Stefán, who found Stefánshellir in 1918. Stefán was heartbroken because of the fate of "his" once beautiful cave. "I don't want to go there anymore", he said, "everything has been broken and damaged". By that he meant the formations.

In 1957 reports came about a new cave find in Gullborgarhraun. Some of the caves were very well decorated. "It won't take them long to be damaged", the older people said. I was only eight years old at the time. They were wrong, it did take a long time. It took fifty years to clean out all the stalagmites in Borgarhellir and the other Gullborgarhraun caves.

This exception was because Guðmundur Albertsson, a local farmer, who found the caves as a young man and Sigurður Þórarinnsson, (a geologist renowned for introducing tephrochronology) did everything in their power, except to gate, to protect the caves. Icelandic lava caves are usually cleaned out in a much shorter time.

I have been wondering all my life why this happens to be so. I have spent a great deal of time thinking about how to open people's eyes, how to reach a consensus on what is needed, how to get public or private support and funding for the necessary intervention.

Of course we all know the cave environment is sensitive and that people damage caves. Minimal impact caving codes are intended to minimise the impact of human visits. Humans have to restrain themselves, or restraints have to be put on humans to minimise damage. As the humans are the cause, human nature has to be studied to understand damage.

There are several reasons for the damage to Icelandic lava caves:

- Open and sparsely inhabited country;
- More or less free public access to land and caves;
- Icelanders are independent, anti-authority and don't like to follow rules;
- The lava caves are vulnerable, relatively easy to access, once the location is known and for the most part horizontal;
- For the most part no special equipment or techniques are needed;
- The formations of the lava caves are almost invariably small and fragile, prone to accidental breakage, removable and/or within reach of curious or collecting hands.

I do not see damage as acceptable; never did. Once found, caves and their inventory need to be documented and classified. Access to the sensitive caves, or cave sections must be restricted and some caves must be closed to practically all traffic. To prevent damage compromises have sometimes to be made. This paper reports about ongoing damage to Stefánshellir, Víðgelmir and Vatnshellir, and tells the story about a compromise.

### **Stefánshellir**

Stefánshellir was found (in the modern era) and explored in 1919. Fragile formations were soon severely damaged and most of the larger stalagmites more or less removed. In 1957 only a few "minors" were left, and they are now almost totally gone. The study on Stefánshellir is by no means exhaustive.

On four trips in 2008-09, I, my wife Gunnhildur, grandchildren and a few friends collected some 25-30 kg of thrash. Mostly old lighting gear, like sticks, cloth, wire, oil cans, broken bottles, flashbulbs, candles and wax. We also found newer remains like chewing gum, cigarette filters, chocolate wraps and carbide dumps.

In one 60 m section (1/25 of the total length of the cave), we counted the bases of 76 broken stalagmites. The cave roof was, according to Stefán (who found the cave), quite decorated in places with lava straws and helictites, the remnants of which can be found lying between lava ropes on the floor. Only sad remnants hang where the ceiling is at the highest, 4+ m. In the downflow section we found the bases of five, up to 60 cm wide dribble spires I vaguely remember having seen in 1963. The highest was as far as I remember, about 60 cm high. No photographs of the formations of Stefánshellir exist.

### **Víðgelmir history**

Víðgelmir was first explored by Matthías Þórðarson, the manager of the National Museum in Iceland, in 1909. In an article in *Skirnir* (Þórðarson 1910) he describes the curious artwork of nature, asks the readers to take care not to do any damage, tells about his intention to have the cave declared a national monument and mentions if damage is done the cave should be closed. Worthy as this intention was, the cave never was declared a national monument. Between 1957 and 1963 (when I was aged 8-14) I heard people talking about increasing damage. Some said the cave should be closed but nothing was done.

In December 1972, just before an ice plug closed the cave, Mills & Wood (1972) (also in a letter to the Institute of Natural History in Iceland) recommend some sort of conservation measure be taken to preserve this unique cave. In the fall of 1991 the ice plug opened and the cave became accessible again. Shortly after the Icelandic Speleological Society gated the cave and subsequently handed the keys over to the owners, the farmers at Fljótstunga (Jónsson & Hróarsson 1991). I criticised leaving the responsibility solely with the owners who, incidentally, hardly knew the cave. At the same time I recommended that a work group be established within the ISS to help the owners take care of Víðgelmir (Stefánsson 1991). No contact was established to ensure the preservation of the cave and no consensus was reached on a work group. Access has been limited to guided parties and "responsible" groups. When we surveyed Víðgelmir in 1995/1996 I fitted several pieces of "almost fitting" fragments of broken stalagmites together and re-erected them on former bases (Stefánsson 1995).

