

# *BCA Newsletter No 31*

## *November 2017*

Edited by David Rose



### *Editorial*

*This is my first issue as editor, and my first job is to thank Robin Weare for all the hard work he performed in this role as my predecessor.*

*Some members will know me as a caver of very long standing: I enjoyed my first trip (Swildon's Hole) in 1969, when I was 10, and I'm now 58. However, I'm still keen and active. I'm currently working on a book for a mainstream publisher about caving, *The World Beneath the World*, and in pursuit of researching it I've caved during 2017 in Mexico, Mulu and (twice) in Riesending, the longest and deepest cave in Germany, as well as on Mendip, in South Wales, and the Yorkshire Dales. My hope is that while cavers will find the book interesting, it will also persuade a wider public why caving is such a fantastic and absorbing activity. With my friend Richard Gregson I am co-author of a previous book, *Beneath the Mountains*, which describes Oxford University Cave Club expeditions to the Picos de Europa 1979 – 86.*

*Being generally quite busy as a family man and working journalist, I intend to keep the issues brief. The BCA newsletter should not try to compete with other caving news sources, such as *Descent*, *UKCaving.com*, *Darknessbelow.co.uk* and club and regional council newsletters. In the hope that it will stimulate debate and make the BCA more accessible to 'ordinary' cavers, I intend to post a link to each issue on the *UKCaving.com* forum.*

### **Chairman's Piece**

First, I should like to thank Dave Rose very much indeed for taking over as Editor of this newsletter, but of course it cannot possibly go without mentioning the enormous amount of work that Robin Weare has done over the last few years. Robin says in his and one and only editorial his challenge was to prove that a BCA newsletter was viable, and I am sure that Robin has done that very well. We must however, find a way of distributing it to more of our membership. Please can people be encouraged to let us communicate with their email addresses. Thank you very much indeed Robin for your help and vision.

Moving on to the current situation. Clearly, Dave Rose's treatment of the newsletter was going to be different and I welcome a change, and mentioning some controversy. A lot is going on within BCA and there is a period of great opportunity. I think the recent ballot shows our membership wants CROW to apply to caving, and indeed, whether we like it or not. I am sure it will be agreed by the powers that be it does apply to caves in England and Wales the same as it already applies in Scotland. However, we want to move our efforts from continuing and finalising the CROW campaign, to in addition doing an even more substantial campaign on cave conservation and access. Once CROW has been shown to apply to caves there is a legal way of controlling access to fragile cave sites called Section 26 of the

CROW Act. One of the things we must do is help to set this up so it is a viable tool to help with conservation.

There are a number of new initiatives within BCA. I have already talked about CROW, but in addition there is the reorganisation of the training scheme and a review of the constitution. Overall, and by far the most important thing we need to do with BCA is to bring in more willing and capable people to help with the running of the organisation. I produced some notes recently on why I think we need a national organisation. I've reproduced these in this newsletter and emphasise, to fulfil our aims and objectives we need people.

Tim Allen points out in his CROW Act access campaign, we need to look outwards, promote caving and see if we can change old fashioned attitudes by the general public and the authorities. I have recently done a lecture in London on our recent world-wide laser scanning project and obviously the caves were huge; the audience could not believe such places existed, they had no idea about caves and caving.

Which brings me on to my final points, the Kendal Film Festival as mentioned here is a definite step towards presenting caving in a good light to the general public. In addition, the Royal Geographical Society event is aimed very much at a similar goal. There is a fantastic line up of speakers and subjects at both events, a total of over 30 speakers in London and all British. The RGS should be a most enjoyable weekend and I hope British cavers will get behind it and showcase to the doubting, disbelieving general public that caves, caving, cave exploration and cave science are worthwhile endeavours.

**Andy Eavis**

## **BCA constitution ballot result**

At the end of September, the results came in of the recent membership ballot, in which the two 'houses' of the BCA voted whether to approve four proposed changes to the constitution.

