

# **The APEX 5 Expedition and Apex (Altitude Physiology Expeditions)**

## *Inspiring Learning in the Bolivian Andes*

### APEX 5 Expedition Team

**Christopher Graham – APEX 5 Leader**

**Greig Torpey – Logistics Coordinator**

Rebecca Dru – Finance Coordinator

Eleanor Lee – Volunteer Coordinator

Gordon Paterson – Research Lead

Jason Young – Research Lead

Joseph Willson – Research Assistant

### Apex Charity Committee

Alexander Jackson

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# Apex (Altitude Physiology Expeditions)

- Six student-led high altitude medical research expeditions since 2001
- Fantastic research experience for Edinburgh medical students
- Unique international learning experience for University of Edinburgh student volunteers
- Success thanks to student-staff partnership







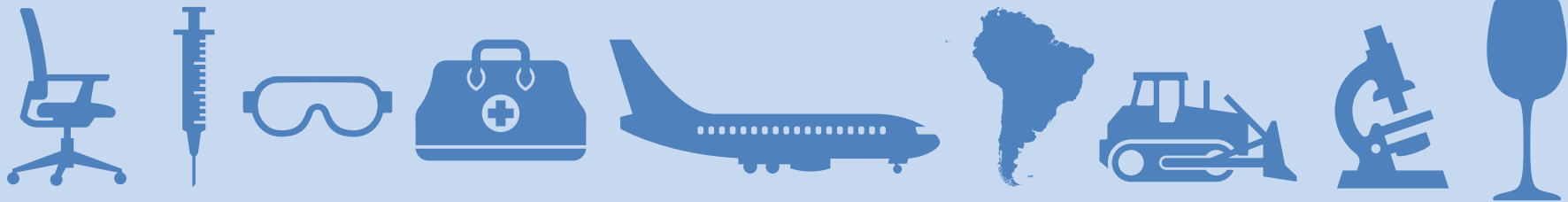
# APEX 5 Expedition

- 19<sup>th</sup> – 30<sup>th</sup> June 2017, Bolivia
- Student organising team: autonomous, but supported
- 27 student volunteers; 2 expedition doctors
- Aims:
  1. To further understanding of the physiological responses to low oxygen levels (hypoxia)
  2. To inspire and develop our student volunteers

# Timeline

2015

2017+



**Pre-expedition:** research ideas and supervisors, volunteer selection, Weekend Away, media, ethics, grants, Baseline Testing

**Expedition:** research and a safe, enjoyable experience (and a bulldozer...)

**Post-expedition:** travel in South America, research analysis, presentations and publications

# Pre-expedition





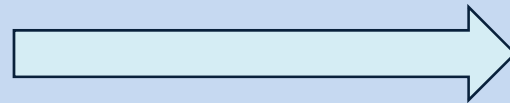
# Research

- 29 research participants
- Sea-level: *Queen's Medical Research Institute, University of Edinburgh*
- High-altitude: *Huayna Potosí, Bolivia (4,700m)*
- Ethical approval: ACCORD Medical REC and the University of Edinburgh Psychology REC
- Data analysis and manuscript preparation are on-going

