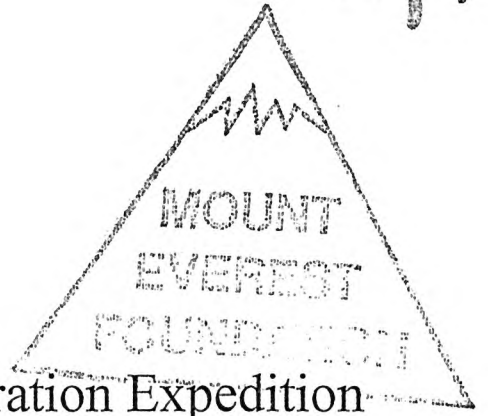


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Imperial College Science and Exploration Expedition

Kyrgyzstan 97

Preliminary report

(November 1997)

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Introduction

Imperial College Science and Exploration Expedition Kyrgyzstan 97 was an expedition to the Tien Shan mountain range in Kyrgyzstan, one of the former Soviet Central Asian republics. The team consisted of five Imperial College students and one student from the University of Liverpool. The expedition spanned from the 2nd July and 28th August 1997. The objective of the expedition was to attempt ten first ascents of peaks between 4000 and 6000m and to carry out measurements of high altitude exposure to ultra-violet-B (UV-B) radiation. The expedition was prepared with the support of the Imperial College Exploration Board, which provided technical, financial and administrative assistance.

During our stay we explored two regions in southern Kyrgyzstan.

The first base camp was in the Khrebet Borkoldoy. There, we acclimatized on a number of small peaks, explored the area and attempted seven peaks between 4600 and 5000m. Four of these attempts were successful. It is unknown at this time whether any of these were first ascents.

The second base camp was in the Pik Dankova region of the Khrebet Kokshaal-Tau on the Chinese border. Four peaks were attempted and two successfully climbed, one of which had not been climbed ever before (according to the archives in Moscow). Khrebet Kokshaal-Tau was a higher and much more impressive range than Khrebet Borkoldoy. The glacier scenery was breathtaking and a lot of the peaks were impressive razor cut edges.

UV-B measurements were performed in the regions of both base camps. Complete sets of data consisting of 3 measurements at 30 minute intervals from dawn to dusk were acquired at 3200m, 3400, 4100m, 4400m and 4600m. In addition partial sets were taken at various other altitudes, at times under non clear sky. *The data provides good basis for the investigation of the effect of altitude on the direct and diffuse radiation.*

On the whole the expedition was a success: everyone came back intact. The mountains were not as virgin as we thought they would be but nevertheless provided some good climbing and the UV-B experiment promises to yield some valuable results.

Preparations

Team. Our expedition team consisted of Loic Jounot (4th year Msci Physics) as the leader; Alexander Tancock (1st year Theoretical Physics) as the sponsorship officer; Jan Kerner (2nd year PhD student in Biomechanics) as the liaison officer; Olivier Hymas (4th year Biology); Kerim Hestnes Nisancioglu (3rd year Msci Physics) and Pierre Hymas (4th year Msci Physics at the University of Liverpool).

The preparations involved planning, fund raising, purchase of equipment and food and organization of the logistics of the stay in Kyrgyzstan (visas, permissions, transport to the mountains, re-supply).

Choice of location. The preferred climbing locations were determined prior to the departure. We made a deliberate attempt to avoid the higher massifs of the Tien Shan surrounding Peak Pobedy (7437m), which has been one of the hot-spots of Soviet mountaineering during the second half of this century. Instead we decided to explore some of the lower massifs which we thought no mountaineer had ever trodden before. The only map available in London was a sketchy US air navigation map at the scale 1:500,000 (not remotely useful for mountaineering) and we selected several areas with by pointing our finger to what seemed the highest and most promising peaks of the region. We applied to the authorities for the permissions to travel to these regions (all of them are in closed military border zone) and hoped for the best. Even though we were not granted permission for one of the regions from the top of our list we were allowed to another interesting area – the Pik Dankova region.

Fund raising. Fundraising as always was difficult enterprise. All direct contributors are listed in the budget section together with their respective contribution. In particular, we wish to thank Imperial College Exploration Board, the Harlington Trust, Imperial College Atmospheric Physics Group, the British Mountaineering Council and the Mount Everest Foundation. Other contributions were made by equipment companies that gave us generous discounts. We are grateful for the support of Field and Trek, SMC Mountaineering Equipment, Kodak, and Snuggledown. In addition, Pierre obtained personal funding of £500 from the University of Liverpool which was not added to our expedition fund and hence does not appear in the budget.

Equipment. The exploration of and mountaineering in the remote mountainous areas required range of special equipment. Apart from personal equipment (clothing and basic mountaineering gear) which everybody took care of himself there was the group equipment which was used by all members of the team and consisted of camping gear, mountaineering kit and communication equipment. The main items are listed in the table. Many other items have been used throughout the expedition by the whole group but are not strictly counted as *group equipment* because they belonged to individual members who only temporarily shared them. The group equipment was either borrowed or purchased. Some of the equipment was bought at expedition discount prices generously offered by several suppliers (as indicated in the table). All purchased group equipment was upon the return donated to Imperial College Recreational Clubs.