Arguably the most important was that which removed a sentence (item 4.6) saying that the BCA accepted landowners' rights to control or restrict access to caves on their land. Some had argued that this effectively nullified the ongoing BCA campaign to get recognition for what we believe is a legal right of access to designated open access land under the Countryside and Rights of Way (CROW) Act 2000. This passed by an enormous majority: 88 per cent of individual members and 85 per cent of groups supported the change. Tim Allen, the BCA CROW liaison officer, commented: 'This result sends a broader message to council beyond that of these relatively small changes to the constitution, and removes the sentence used by some to try and obstruct the CROW campaign from being effective. I hope all on council and the exec will accept this decision and work towards achieving what the membership clearly want.'

The other three changes, which essentially modernise the BCA voting process and make it easier for future ballots to be carried out online, passed by even bigger margins, well over 90 per cent. Many thanks to Bob Mehew and David Cooke for their enormous efforts in making this vote possible.

## **Kendal Mountain Festival**

For several years, one of the most popular events at the annual Kendal Mountain Festival has been the Petzl Underground session, which in the past has taken place on the Saturday night of the long festival weekend in the smallest of its three venues, the Box theatre.

This year the session is being run by Tim Allen, aka the BCA CROW liaison officer and Badlad, proprietor of UKCaving.com. He is also an indefatigable caving activist and a key figure in recent discoveries by the 'Leck Fell chums' in the Yorkshire Dales. It is moving to the festival's Friday evening, 16<sup>th</sup> November, and to its biggest venue, the Kendal Town Hall. Unlike the Box, the Town Hall serves beer.

Of further exceptional note will be the world premier of multi-award winning director Paul Diffley's stunning feature length film about new discoveries in the Picos, The Ario Dream.

Tickets for the underground session are still available at

[http://www.mountainfest.co.uk/tickets/buy/597527?spektrix\\_bounce=true](http://www.mountainfest.co.uk/tickets/buy/597527?spektrix_bounce=true)

The session programme includes a showcase of the work in British caves by three cave photographers, Mark Burkey, Stu Gardiner and Nicky Bayley, and a presentation by Matt Kirby and Frank Pearson on the long and extraordinary story of cave exploration in Mulu.

The film premier is already sold out, but tickets are still available for special second screening – partly in aid of the Cave Rescue Organisation – on the Sunday morning:

<http://www.mountainfest.co.uk/programme/event/the-ario-dream-special-film-screening>

## **Royal Geographical Society event: the golden age of British caving**

A second tremendous public event takes place within the august confines of the Royal Geographical Society in London over the long weekend 1 – 4 December. The weekend celebrates the Golden Age of Cave Exploration and cave science, looking at how British cavers have led the way in discovering more caves than any other nation over the last 50 years. There will be talks from world-renowned experts on the latest developments being made in cave science.

The Friday night will commence the weekend at 7pm, with lectures by leading cave scientists and some of the most experienced cave explorers in the world. Participants will hear talks on a range of speleological discoveries – including probably the largest known cave passage in the world in Vietnam. Saturday and Sunday will be full days from 9am till 6pm covering much of the best cave science and cave exploration that has occurred over the last 50-year period.

In addition, there will be a large screen in the café bar area continuously showing cave related films, many will have not been seen before and it will be introduced by possibly the world's

greatest cave film maker Sid Perou. The weekend will conclude on Monday evening with a lecture from veteran cave explorer and much acclaimed author Tony Waltham discussing how British explorers have pioneered many of the deepest, longest and largest caves in the world. Tony will be joined by Tim Atkinson, one of Britain's most renowned cave scientists, who will talk about the fantastic contribution to science that British Speleologists have made, and the critical impact it's had on the world's knowledge and appreciation of climate change. Fellow Brit, Hazel Barton who currently works in California for NASA, will conclude with a talk on cave bacteria and the essential and amazing role it plays in cave formation.