# White blood cell gene expression and survival



*Bacterial infection*



SEVERE SICKNESS

*Hypoxia*



*Hypoxia*



*Bacterial infection*

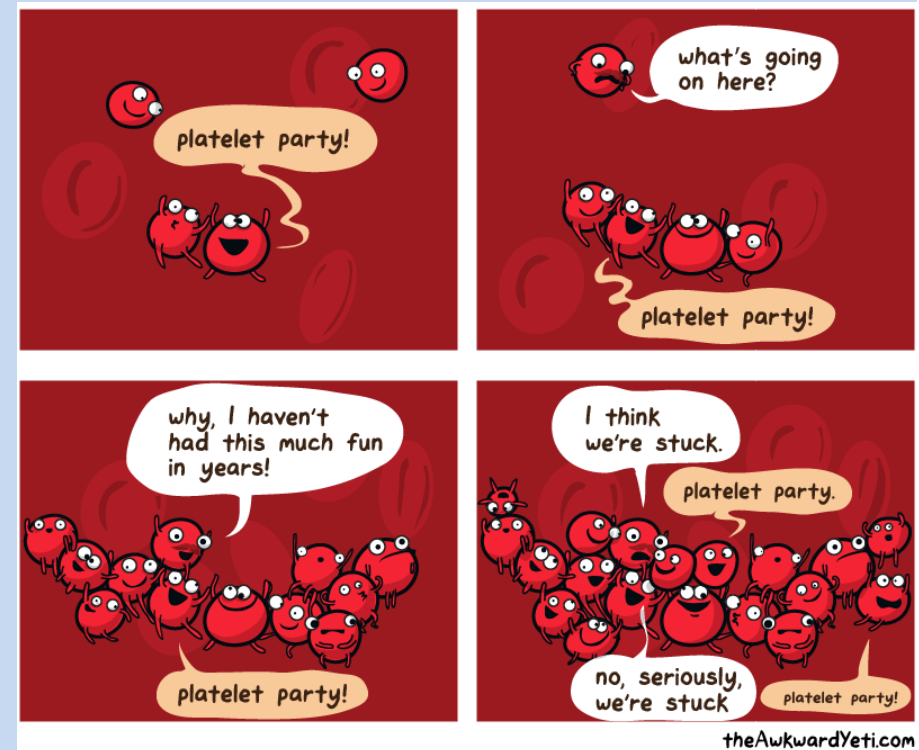


OK

*Hypoxia*

# Platelets and blood clotting

- Increased tendency to form clots at altitude and in hypoxic diseases → more strokes/heart attacks
- Platelets more readily activated in hypoxia
- APEX 4 identified a key activation pathway in hypoxia – we explored this further

