Geographical Fieldwork Grants 2007

Royal Geographical Society with IBG
Advancing geography and geographical learning

Please ensure that you read the guidelines before completing this form
Word processed forms are acceptable but must follow this page layout exactly

1. **a) Name of project** Cambridge Austrian Cave Science Expedition 2007

   b) Name *(short version: 2 or 3 words only)* Expo 2007

2. **Affiliation** *(i.e. University/Organisation)* Cambridge University, Geography Dept, Biological Anthropology & Caving Club

3. **Name of project leader/director** Mr Aaron Curtis

4. **Address of leader/director**

Permanent address (Miss D. VELDHUIS)

Girton College
Huntingdon Road
Cambridge, CB3 0JG

tel (day) 44 (0)1223 764720
(eve) -
Mobile +44 (0)7962501503
Fax +44 (0) 1223 764 710
email: dv217@cam.ac.uk

Term-time address (Mr A. CURTIS)

Robinson College
Grange Road
Cambridge, CB3 9AN

tel (day) -
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mobile +44 (0)7913321781
fax -
email: ac511@cam.ac.uk

5. **Project website address (if any):** http://cucc.survex.com/expo

6. **Number of UK members** 12 **Number of host country members** 0
   Number of members from other nations 3 **Total number of members** 15

7. **Location** *(Country, region)* Austria, Totes Gebirge (Northern Calcarous Alps), Loser Plateau
   Latitude (degrees, minutes N or S) 47°38 *Longitude (degrees, minutes E or W)* 13°48

8. Attach to the **front** of your application an **A4 map** showing the location of your research area.

9. **Dates** *From* 7th Jul 2007 *to* 18th Aug 2007 *Days in the field* 42

10. **RGS-IBG Recognition**
    This project wishes to apply for (please delete as appropriate): ~~Approval only~~ / Approval and financial support

11. **Budget** *Total* **£** 13112 *Total team member contributions* **£** 7200

12. **Please tick the box if you are interested in the use of a Land Rover loaned from the Gordon Foundation (as outlined in section F of the guidelines):** ☐

13. **Aim of research**
    Describe the research team's overall aim and supporting objectives. Use **no more than 100 words** full details to be given in question 14.

We will focus an aspect of caves (condensation) and of the human response to caves (stress). Electronic sensor data and in-situ observation will allow an understanding of cave microclimate geography and interaction with condensation and cave thermal inertia, ultimately contributing to an understanding of response to climate change (e.g. Badino 2004).

The microclimatic data will also contribute to an understanding of the stress physiology of cavers. We will explore a) caver variability in stress-hormone levels; b) what underground stressors are dominant and c) stress-coping mechanisms. Understanding responses to the stresses of the subterranean environment is limited (e.g. Stenner et-al. 2006) and this project aims to increase awareness.

14. Details of research programme

a) Explain why and how this research programme has been developed. (**150 words max**)

A desire to take advantage of years of exploration (since 1976) and available surveys conducted by the CU Caving Club was coupled with the research interests of Aaron Curtis and Djuke Veldhuis. Our interest in speleogenesis and its relationship to cave microclimates led to a focus on the contentious (Dublansky and Dublyansky 1998, Dreyboldt et al 2005) role of condensation in cave corrosion and karst hydrology. The temporal and spatial range (July-August and 1600 to 2100m) predict very high rates of condensation. Observations of condensation have been extensively carried out in Russia and Ukraine, but we are aware of no studies conducted in the Alps. Based on previous stress physiology research (among indigenous Papua New Guineans) and awareness of practical methodology which can be utilised in a subterranean environment we wish to develop an understanding of the stress physiology of cavers and the effect a cave's ecology has on them.

b) Describe the fieldwork methods to be used to achieve the objectives listed in question 13. (**400 words**)

A network of sensors and data-loggers will be placed above and below ground. The data-loggers will be removed periodically and downloaded. Dublansky and Dublansky (1998)'s microclimate method will be used to produce estimates of expected condensation from sensor data. A pilot-study will be carried out to predict primary condensation areas. Those areas will be re-visited and their morphology investigated for signs of condensation corrosion. Control areas where condensation is less likely will also be visited.