A café bar will be open all day. Tickets will be available on the door or in advance on Eventbrite ([www.eventbrite.co.uk](http://www.eventbrite.co.uk)). Tickets for the Friday lecture cost £10, and £5 for Saturday and £5 for Sunday. The RGS is in Kensington – in easy reach of central London railway stations. Please support this superb occasion.

For further information look on the BCA website: [www.british-caving.org.uk](http://www.british-caving.org.uk)

There will also be a grand prize draw. All profits go to the Ghar Parau Foundation. First prize is a free trip for two to Mulu, including flights and five days accommodation.

## **Andy Eavis to bow out as BCA chair**

Reporting to the last BCA council meeting early in October, Andy Eavis dropped a bombshell: that after two three-year terms, he intends to step down next year.

Few people have been active cavers for as long as Andy, and few people, if any, have ever made such an immense contribution to our sport, both in terms of exploration – he has, literally, hundreds of kilometres of new passage to his name – and, latterly, organisation. Andy was central to opening up two world-class caving regions for British exploration, Mulu and China. And as I can attest, having caved with him this year in Mexico and Mulu, and even shared a tent, he has done it all with warmth, commitment, and always excellent humour.

Andy says he always considered two three year terms enough for anyone: hard to disagree. But needless to say, his are big shoes to fill, and members need to start to give careful thought to who might be suitable – and prepared – to succeed him. He will be sorely missed.

Within another year, the BCA is going to need a new secretary, too – the acting secretary, Nick Williams, who took over from Simon Brooks, has indicated in his report to the BCA council that he will not be able to continue beyond what would have been the end of Simon's term at the 2019 AGM.

## **New entrance to Ogof Draenen**

No cave in the country has attracted quite so much controversy over access and management as Ogof Draenen, which at roughly 70km is the longest system in Wales, with potential for significant further enlargement. The Pwll Du Cave Management Group (PDCMG), an access control body run by cavers, was set up in 1994 to manage cave access with the consent of the

then landowner, the Coal Authority. This included members of Oxford University Cave Club, an institution with which your editor has long been associated.

Some of the cave's explorers, including the OUCC contingent, have tried for many years to maintain a 'single entrance' policy, in order to preserve the adventurous nature of trips far into Draenen. Others, equally vehemently, disagree. The Nunnery, a second Ogof Draenen entrance, was discovered in the late 1990s, and capped by the PDCMG. Shortly afterwards, the land containing both the original entrance and the Nunnery was sold to Pwll Du Conservation Ltd. PDCMG then contracted an access agreement to the original entrance only with this new landowner.

In 2009, the focus for what has become an ugly conflict among cavers shifted to another new entrance, Drws Cefn (Welsh for 'back door'). This small cave was first discovered during the Coal Authority era, but that year it was connected to the main system via a series of crawls. Using Drws can cut an hour or more travel from the original entrance, so reducing the time needed for pushing trips in the cave's far reaches and making the eastern part of the system more amenable to shorter visits, such as local cavers might wish to conduct for midweek digging projects.

Unlike the original Draenen entrance, Drws Cefn happens to lie on CROW Act access land. It has been open and unlocked since 2010 – so rendering the single entrance policy, for the time being, null and void.

In 2015, the landowning company submitted a bat conservation licence application to Natural Resources Wales to block Drws Cefn permanently with a large concrete and steel structure in the entrance shaft. This was supported by the PDCMG, but many Welsh cavers resented the idea, not least because of the principle of open CROW Act access. The ensuing row was bitter. Eventually, NRW 'withdrew' the licence application for the barrier on the grounds that the cave bats were not at risk from cavers. NRW indicated that a 'development' class of licence would be needed here instead, since there was no bat conservation issue to address.

Last year, PDCMG developed a second Drws Cefn closure plan. This would have involved a fixed round scaffold pole across the narrow entrance crawl. NRW objected to this on the grounds that vandalism by cavers opposed to closing Drws might have a negative impact on the bats. Drws stayed open.