Donor	Items	Number	Supplier (bold if subsidised)
Harlington Trust	2-men Ferrino tent	1	SMC Mountaineering
	3-men Ferrino tent	1	SMC Mountaineering
	4-men Ferrino tent	1	SMC Mountaineering
	3 FM two way radios	3	Maplins
	Solar chargers	2	Maplins
	AA rechargeable batteries	28	Field and Trek
	MSR stove	2	Snow& Rock and Cotswolds
	Marlow ropes	4	Field and Trek
	Dead-men	4	Field and Trek
	CAMP ice-screws	9	Field and Trek
GRIVEL ice-screws	3	Field and Trek	
IC Explo-Board	GPS	1	
IC Medical Centre	Medical Kit	1	
IC Medical Centre	Dental Kit	1	
IC Atmospheric Physics Group	UV-B instrument	1	

Food. We decided to bring the majority of food with us as we were unsure about the availability of lightweight high-energy food on Kyrgyz market. Typically, meals consisted of rice or pasta together with either Vesta or McDougals sauces, with the occasional soup or ready-made mash potato meal. As expected the variety of suitable food was very limited in Kyrgyzstan. We bought there only rice and pasta. (A special warning must be issued about the needle-type pasta that bears no resemblance whatsoever with the Italian delicacy of the same name. Mountaineers: avoid it!)

Visas and Permissions. Obtaining visas for Kyrgyzstan requires an invitation approved by Kyrgyz Ministry of Foreign Affairs. We managed to get that through Sergey Pyshnenko, a Russian entrepreneur from Karakol, who, apart from many other businesses, runs a small travel agency providing logistics support to hunters, trekkers and mountaineers. After obtaining the necessary invitation the visas were issued by the Kazak embassy in London at the cost of £65 per person. Sergey turned out to be very useful contact as he helped us not only with the visa invitation but also with permissions from Russian military authorities (being an external border of the Commonwealth of Independent States CIS Kyrgyz-Chinese border is still guarded by the Russian Army) to enter the closed military border zone.

Travel. Intercontinental travel was another difficult problem. This time not because of some bureaucratic obstacles but because of our very limited budget. We have investigated several possibilities including Russian Transaero via Moscow, Turkish Airlines via Istanbul and Lufthansa via Frankfurt. Lufthansa seemed the most reliable but was prohibitively expensive. Luckily for the expedition after we sent Lufthansa a letter explaining the purpose of our travel and giving more information about the expedition the company decided to give us a generous student discount (normally given only to German students for European flights). With this

discount the price of the return flight was £445 a person, which was even less than what was offered by the competing (and in our view less reliable) airlines.

Local transport. We knew that transport to the mountains was a big problem for the previous IC expedition to the area. We therefore tried to organize the transport before leaving London. Hiring of a truck and drivers was agreed upon with Sergey. It should be said at this point that we were very lucky as Sergey's services were reliable (at least by Central Asian standards) and he himself was very effective in dealing with our requests. Everything was arranged via email (another of numerous Sergey's businesses is that of the only Internet provider in the area) which saved us from the frustration caused by famously unreliable communication systems of post-Soviet countries.

Medical Safety. Our two expedition medics were Kerim and Alex. Previous to the trip, Kerim had been an active Norwegian Red Cross Mountain Rescue leader for 2 years. Alex completed an advanced 5-day medical training course. The medical kit was provided by Imperial College Health Centre. All members had full medical insurance, provided by Imperial College Exploration Board.

On the way there

The last few weeks in London were busy. Our days were spent running around town in an attempt to make sure that we had bought, borrowed or built everything we needed (or thought we needed). Random stacks of food and equipment were accumulating in the IC S&G club stores still to be split up into six parts and packed into our rucksacks. As surprising as it may sound, the tents and some other vital pieces of equipment were delivered only on the afternoon preceding our departure. In fact the equipment company had failed to deliver a few minor items that Jan had to hunt for on the last evening in local outdoor shops. The final packing up ended at 4am on the 2nd July allowing us to catch the first tube to Heathrow.

Although each of us had at least two big rucksacks (90+ litres), we managed to slip onto the Lufthansa flight without paying a single penny for overweight. This was achieved by a combination of Alex's powerful negotiating skills with the company employees (he had already bargained tickets for half price), and loading ourselves up with all the heaviest bits of equipment. Olly will be remembered for wearing his bright yellow plastic boots and tying up half a dozen random bags, ropes and other miscellaneous items underneath his winter jacket, so that he looked very much like a oversized duck. The flight took us via Frankfurt to Almaty, capital of Kazkstan, in approximately 12 hours in total comfort.