## Víðgelmir count

In December 2009, we inspected a 400-500 m section, downflow from the gate and identified the bases of 374 broken stalagmites. Almost no fragments, or remains, could be seen and not a single remaining stalagmite could be found. From this we estimated that over 1000 stalagmites must have been broken and removed from the cave.

In July 2010 we finished the count. In all, 1093 stalagmites have been broken and most of the fragments, around 90%, have been removed. Almost all large stalagmites have been removed and the few remaining are in the innermost 200 metres of the cave; the largest high on the walls. Of the 20 stalagmites I had repaired in 1995, seven had been broken again. The remnants of one had been removed.

527 stalagmites over 5 cm long are remaining in the inner half of the cave. Most of them are small, average height 12 cm, max. height about 40 cm. Average height of all stalagmites over 5 cm originally in the cave was probably a little over 20 cm.

The soda straws and helictites have been severely damaged, the accessible ones hanging from shelves, were damaged by humans before 1970. The ones out of reach, were blown away by a shock wave, created by a huge collapse in the innermost section of the cave in the early seventies.

## Vatnshellir, introduction

At the 13th International Symposium on Vulcanospeleology on Jeju Island in Korea I reported about ongoing damage to four lava caves in Iceland (Stefánsson 2008; Stefánsson & Stefánsson 2008). One of these caves was Vatnshellir. Vatnshellir is one of the oldest lava caves in Iceland, 8-10,000 years old. The Twins, two 60-70 cm high stalagmites (Fig. 1) were vandalised around the turn of the century. When we found the remains of The Twins (Fig. 2) and three fragments of one of the largest stalagmites in an Icelandic lava cave (Fig. 3), in 2007, I could not keep



Fig 1. The Twins, prior to being vandalised.



Fig. 2. The broken pieces of The Twins, as found in Vatnshellir in 2007.

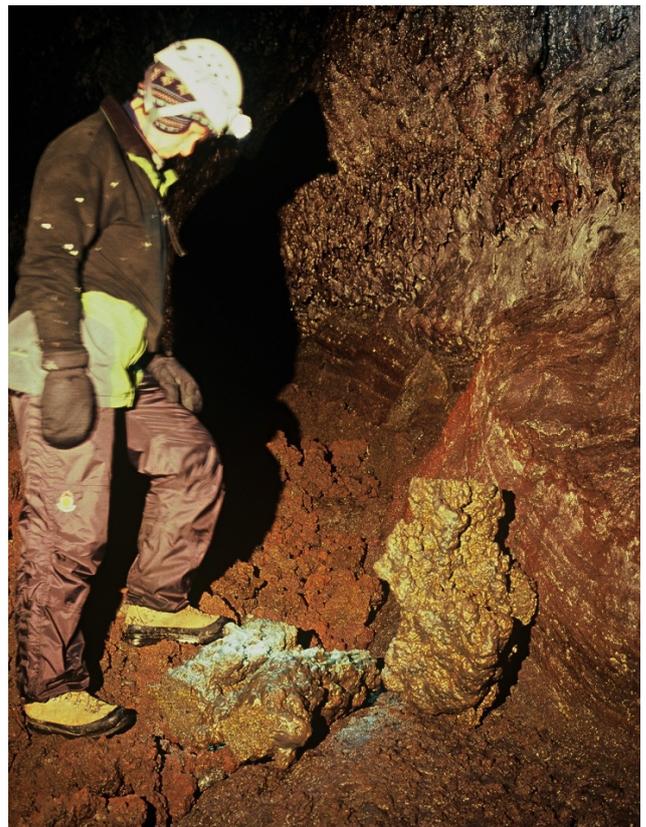


Fig. 3. Fragments of The Thumb, one of the largest lava stalagmites known from an Icelandic cave.

quiet and sent a report to the Environmental Institute and Environmental Ministry, with the suggestion, or demand, the cave be closed. In light of how interesting the cave is, I also suggested the cave be developed into a tourist cave. I offered to lead the job and also offered to restore and reinstall the broken stalagmites.