Three very recent developments suggest this long saga may be nearing some kind of resolution. The first is that the PDCMG has come up with yet another proposal to block Drws Cefn, this time with an external grille over the entrance shaft that would stop cavers, but not bats. Its design detail has yet to be submitted to NRW for comment or approval. However, the prospects of this being enacted may have been reduced by the second development - changes of personnel on the PDCMG committee. Some of its members have stood down and, in informal conversations with your correspondent, one or two of their replacements have suggested they may not be so strongly in favour of the single entrance policy as their predecessors were. Moreover, some of the Welsh cavers most strongly opposed to blocking Drws have indicated that if attempts were made to make the grille a reality, they would take legal action. They say they believe the law would be strongly on their side.

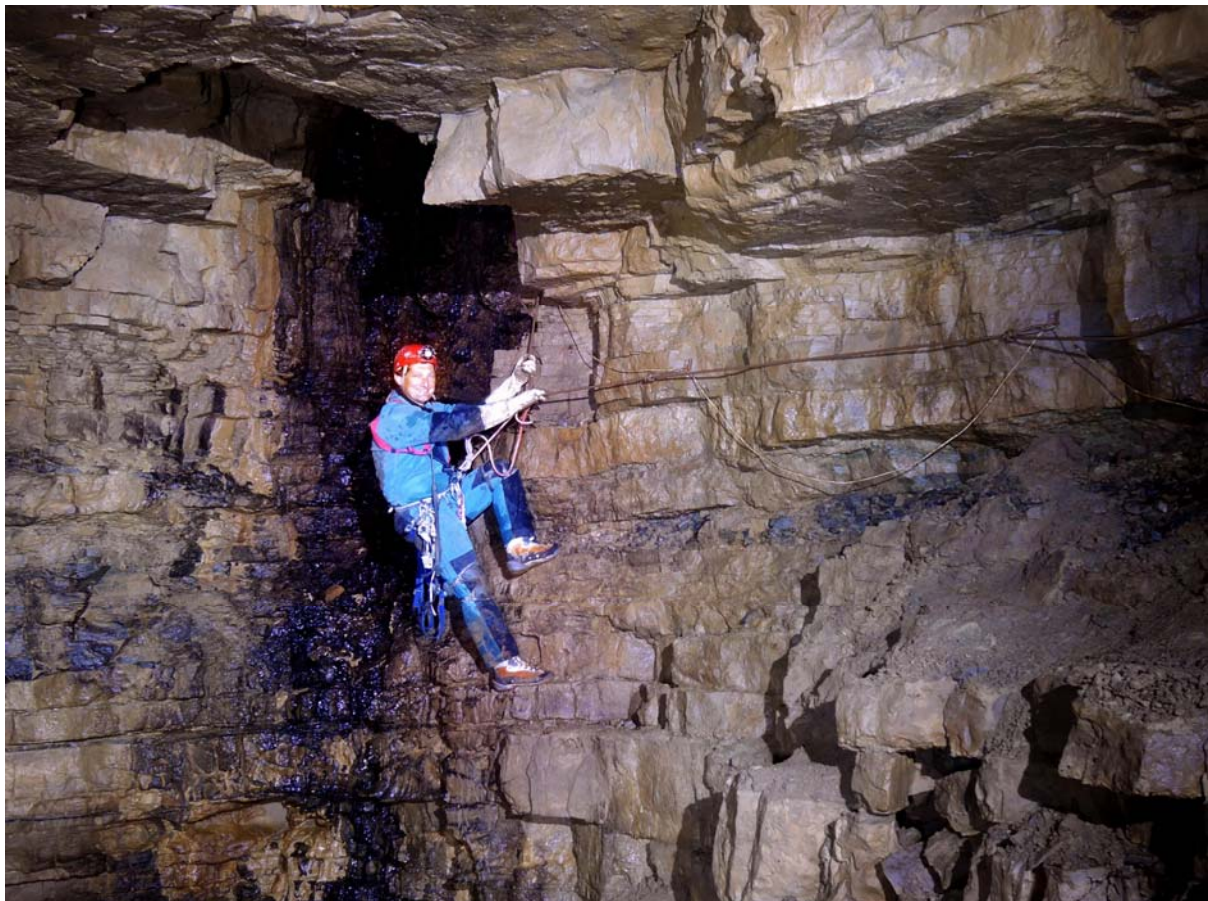
It is to be hoped that this will not be necessary: cavers fighting other cavers, the landowner or NRW in the courts would not be a pretty sight. Complicating matters still further, there is

potential for even more entrances, because Ogof Draenen comes very close to the surface in a number of other places.