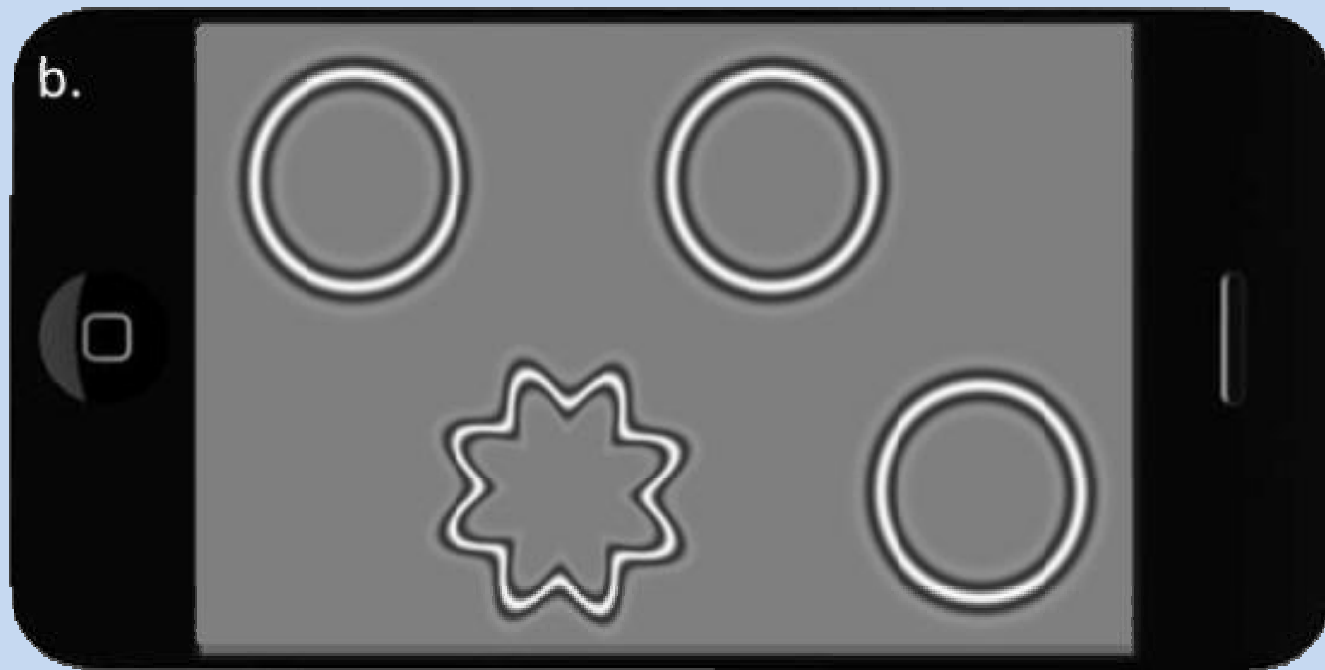


## Thromboelastometry and Platelet Function during Acclimatization to High Altitude

Alistair S. Roche<sup>1</sup> Gordon G. Paterson<sup>1,2</sup> Matthew T. Barber<sup>1</sup> Alexander I. R. Jackson<sup>1,3</sup> Shona Main<sup>1</sup>  
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Paul Harrison<sup>7</sup> Alastair F. Nimmo<sup>6</sup> A. A. Roger Thompson<sup>1,8</sup>



# Hypoxia and macula function



Handheld radial shape discrimination test – *myVisionTrack*  
Adapted from: Ku *et al.*, 2016, PeerJ 4:e2650

# Brain function at altitude



Ober Consulting Saccadometer, testing saccadic eye movements

# Imaging the eye's fundus



Epipole provided image and epiCam cameras





# Personality and perception of AMS

- APEX 5 volunteers and matched sea-level controls
- Personality trait questionnaire: NEO Five-Factor Inventory
- Acute Mountain Sickness (AMS) questionnaires every day of expedition
- Do different personality types correlate with symptoms of AMS?