Both control and experimental areas will be examined for evidence of drop-dents, rill-trails, splash-patches, and drip-holes, which would indicate condensation corrosion. Areas with scalloped walls and speleothems will be especially targeted. Water beading will be used to indicate recent condensation. All evidence will be described in-situ, photographed and recorded geographically. Observations will be spatially integrated using the extensive and detailed survey data; an overlay with information regarding locations of scalloping and expected/observed condensation maxima will be incorporated in the 2007 survey. Surveying is another objective and we expect to survey and document at least three kilometres of new passage.

An analysis of the stress physiology of cavers will be based on techniques developed previously on a three-month expedition in Papua New Guinea. Perceptions of caving related stressors will be assessed via psychometric questionnaires (e.g. Sheldon et al, 1983, "A Global measure of perceived stress.") *and* physiological measurement, in this case the analysis of stress-hormones in saliva. Limited utilization of saliva until recently is a reflection of the ambivalence that has characterised both public and professional views of the nature of saliva over the ages. It is now recognised that saliva is a "*useful, worthwhile…non-invasive, easy, and inexpensive"* diagnostic tool and reliable for both the scientist and clinician (Scheer and Buijs 1999; Nagler, Hershkovich et al. 2002). Salivary samples will be assessed for cortisol (upon return to Britain) using enzyme linked immunoadsorbent assay (ELISA). This is a competitive assay where a 'label' (horseradish peroxidase) competes with the cortisol. Unique to this study, the stress measures will consider the microclimatic data, as hormonal responses to stresses vary based on heat/cold stress and humidity. Thus, we control and explain some of the external sources of variation and concentrate on inter-individual variability in response to stressors.

Expedition members have expressed commitment to the scientific goals and will assist placement and retrieval of data-loggers. All equipment will be tested during the Expo Training Weekend.

15. Details of research area

Describe the geography of your research area as outlined in your location map in question 8. (**200 words**)

Map 1 shows the location of our project on a large scale. The white rectangle marked "Kataster area 1623" is and overlay of the prospecting guide employed during CUCC expeditions, which can be seen in A4 size as Map 2. The area that the 2007 expedition will focus on is the northeastern area inside the box marked "204 map." Cave 204, named "Steinbrückenhöle" after the natural bridge above entrance 204e which provides shelter for top camp, is a cave system which has been surveyed to a length of 11.7km, a depth of 542m and extent of 645m (approximately N-S). This is the eastern border of the Löser plateau and the western slope of the Nieder Augst-Eck.

The area is formed mainly of massively bedded Triassic Dachstienkalk limestone deposits, surrounded by more recent Jurassic limestone. The Löser plateau has been called an upper Miocene erosion surface (West 1988). The alpine landscape is dominated by karst landforms such as rillenkarren, trittkarren, deep grikes, and extensive caves. Vegetation is largely limited to "Legföhren"—dwarf pine . Fauna encountered mainly consists of "gämse"—wild goats (*Rupicapra rupicapra*) and rodents. Snow patches cover areas of the plateau, often persisting far into the summer.

16. Bibliography of proposed research

List up to six key publications, maps and other materials used in the development of the research objectives of the project.

- Dreybrodt et al (2005) "Condensation corrosion: a theoretical approach" *Acta Carsologica*, 34 (2): 317-348.
- Dublyansky and Dublyansky (1998) "The Problem of Condensation in Karst Studies" *Journal of Cave and Karst Studies* 60(1): 3-17.
- Howarth, F. G. (1993). "High-stress subterranean habitats and evolutionary change in cave-inhabiting arthropods." *The American Naturalist* **142** S65-S77.
- Nagler, R. M., O. Hershkovich, et al. (2002). "Saliva analysis in the clinical setting: revisiting an underused diagnostic tool." *J Investig Med* **50**(3): 214-25.
- Stenner, E., E. Gianoli, et al. (2006). "Muscular damage and intravascular haemolysis during an 18 hour subterranean exploration in a cave of 700 m depth." *Br J Sports Med* **40**(3): 235-8.
- West, Jared (1988) "The Geology of the CUCC Expedition area, Totengebirgs, Austria" *Cambridge Underground* 1988:8-13.

17. Advisors

List up to five key advisors and their expertise who have helped you develop your research programme. Please indicate their area of expertise.

- Professor Paul Smith, Geology and Paleobiology. Director of earth sciences, Birmingham University
- Dr James Brasington, Hydrology, Cambridge University department of Geography.
- Dr Anthony Day, Geology PhD, Durham University
- Prof J. Herbert, Neuroscience & Physiology, Cambridge University
- Mr Antony Rooke, Geology graduate, Imperial College London

18. Association with the host country

Give details of the main Government body and any other key organisations with which are you collaborating in the host country.