In any event, the third recent development may well render all this redundant. A little over a year ago, at least the fourth Draenen entrance was discovered by climbing avens inside the cave. Kept secret at the time, news of this has gradually filtered into the public domain. Also on CROW Access Land, Twll Du ('black hole' in Welsh) joins the main cave some way further into the mountain than Drws Cefn does. I went down the new entrance recently and it seemed to me to be the best and safest Draenen entrance yet found. Unlike the original, it is not flood prone, and does not rely on extensive shoring through a potentially dangerous boulder choke. Unlike Drws Cefn, it does not involve an unpleasant, tight crawl. It consists of a series of short, spacious drops rigged with fixed ladders, followed by a roped traverse around the lip of a pitch and then a comfortable free-hanging descent on rope of about 12 metres. This does require visitors to be competent in SRT.

How the landowner and the reconstituted PDCMG decide to handle this situation remains to be seen. But it does look like a potential game-changer.

Here are three photos taken near Twll Du – yours truly on the traverse, one of the fixed ladders, and the SRT pitch. They were taken by Ed Waters and Martyn Farr.









## **CHECC 2017**

The Council of Higher Education Caving Clubs has played a big part in recent years in attracting fresh new blood to our sport. This year's weekend bash – at which, I am told, both good trips and a degree of what is known among the young as 'partying' are likely to take place – will be held at Dalesbridge 24 – 26 November. Full details can be obtained by following the links on this post on UKCaving.

<https://ukcaving.com/board/index.php?topic=22637.0;topicseen>

## **2018 BCA AGM**

Next year's BCA AGM, at which all members will be welcome, is to take place in the Forest of Dean on 3 June – a week earlier than originally planned. Further details nearer the time.

## **BCA CROW Act access campaign**

As noted above, the successful recent ballot on constitutional changes removes a small roadblock which had hampered the BCA campaign to get the government and associated quangos such as Natural England and Natural Resources Wales to accept that the CROW Act does apply to caving.

The following is an edited version of CROW liaison officer Tim Allen's report to the October meeting of the BCA council:

Several of my reports over the last years have asked questions which are as yet unanswered. Put most simply – where do we go from here? We have studied, analysed and argued over the issues surrounding CROW and caving and it is obvious that there are two views. There is the considered view that the CROW Act already covers caving and this was the intention of parliament. This view is supported by many cavers, outdoor organisations, and individual MPs, and is backed up by the formal opinion of Dinah Rose QC [my sister – Ed].

By contrast Defra/NE take the view that the Act does not apply to caving, but only for access to the entrance and a descent of the cave to an ill-defined point where the Act no longer applies. Defra/NE have clearly stated that although this is their view, it is not definitive, and so only a court can decide. Are we to continue with this impasse or is there anything to be done to bring about a decisive answer?

The first question we need to answer is - who needs to prove their case? BCA should support the view that CROW already applies to caving and leave it to others to prove that it does not. It is, after all, difficult to campaign for a view which you then imply that you do not hold. Alternatively, BCA could support some form of court action (Judicial Review for example) to determine the matter beyond doubt. This should be discussed at council and amongst members to determine our direction.

Since my last report I have continued a dialogue with Defra/NE. It has become clear that if they conceded our point they would have to retract a written parliamentary answer, and so

they stick with their original position, however implausible and wrong it is. This reinforces the notion that the civil service (government) view is unlikely to be changed, whatever the strength of the argument put forward. The evidence suggests that the lead civil servant, Richard Hepburn, doesn't understand caving, doesn't like the sound of caving and will not change his view on caving unless he is forced to by outside forces he cannot argue with.