## April 2007-January 2009

I decided to wait for things to evolve and hid the fragments of the stalagmites in the cave in April 2007. Late in 2007 the Snæfellsjökull National Park manager decided to support the idea of gating the cave and making it a tourist cave. In January 2008 a renowned architect, Hjörleifur Stefánsson, stepped aboard and agreed to design the necessary structures for free. In May 2008 a meeting was held with the park

staff and some staff members expressed their concern about human intervention. Somehow some “innocent” people tend to think human behaviour is changing for the better and in their innocence are unable to foresee the inevitable. In November I gave a Natural History Society lecture on the conservation and preservation of lava caves, based on the presentations in Korea two months earlier.

An application for an equilibrium grant in the field of tourism was turned down in February 2009.

### January 2009-August 2010

In January the Environmental Institute decided to put some money into Vatnshellir. The money was limited, but the grant meant the institute accepted something needed to be done. Which was in my mind the main thing. It was clear that the job would largely have to be done on a voluntary basis and a team was needed. In March 2009 the Snæfellsjökull National Park and the Lions Club at Hellissandur invited me to give a lecture on lava caves and preservation. A little later the park manager told me that Þór Magnússon, the chairman of Lions and the householder of the Ruine Rescue School at Gufuskálar, a very able man, was interested and wanted to help. In May I was notified the allocated funds had to be spent before the end of the year. In June an application to the Pálmi in Hagkaup Nature Preservation Fund was turned down.

There was not much use waiting. In July I surveyed the cave with my wife Gunnhildur, with an emphasis on the funnel, the entrance to the lower part of the cave (Fig. 4). Hjörleifur finished his first proposal in the

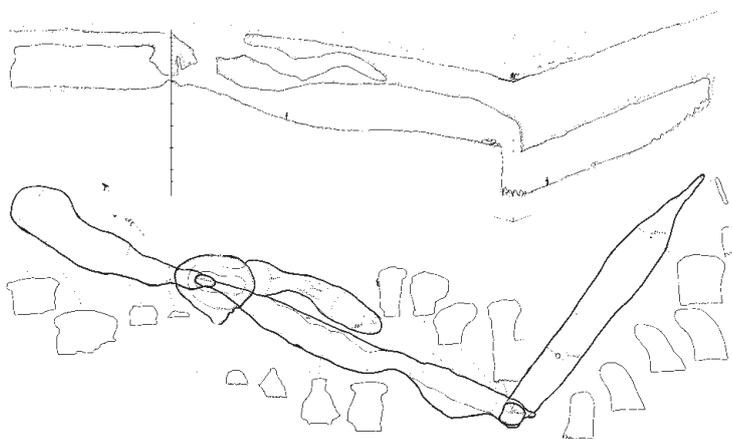


Fig. 4. The Stefánsson survey of Vatnshellir, July 2009

beginning of August. Late August we introduced our plan to the park manager, some of the park staff and most importantly, to the then uninterested mayor of Snæfellsbær, Kristinn Jónasson, who had reluctantly decided to come along. Upon entering the cave he fell for it and got kind of jolly and enthusiastic. I did not realise it at the time, but we had hit the jackpot.

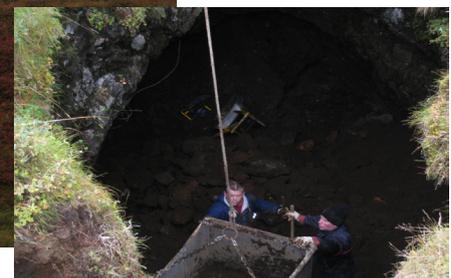
### September 2009-December 2009

The plans were accepted in late September. The Lions and other community groups, with Kristinn and Þór leading, offered to help. Hjörleifur not only designed the structures, he also became an important part of the manual labour team. Svanur and Tómar, members of Lions and owners of a ground work [earth-moving] firm, were just as delighted as Hjörleifur when they were told we had no money. The team worked like an old crew from the very beginning. It had a free mind of its own, initiative and a strangely positive mentality.



Fig. 5. Removal of material from the entrance pit of Vatnshellir.