Every year since 1976 CUCC has obtained permission from the "Landesregierung Oberösterreich" to cave in the Loser-Augst Eck national park and explore Kataster (the Austrian cave registry) area 1623. They, in turn, liase with Österreichische Höhlenrettung, the Austrian cave rescue service. Our relationship with the local caving club "Verein für Höhlenkunde in Obersteier" is very healthy and they assist with the registration of our discoveries in the Kataster. In addition to joint trips underground which we often arrange, they are invited to the Expo Dinner which occurs halfway through the expedition and often invite us to events. We gave at talk at their 2001 Speleo Austria conference and hope to do so in the future. We also organize joint trips and events with the German caving club ARGE which operates in the area. We will be in touch with both of these clubs and arrange cooperation this year.

19. Permissions

Please indicate (i) the steps that have been taken to establish what permissions are required from the host country authorities to undertake this work and (ii) what stage you have reached in obtaining such permissions. Please enclose copies of any permits and / or correspondence. Tourist visas are not sufficient.

(i) In order to carry out an expedition in the national park, permission from the Landesregierung is required.
(ii) The application for this will be carried out in March.

Do you intend to bring any scientific samples back to Britain? (Yes) / No
If Yes, please state the nature of the material you propose to export, and attach letters from the relevant authorities in your host country confirming permission to do this.

Yes, saliva samples. Authorities have been contacted and letters are pending.

Continued. . .

19 cont *Have the following been informed of your plans?:*

Foreign and Commonwealth Office
(this includes your obtaining the latest relevant FCO travel advice bulletin) (Yes) / No
British High Commission / Embassy in the host country (Yes) / No
Has the project been endorsed by a UK university? Yes / (No)
Has the project applied for endorsement by a UK university? (Yes) / No

(The Cambridge Expeditions Committee will review applications on 2nd Feb)

Which University? University of Cambridge

20. Project members

List names, ages, qualifications, nationalities and languages spoken by the leader and team members from *both the UK and host country*, and give full details of previous expedition or research experience. University staff members and Research Fellows of the team should be listed separately. University students should give the name of their institution, year of residence and subject being studied.

(See attached Member List)

21. Risk Assessment

It is assumed you have undertaken a written risk assessment of your project. Please give details of this risk assessment here. If you need further space, please attach the assessment to your application form and notify the Grants Officer accordingly.

(See attached Risk Assessment)

22. Medical skills

List the first aid training and medical qualifications of all your team members.

- Dr Phil Underwood: registered GP, BSc, MSc, AKC, MRCGP, MRO, CasCare Course, Member of Cave Rescue.
- Miss Djuke Veldhuis: Wilderness First Aid qualification (valid as "appointed person" First Aider within a work place.
- Mr Peter Harley: First Aid certificate
- Mr Adam Kessler: First Aid certificate

23. Health, safety and casualty evacuation

Outline the plans you have made to ensure the safety of all members of your team, including any plans for casualty evacuation.

We will adhere to a standard callout system following the National Caving Association and CUCC guidelines (http://cucc.survex.com/cucc/nca.shtml). Every group travelling underground will leave a trip plan including location, trip members, and expected return time at base camp or top camp; all of which is recorded in a callout book cancelled upon safe return. We ensure that someone is always available and awake to verify that each callout time is met. If a callout is missed, the Austrian cave rescue service (Österreichische Höhlenrettung) is immediately notified; a rescue operation of our own will also be launched. All members are trained in the use of rescue equipment including pullies and "Little Dragon" warm air generators. The callout system will also be employed above ground for the hike to top camp and for surface survey work.

Dr Phil Underwood is a registered GP and will be our medical officer. Appropriate first aid kits will be kept at top camp and base camp, and personal first aid kits will be carried underground.

24. Travel and logistics

Give an outline of your method of travel, route, accommodation and supplies. Please indicate if an agency is helping with logistics and if so, give details.

CUCC organises travel to expedition on a communal basis, with exceptions for those travelling from or to unusual destinations. The communal transport arrangements are largely effected using cars and ferries (driving to Dover and taking the ferry to Calais and driving on to Austria from there). A few individuals may use plane and train if car space is not available. To reach top camp from base camp, a 20 minute drive up the Loser Panoramastrasse toll road and a two hour hike is required. CUCC has a good relationship with the toll road organization and will negotiate a discount rate for use of the road during the expedition.