I would like to take this opportunity to congratulate Stuart France and the CCC for the work they have done towards the Welsh Government consultation on recreational access and management of natural resources. The detailed submission was well drafted and took into consideration both the demand for improvement and legal clarity on access and the concerns regarding safety and conservation. I had no hesitation in personally supporting the document and am very pleased that BCA did likewise. This measured and well-argued approach is surely the best way forward. The CCC have certainly tried to encourage individual responses from cavers and I hope that has borne fruit in sufficient numbers to have a positive effect.

An example where positive responses bear fruit is the Yorkshire Dales National Park Authority consultation on a new management plan. Cavers responded to the questionnaire, not in huge numbers but enough to have an effect on the result. So successful was this that in response to the question 'what do you like best about the NP', caves featured fifth on the list! This will certainly have the effect of keeping caves and caving on the agenda. For decades cavers have kept things low key, out of the public eye, 'underground' if you like. I am not sure this has done us much good. The perception of our sport is poor amongst the public and non-caving authorities alike. If the public don't like us we are not going to compete with other activities and the authorities' interest in caving will be trivial, and they are unlikely to shift on improving access.

In conclusion, let's look outwards more, promoting caving, and see if we can change old fashion attitudes. This should help the CRoW campaign a lot.

## **Welcome Claire Peacey**

The BCA has an essential new staff member in the shape of administrative assistant Claire Peacey. Welcome, Claire, and wishing you all the best in the job.

## Latest Ghar Parau grants

Phil Rowsell writes to say that the Ghar Parau Foundation met on the 1st October 2017 to consider five applications received for 2017 Round 2. The allocations and the committee feedback are given in the following table:

Expedition	Expedition Name	Feedback	BCA	GPF	China Caves	Alex Pitcher	Total
<b>GPF2017 b-001</b>	Matienzo 2017	Well established repeat expedition with a solid track record of exploration and documentation. The hydrological project sounds very interesting. It is a great shame that more younger members are not currently signed up as the experience they would gain would be invaluable (especially the water tracing techniques). Hopefully the leaders will recruit some younger members before the expeditions take place.	<b>£400</b>				<b>£400</b>
<b>GPF2017 b-002</b>	SMCC Thailand 2018	Experienced expedition team working consistently over a period of time with good results and reporting. Different area already recce'd with established potential. Another project worthy of continued GPF support at a decent level. The application lacked a little detailed in places - The committee hopes this will be addressed in subsequent applications.	<b>£300</b>				<b>£300</b>
<b>GPF2017 b-003</b>	Svalbard 2018 - Austre Broggerbreen	Interesting and well filled out application with a good science bases - driven by a PhD project. The cave map supplied is very basic. Hopefully a more detailed original survey is available, as comparing new data against the one supplied will not give very scientific results - It would have been nice to see the 3D image of their first visit/scan. While a good science project in Ice caves,	<b>£100</b>				<b>£100</b>

		the project was only token support due to very small team and BCRA funding (which has been applied for) is thought more appropriate.					
<b>GPF2017 b-004</b>	Pena Colorada 2018	A good application, good team (multi national team) with a varied age range but generally fairly young participants. The expedition leader has organized a number of expeditions to this area and this one is a very interesting cave and may be the key to the system. Significant technical challenge in a remote location - the standout expedition of this round and has been funded accordingly.	<b>£1000</b>				<b>£1000</b>
<b>GPF2017 b-005</b>	Kyrgyzstan 17	Expedition to a new area by a new group to GPF, but who are known to regularly go on expedition to Greece several times a year. An interesting project in a new and little-known location. The costs of getting to Kyrgyzstan are high and may have possibly warranted longer time in the field, It is however a recce and the committee will be very interested in seeing the results, and hopefully lead to a follow up expedition if initial results are positive.	<b>£200</b>				<b>£200</b>

Phil adds:

At Hidden Earth 2017, the Ghar Parau Foundation organised the raffle of a Scurion caving light during the event. The raffle raised £1046 with a further £293.82 from GPF Card sales.