According to my original plans it would be enough to remove about 3 cu meters of debris from the entrance, i.e., from the bottom



of the funnel (pit) and I had intended to do it manually. The group mind decided to do it otherwise. A hauling system was constructed on a digger and landing vessel used to haul the material out (Fig. 5). In all 28 cu meters, or about 60 tons of rocks (some of them huge), ash, and debris were manually dug up, put in the landing vessel and hauled out of the entrance, from a depth of 10-12 meters.

At the beginning of November we got an extremely reasonable bid, based on goodwill, for a supporting frame and for an eight metre high spiral staircase. However reasonable the bid was, it was double the funds available. I accepted but told the firm half the cost would have to wait for our 2010 funding.

In the light of how things evolved the Environmental Institute decided to double

the 2009 allowance. Snæfellsbær [local council] decided to pay the material cost of the stairs down into the south passage. Lions and the other benevolent from Snæfellsbær built the stairs in November-December. Hjörleifur was very flexible and regularly altered his plans to suit the environment and the group mind. Late in October Þór, with two others, set up a working platform. Subsequently Hjörleifur took measurements for the supporting frame. On 21st November the carrying structure was put up and we finished pouring concrete into the moulds for the supporting pillars. During the next few days we had frost down to  $-10^{\circ}\text{C}$  but the concrete held out. At the end of November-beginning of December we had northerly gale winds with a heavy snowstorm. An underpressure was created in the cave and it sucked the snow in like a vacuum cleaner. The 8 m deep entrance was filled with snow and the working platform collapsed under tons of snow. The carrying structure however held out. Two weeks later, after an intense thaw period, the group managed, just before Christmas, to cover the carrying structure with a 22 mm watertight plywood and tarred felt.

### Stalagmites, Sept. 2009-May 2010

Because of the immense damage done to stalagmites and other formations in Icelandic lava caves I have often reflected on various methods of remaking stalagmites and reinstalling them into damaged caves. In September 2009 it came to my mind that I should try to make casts.

Parallel to the work in Snæfellsnes I collected The Twins and the large stalagmite, The Thumb, from the hide in Vatnshellir, got “back” formations I had known about since 1991, collected from cave looters in 1967. I also took out three stalagmites in my own possession. I found them broken in a cave in 1966 and collected them with the reflection: “I better take them before someone else does”.

Late September I had two rather expensive silicone moulds made from two of the stalagmites I found in 1966 and subsequently experimented with casting materials and colours. By December I had found suitable materials and colour composition. Then I set out to reconstruct the 37 stalagmites that decorated the end of Borgarhellir in Hnappadalur when found in 1957 (Stefánsson 2008; Stefánsson & Stefánsson 2008). To be able to do that I repaired the over two dozen, for the most part broken and fragmented stalagmites retained in 1967, with epoxy glues mixed with powder colours. Subsequently I made moulds of seven of these. At the end of January I had managed to produce around 70 stalagmites, 39 of which were intended for Borgarhellir (Figs 6a, 6b). Reflecting on the “treatment” of Víðgelmir, inspected a month



Fig. 6a. Some original (repaired) lava stalagmites, left, and Fig. 6b, some of the replicas made from them, right. before, I changed my mind. Rather than put them up in Borgarhellir, I decided to put them up in a secluded corner in Vatnshellir.

In February I reconstructed The Twins from the collected fragments as well as I could, with the help of enlargements of a photograph I had taken in 1996 (Fig. 7).

The Twins and the 37 replicas were set up in Vatnshellir in May. The three fragments of The Thumb were too heavy for removal from the cave and were repaired in situ. The pieces were drilled through, the bottom one with a 60 cm long, 18 mm drill and all three with



Fig. 7. The (reconstructed) Twins (cf. Fig. 2.)

a 80 cm long, 14 mm drill. A 50 cm long galvanized 16 mm iron rod was used to fasten the bottom piece to the ground and two 100 cm 12 mm rust-free rods were used to fasten the pieces together. A two component Hilti epoxy glue was used to fasten the rods and fit the pieces together.

### January 2010-June 2010

In January we applied for a generous grant from the Icelandic Tourist Board. We were pretty sure we would get it, but in March we were turned down. Apart from the entrance pit being almost totally filled with snow, (Fig. 8) this was the best thing that could have happened. The task was now even more impossible than when we started. Impossibilities are just challenges. The prerequisite is to be stupid enough not to realise the impossibility.



Fig. 8. The entrance depression partially filled with snow and the working platform destroyed — a minor setback.