Accommodation at base camp will be provided by Gasthof Staud'nwirt, in Bad Aussee. Hilde Wilpernig, who runs the Gasthof, has always welcomed us to use their campsite and also a small, one room hut where we draw up and type in our survey data. The hut also includes a refrigerator. CUCC already owns a mess tent, cooking facilities and a quantity of non-perishable food which are stored in the attic of the hut.

25. Specialised equipment

Describe any field equipment being used and previous experience in the use of any specialised items such as GPS.

(See attached Item 25)

26. Budget. Please give details of your planned income and expenditure under the following headings. If need be, please add any budget headings to the list.

EXPENDITURE	
Pre-fieldwork / preparation	£ 300
Training	£ 100
International travel (flights)	£ 2200
Subsistence (accommodation and food)	£ 1800
In-country travel	£ 300
Local counterparts / guides	£ 100
Field equipment	£ 4900
Insurance	£ 600
Medical / health & safety	£ 300
Film / photography	£ 100
Post-fieldwork activities	£ 1100
Preparation of project report	£ 20
Dissemination of findings	£ 100
Other (please itemise)	£
……..	£
……..	£
Contingency (usually 10% of sub-total)	£ 1192
TOTAL	**£ 13112**
INCOME	
Personal contributions	£ 7200
Grant giving trusts	£ 4812
Fund raising events & activities	£ 300
Commercial sponsorship	£ 800
Individuals donations	£ 0
Other sources	£ 0
TOTAL	**£ 13112**

27. Support from other organisations to date

State amount of any financial contribution awarded or promised by other funding bodies. Also indicate what other funding applications are pending or are yet to be made.

We are in the process of applying to the following organizations:

- Ghar Parau Foundation
- Cambridge Expeditions Fund
- BCRA Cave Science and Technology Research Initiative
- Shell Personal Development Award
- Cambridge University Geography Department Bedford Travel Grant

28. Project report and other outputs

a) List the proposed outputs from the project (e.g. final report, published papers, articles, educational literature), indicating when each item will be available and for whose benefit it is being produced.

- Cave data will be appended to Austrian national "Kataster" cave catalogue
- Completed surveys will be presented to the Austrian caving club
- Article in *Cambridge Underground*
- Article in *Cambridge Expeditions Journal*

Continued. . .

- Possible articles in *Caves and Caving*, *Descent*, or *Die Hoehle*
- Survey and Photos will be presented at the "Hidden Earth" Caving Conference 2007.
- Undergraduate dissertation, Cambridge Department of Geography
- Aim to publish stress-physiology data in high-ranking journals (e.g. *Science, Nature*).

b) The Society requires that project teams receiving RGS-IBG approval submit a full report with details of the research undertaken to the Society within one year of returning from the field (refer to the *Guide to Writing Expedition Reports*). Please indicate when the final report will be completed and to which other organisations and authorities the report will be sent.

The report will be completed by the end of 2007 and sent to Verein für Höhlenkunde in Obersteier, the local Austrian caving club, Arbeitsgemeinschaft Höhle und Karst Grabenstetten, the German caving club who operates in our region, to Cambridge University Expeditions Society, the Cambridge Expeditions Committee, the British Cave Research Association, and all of our corporate sponsors.

c) List those team members producing dissertations or other degree-related project work as a direct result of their participation in this project.

- Aaron Curtis
- Djuke Veldhuis

29. Reports from previous expeditions or research projects

If team members have participated in other group projects, give full references for any resulting reports or papers. Please indicate the status of final reports for any previous projects approved or supported by the Society in which the current team participated and projects to which the current application is a direct follow-up, even if current team members were not involved in the previous project.

CUCC reports, surveys, logbooks, and a list of paper publications are available at cucc.survex.com/expo/ . Some paper publications include:

- Löffler, David (2003) "Expedition Report: Totes Gebirge, Austria 2003" *Speleology* 4:10-12
- Shinwell, Mark (in press) "Expedition Report: Totes Gebirge, Austria 2006" *Speleology*
- Day, Anthony (1997) "CUCC in Österreich 1996" *VfHO Journal* 1997:19-23
- Vasbie-Burnie, Tim (1999) "CUCC Expedition to Austria 1998" *Cambridge Underground* 4(4):98-93
- Lawson, Rebecca and Densham, Chris (1990) "Two Austrian Rescues" *Descent* 92:18-19

30. Contact address while research team is in the field

Contact details of home agent in UK and host country contact while the research team is in the field.