The Winners were:-

**First Prize:-**

The 1500 Scurion lamp (donated by **Scurion**): **Alex Hannam**

**Second Prize:-**

A painting (donated by **Robin Gray**): **Basher Baines**

Third Prize

A **pottery Mug** (donated by **Handknitted Pottery**): **Lydia Leather**

A really big thanks to Maxine Bateman and Kate Humpries for their sterling job of helping sell raffle tickets. A even bigger thanks to Scurion, Robin Gray and Hugh Penny for donating prizes in support of the Ghar Parau Foundation.

## **New publications**

There are two new additions to what has already been a bumper year for books about caving. First comes the authoritative new edition of the Northern Caves guidebook covering the Three Counties System and the Northwest. The work of Sam Allshorn and Paul ‘Beardy’ Swire, it is lavishly illustrated with photos and surveys, and will be an essential companion for anyone active in the western half of the Dales many years to come. It is clearly the result of a phenomenal amount of effort. Published by High Mead, it is available from all good caving stockists.

Second is volume two of Caves and Karsts of the Yorkshire Dales, the definitive survey edited by Tony Waltham and David Lowe. This book presents an overview of all aspects of the great cave systems and spectacular karst landforms in the limestone terrain of the Yorkshire Dales. Produced altogether by 31 authors, all experts in their fields, Volume One, published in 2013, contains overview chapters covering individual aspects of the geomorphology, speleology and science relevant to the area. The new second volume contains chapters that describe the major caves and a regional overview for each of 17 areas within and around the Yorkshire Dales karst. The book is aimed at anyone with a serious interest in the Dales, from academic geographers to keen cavers. Details from the BCRA website: <http://bcra.org.uk/bookshop/dales.html>

## **Why Does Caving Need a National Body?**

Further thoughts from **Andy Eavis**:

There are several reasons why I think we must have a viable national organisation in British Caving.

The BCA gives British caving a broadly-based stable platform on which to secure and develop the future of our sport.

Whether we like it or not, in this day of litigation, we need insurance. In the case of an unfortunate event blame could be pointed at someone with potentially significant financial consequences for both an individual and their club. It is a disaster waiting to happen and we need to insure against it. Also of course the BCA insurance gives other advantages such as landowner protection helping towards easier access etc.

We need to have a training scheme with good quality certification to enable leaders to take novices into caves as safely as possible. Government legislation suggests all organisations of our type have an appropriate scheme in place or risk it being foisted on us from outside. Training and certifying the professionals who lead novices into caves helps to ensure that

caving maintains a good name in the public eye which benefits us all, promoting conservation and encouraging interest among new recruits to the sport.

Similarly, the Government dictates that we have to have a Child Protection Policy to give guidance to people working with young children and vulnerable adults.

In my opinion it is very good that we have an equipment and techniques group to research caving procedures and equipment and make both as safe as possible. Cavers across the country benefit from the anchors which are placed with the assistance of the scheme organised by BCA's E and T committee.

The British Caving Association does and always will treat cave conservation and access as a cornerstone of the organisation. To give even more protection to the underground environment there may need to be changes to the law and the BCA needs to be able to lead this.

Our publications section that is nationally funded and organised, regularly produces high quality material which is freely available to all its members.

The science section of British caving under its BCRA umbrella is well respected throughout the world as a premium scientific institution.

The British Caving Association in conjunction with its science partner BCRA has a very good caving library, available to all members.

International work, including supporting British expeditions via the Ghar Parau Foundation has enabled British cavers to explore more caves around the world than any other nation.

BCA, through its officers, should be negotiating on behalf of its members with Government institutions wherever the activities of government have a potential impact on caves, cavers and caving.

We appreciate the help we get from British cavers and would like even more help and understanding into the future.