In late February I managed, with Þórs help, to finish the survey Gunnhildur and I had begun the summer before. While we were surveying the deep part of the cave, it so impressed us that we decided not to sleep or rest until we had secured the finance for a second spiral staircase, leading down there. Subsequently, early March, I managed to finish a three dimensional map with Snæfellsjökull in the background.

The map was intended to be the basis of an information sign. The map, the argument “the group has done such a good job, it deserves some more”, the fact the Tourist Board had turned us down, the fact Þór offered to lead setting up the spiral staircase and Kristin’s support, lead the Environmental Institute in late March to take the

gallant decision to finance the second spiral staircase. Having the financial situation in Iceland at this time in mind, this was by no means natural, or self evident.

In late March the work group in Snæfellsbær launched an attack on the snow in the pit and managed to dig 5 m down, through snow and timber and free the plinth of the spiral staircase. In late April the team spirit changed its mind about the stairs into the downfall. Instead of wooden stairs they made rock stairs from large 20-30 cm thick pieces from lava in the vicinity. A very large rock 2m x 1.5m x 0.6 m, misplaced in the downfall, got the name ‘stubborn’, as it was being manually put in place. The attack on the snow in March enabled us to put the spiral ladder down on 13th May. The blacksmiths at Stálprýði gave their work and the 200 km transport. Late May-beginning of June Hjörleifur and Sæmundur finished the platform (Fig. 9) while I finished “downstairs”.



Fig. 9. Work on the platform advances and the cover over the spiral staircase is in place.

On 15th June 2010 the Preservation Plan for the Snæfellsjökull National Park was signed in the entrance of Vatnshellir (Fig. 10) and the cave was formally opened to the public.



Fig. 10. The Minister for Environment signs the preservation agreement for Snæfellsjökull National Park at the official opening of the cave.

## Rough compilation of the voluntary work

(Minimal numbers)

Work	966 hrs
Driving	198 hrs
Driving	10,950 km
Towing truck and digger	53 hrs
Transport truck	46 hrs
Tractor digger	26 hrs
Motorsaw	16 hrs
Generator	130 hrs
Various electrical tools	xyz hrs

N.B. Architectural work, work by ÁBS April 2007-September 2009, stalagmite repair and administrative work are not included.

## Postscript, Late October 2010

During the first summer over 1000 guests have visited Vatnshellir. Entrance fee for adults was about US \$9 and free for children. Trips were run two days a week except one week in August when the cave was open every day. People had to book in advance. Most who did so were able to enjoy the cave, which, according to the park staff everybody did. Icelanders are not especially prone to planning their holidays in advance. Therefore some were quite disappointed. The summer of 2009 was regarded as a test summer. The cave and the park staff more or less passed the test. Next summer more staff will be needed.

The second spiral staircase, 12 m high, was set up during the first two weekends in October 2010. The entrance bridge to the spiral staircase was then under construction. In the middle of October it was decided to change the wooden exit stairs because of the creosote smell. New stairs made of galvanised steel are under construction and will be put up in the beginning of 2011.

## References

- Jónsson, S.S. & Hróarsson, B. 1991 Opnun Víðgelmis, *Surtur*, 1991: 39-42.
- Mills, M.T. & Wood, C. 1972 *Shepton Mallet C.C. Journal*, Series 5 no. 4 autumn 1972.
- Þórðarson, Matthías 1910. Tveir hellar í Hallmundarhrauni, *Skírnir 1910*, pp. 330-351.
- Stefánsson, Á.B. 1991 Um lokun Víðgelmis, *Surtur*, 1991: 43-44.
- Stefánsson, Á.B. 1995 Varðveisla hraunhelle, *Surtur*, 1995: 27-36.
- Stefánsson, Á.B. & Stefánsson, G. 2008 About the preservation and conservation of sensitive formations in Icelandic lava caves. *Proceedings of the 13th International Symposium on Vulcanospeleology 1-5 Sept 2008*, pp. 53-64.
- Stefánsson, Á.B. 2008 Um verndun og varðveislu íslenskra hraunhella [About the preservation and conservation of Icelandic lava caves], *Náttúrufræðingurinn [Journal of the Icelandic Society of Natural History]*, 76(3-4): 121-131.

*Vatnshellir map, May 2010 - with Snæfellsjökull ('Snow Mountain') behind — where Jules Verne located his entrance for the "Journey to the Centre of the Earth".*