Home agent:		Contact in the host country:	
Name:	Prof James Hickson	*Name:*	Hilde Wilpernig
Address:	Pembroke College Cambridge CB2 1RF	*Address:*	Grundlseer Straße 21 8990 Bad Aussee, Austria
Tel:	+44 (0) 1223 338100	*Tel:*	+43(03622)54565
Fax:		*Fax:*	+43(03622)52427
Mobile:		*Mobile:*	
Email:	jcdh1@cam.ac.uk	*Email:*	gh.staudnwirt@aussee.at

31. Referee statements

Two referee statements are required for each application. One of these will normally be from a university academic who can comment on the proposed research and methodology, the other should be from an appropriate contact in the host country, preferably from a government representative or an academic helping with your research programme. Your referees should not be members of the fieldwork team, nor be directly involved in the planning of the research. Please send each referee one of the **Request for a Referee Statement** forms, downloadable from www.rgs.org/grants, completing only the top two lines yourself, and ask them to return the forms and their statements directly to the Society (by post, fax or email) by **26 January / 22 June 2007**. **These are very important: your application is jeopardised if the referee statements do not arrive on time.**

Names, and contact details of the referees:

From the UK:

Name *Name* Dr Steve Trudgill

Address

Robinson College
Grange Road
Cambridge CB3 9AN

tel +43 3623/2586
fax +43 660/2197133
email hoehle.robert.seebacher@utanet.at

From your host country:

Name Robert Seebacher

Address

Robert Seebacher,
Sonnenalm 78, A-8983
Bad Mitterndorf

tel +43 3623/2586
fax +43 660/2197133
email hoehle.robert.seebacher@utanet.at

32. Data Protection Act 1984

The information you have given on this form will be held on computer and may be released to other research planners, potential sponsors and / or the media. Please tick here if you **do not** wish to have this information released. ☐

33. Application submission

I enclose:

Two copies of this application form and supporting documents ☐
Two copies of A4 map of research area attached to the front of the form ☐
The latitude and longitude co-ordinates of the research area (Question 7) ☐
The £10 application fee ☐

34. Declaration

The information submitted in this application is to the best of my knowledge correct at the time this application was made. Should any significant developments arise after this application is made, such as change of team members or official permits being gained, I will keep the Society informed of such developments. I have informed my two referees that their statements should be returned directly to the Society by **26 January 2006/ 22 June 2007** *(delete as appropriate)*. Should this project be cancelled or postponed subsequent to receiving support from the Society, I will return the grant awarded.

Signature(Leader/Director)……Date……

Acknowledgement of receipt will be by email unless otherwise requested. Please tick here if you would prefer a posted acknowledgment. I would prefer postal confirmation ☐

Appended to form:

25. Specialised equipment
Describe any field equipment being used and previous experience in the use of any specialised items such as GPS.

We intend to purchase a network of electronic sensors for monitoring atmospheric conditions inside caves and near cave entrances. These will include temperature, humidity, and airspeed sensors in addition to dataloggers. Aaron has used similar equipment in the past when monitoring conditions on the Bas Glacier de Arolla, Switzerland.

Many expedition members own GPS which will be used for surface navigation and prospecting. There is a common database of GPS points derived from the extensive database on the expedition website, including camps and all cave entrances, which will be uploaded to each GPS from the expo computer at the beginning of expo. This year's new entrance discoveries will then be added to the database and uploaded to the website.

Underground surveying has been carried out using four sets of club-owned underground compasses, clinometers, and tape measures. All compasses and clinometers are calibrated by their user before each trip. This data is used to produce a 3D centreline using the Survex package and then combined with left-right-up-down (LRUD) data and plan and elevation sketches to produce a complete survey using the TunnelX package. This year we plan to purchase sonar ranging devices which will provide better estimations of LRUD.

Bi-weekly Single Rope Technique training held in Cambridge ensures that all expedition members are proficient in caving ropework, while an expedition training trip to the Yorkshire Dales will occur in the spring to introduce surveying and bolting. Safety critical caving equipment includes SRT kits, harnesses, rope (static 9-11mm), metalwork (carabiners, hangers, mallions), oversuits and undersuits, lights, Spits and Spit drivers, Hiltis and drills.