As chairman of the BCA I am NOT naturally a bureaucratic person so I can't say I like all the bureaucracy, however, I accept it's something that somebody must do and coordinate.

Cavers often compare BCA with the British Mountaineering Council, there are several very significant differences.

- (1) The BMC has over 82,000 members, we have 6,000.
- (2) They have over 30 paid staff many are full time, we have 4 part time.
- (3) BMC has some government funding partly because of "sport climbing" now being an Olympic sport. BCA receives no government funds.
- (4) Their annual subscription is about twice that of the BCA.

They generally do succeed in putting on a professional front. However, they have recently had their own political problems.

My fellow officers and I do it all entirely unpaid, we put an enormous amount of time, effort and worry to try and make British caving better for its members. We need the help and support of BCA's membership to take it forward and make it better still. There are cavers with appropriate skills who could be extremely useful and help in many interesting areas such as IT, equipment testing and development etc. also with all kinds of administration.

Cavers with ideas on how to help or improve BCA including making it more attractive and relevant to its members should contact me at [chairman@british-caving.org.uk](mailto:chairman@british-caving.org.uk)

## CO2 in Caves and Mines

Recent reports from Mendip have revealed that at least one dig had to be suspended during the autumn because of elevated levels of carbon dioxide.

**Bob Mehew** has been doing some research on this subject, and has contributed the following:

The impact of CO2 has been summarised in the following table.

%CO2	Symptoms
2 to 3	Shortness of breath, deep breathing
5	Breathing becomes heavy, sweating, pulse quickens
7.5	Headaches, dizziness, restlessness, breathlessness, increased heart rate and blood pressure, visual distortion
10	Impaired hearing, nausea, vomiting, loss of consciousness
30	Coma, convulsions, death

The sources and sinks for CO2 in the atmosphere of a cave are many and varied. CO2 can originate from a number of sources:

- a. Decay of organic material captured into water and being transported into the cave;
- b. People, animals, plants respiring;
- c. Formation of speleothems;
- d. Volcanic / thermal springs;
- e. Atmosphere; and
- f. Combustion (lights, stoves etc).

CO2 can be dissipated by natural or forced air drafts and to a lesser extent by diffusion. It can be removed by dissolving into water flowing through the cave if that water is not saturated with CO2.

One study by Whitaker et al indicated a level of CO2 in Scoska cave, Yorkshire of between 0.2% and 0.3% beyond 100m from the entrance. Another study by Craven in the South African Congo show cave indicated levels around 0.5% with peaks above 2%. A recent report from Waitomo Cave indicate suspension of tourists trips to ensure CO2 levels do not encroach on limits. Measurements made elsewhere in the UK suggest even higher levels of CO2 can be present. There are anecdotal tales of cavers encountering concentrations of CO2 sufficient to induce some of the symptoms noted in the table above. There have been three fatal accident in which CO2 is considered to play a major role, Neil Moss in 1959, Langstroth

Pot in 1976 and the mine fatality in Scotland in 2008 plus possibly the more recent mine fatality in 2014.

Whilst the usual assumption that as oxygen is used up, it is replaced one for one by CO<sub>2</sub>, cases do arise where CO<sub>2</sub> arises from other sources such as thermal springs. Diggers occasionally encounter increased CO<sub>2</sub> levels due to their dig being a small 'blind' tube caused by their respiration. Crude calculations suggest it will take about half an hour to raise the CO<sub>2</sub> concentration in a tube some 50cm in diameter and 10m long to around 5%, assuming no draughts. CO<sub>2</sub> is well known for 'pooling' at floor level, presumably due to the nature of its source. Some caves are well known for locations with CO<sub>2</sub> problems whilst others have yet to be properly investigated.

Cavers and mine explorers should be alert to the possibility that if they start top pant, their heavy breathing may not be due to poor fitness, but to elevated CO<sub>2</sub> levels.

**The end.**

**Please note:** The views expressed in this newsletter are those of the contributors and do not necessarily represent the formal view of the British Caving Association.