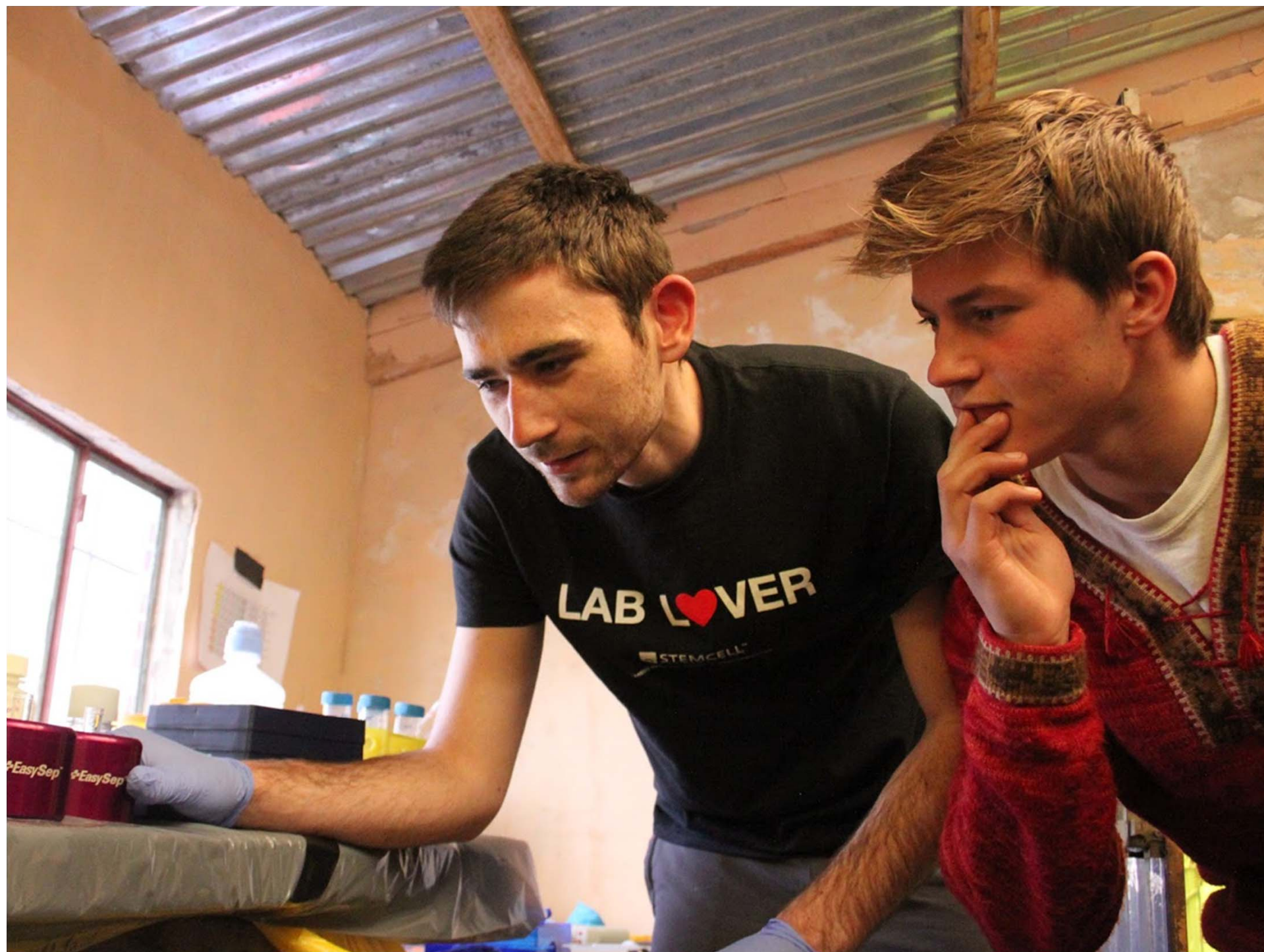
# Research-led teaching

We inspired learning in our volunteers with:

- Tutorials and information sessions about the research
- Half-day 'lab internships', particularly useful for medical and science students
- Active participation in the eye research

*"Being able to see each individual stage of the research production line was illuminating – it made all the theory come to life" – APEX 5 Volunteer*





## ***Inspiring Learning in our student volunteers***

- Through enthusiastic exposure to altitude and medical research and expedition organisation, we inspired our volunteers
- A number of our volunteers are starting to organise APEX 6, with our support
- The student-led future of Apex is secure

*"APEX 5 is possibly the highlight of my time at University"* – APEX 5 Volunteer



*As a non-medic I really appreciated feeling able to ask basic questions about the research and research methods. Everyone was very accommodating to different levels of knowledge*

*The week gave me an opportunity to remove myself from the world and just relax, giving me a better idea of me as a person stripped back of all the "mod cons" we come to rely on. Also gave me confidence in my relationship building skills and ability to get along with people even in tough and challenging conditions*

*Learned about medical research and how it's carried out, some equipment involved in the experiments, gave me an insight into what to expect for intercalation*

*I learnt so so much. It was my first experience with hands on research and I really enjoyed it. I learnt a lot from the organisers about how to build great team spirit and make everyone feel involved in every aspect of the trip. I learnt from the expedition doctors about how much you can do with a medical degree*

*The importance of group moral when on an expedition. Interesting to learn about the process of undertaking research such as proposing questions, finding research equipment and applying for funding*

*It has made me more interested in getting involved with research in the future*

*I have gained further interest and knowledge in high altitude medicine, as well as improving my self confidence (travelling and surviving in South America for a month) and ability to get on with others*

# Enhancing engagement and creating community within the University

The '*Apex model*':

- Student-student: cross-disciplinary
- Student-faculty and student-alumni: cross-generational
- Collaboration and synergism with multiple University of Edinburgh individuals and groups, and with partner institutions





# **Preparing graduates for the future: Organising Team**

We learned from:

- The research: ethical and grant applications, practical research skills, peer education, and data analysis and dissemination
- Organising and executing the expedition: project management, communication, teamwork, overcoming challenges and conflict resolution, and leadership





# Relocation, relocation, relocation

- Relocation of our planned research location at a few hours' notice due to safety issues (essential road access blocked by snow/ice)
- Organising Team: problem-solving; communicating the change to volunteers, their relatives and the University
- Volunteers: adapting to change; supporting others; nicer surroundings to explore!





# **Preparing graduates for the future: Volunteers**

- Teamwork and relationship-building
- Self-confidence and ability to manage in challenging environment
- Travel in South America: communication skills, cultural experiences, character building, gaining perspective





# Outputs

## Oral Presentations



## Poster Presentation

*“Therapeutic Targeting of Hypoxia-Sensitive Pathways”*



## Publications



Teaching Matters blog

*Promoting, discussing and celebrating teaching at the University of Edinburgh*

## Upcoming Poster Presentation



WMS Annual Meeting & Wilderness Medical Society Conference



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