After the arrival to Almaty we spent two nights in a flat of Wolfgang Steiniger, a German businessman whom we met on the plane and who, being an adventurous traveler himself, had sympathy for our low budget style of travelling. He also kindly offered to lend us his flat on the way back, despite the fact that he was not going to be there. Our visit of the Kazak capital mainly consisted of wandering around town under the hot sun, trying to cope with the jet-lag. On the second morning, we packed all our gear in two cars (Sergey and one of his assistants') and drove

to Karakol. The road took us over Torugart pass on Kazakh-Kyrgyz border and through beautiful Karkara Valley to the eastern tip of Lake Issyk-Kul.

Karakol is a fine location as a mountaineering base. In fact this is exactly what it was in the glorious times of Soviet mountaineering. On the way to the mountains we established our quarters at the Hotel Stadium, which is a cheap hotel underneath the local football stadium. The town has a good market where we bought some pasta and rice to go with the dry food we brought with us. We also bought some (not enough) fresh vegetables and fruits to enrich our monotonous diet. While in Karakol we also learnt that some better maps (scale 1:200,000) had been recently declassified (almost all maps of the border region used to be Top Secret) and that Sergey could get them for us. This was big relief as even though these maps were not perfect they were much better than the one we brought with us from London. While waiting in Karakol Sergey taught us how to operate a short wave radio, which we decided to rent from him to keep in contact while in the mountains. Apart from being able to summon help in case of some emergency (which fortunately wasn't necessary) this radio gave us the opportunity to communicate with other mountaineering bases in the region (mainly at Inylchek glacier under Pik Pobedy) and to learn about the weather changes coming to the areas where we operated.

We spent several days in Karakol waiting for the final approval by the Russian army of the permissions to enter the restricted military zone. In the end after more than five days spent in Karakol, we more or less ran out of things to do. However, the mere fact of being in Kyrgyzstan was enough to keep our senses lit up. It wouldn't be an exaggeration to say that the people of this country (and in particular of Karakol) rarely saw foreigners from the Western nations and were very interested to speak to us. Jan must be thanked for making endless translations for the rest of us when people spoke Russian. All encounters were extremely friendly and an endless source of fascination. The town markets, both the food bazar and animal market, were probably our favorite spots in town, because they were so lively and colorful, the heart of an otherwise poor town embedded in the hardships of the post-soviet era.

When the permits arrived we further waited a couple of days for the truck driver and his truck. This truck wasn't a joke: an impressive 6 wheel drive Russian army truck which swallowed gallons and gallons of petrol and could go anywhere. We left rather hastily on the night of the 8th July. We drove along the southern shores of Lake Issyk-Kul and into the first two valleys when we finally reached Kara-Say plateau (about 3350m) with a rear military base. Although there seemed at first glance not to be any activity to occupy the soldiers, the base was in very good condition and soldiers not totally bored and depressed. The Russian flag was happily flapping in the wind on the high pole. So... here we were at 2am, in front of the barracks. No need to say that we woke up the dog and attracted one of the guards to the gate. The rest of the night's story is a piece of delicate negotiation carried out by Jan in the superior's office, who seemingly and understandably was not in the best of moods for our reception, having just got out of his pyjamas. After extremely careful inspection of all our documents, which took him almost two hours, he allowed us to stay near the base for the night. In the morning, now in much friendlier atmosphere, followed another inspection and after that we were granted the entry. In the border zone we had to travel for another day and to cross several mountain ridges (the highest pass as high as 4000m). We finally reached the bottom of the Emegen Valley in the afternoon of the 9th July.

In the mountains

Khrebet Borkoldoy (9 July - 2 August)

We got off the truck about 10km from the place we chose to be our base camp. This gave us a long walk-in, which was not a happy moment for half of us. It was particularly awkward to acclimatize by carrying two loads of very heavy rucksacks up the valley. Some of us, in fact, got very sick and miserable. Olly must be thanked for helping to carry multiple loads for those of us who were particularly unwell, without making any fuss whatsoever. Permanent base camp was established 3 days later at the foot of the highest peak of the massif (just above 5000m), on a very comfortable patch of grass behind a nice boulder at about 3500m.

The peaks of Khrebet Borkoldoy range from about 4000m to 5100m. The top of the Emegen valley is at around 3600m. Glaciers are receding and covered by soil, boulders or a crust of dust, so that it seemed at first glance that there were no glaciers at all. Snow, by mid-summer, covers only the north faces of the mountains. Other faces were almost clear. Instead, most slopes seemed to consist entirely of scree, so that they were a pain to ascend but a lot of fun to descend. Nonetheless, the Borkoldoy has a lot of potential. We did not climb, for example, any of the western parts of the range, and could see many good looking mountains. The valleys themselves are fairly arid, with no trees and very little plant life. We heard and saw a fair few wild creatures such as the locally famous Marco Polo Sheep (which are not sheep but goats), marmots by the thousand, chamoix, rabbits and hares. Although we never saw any, there are also apparently bears and wolves.

In the Khrebet Borkoldoy where there was little snow a lot of climbing took place on rock. The quality of rock was generally poor and at times very scary. The actual technical difficulty varied from easy scrambling to severe walls, however because of the quality of the rock anything harder than an easy climb became very challenging. Placing protection was difficult (impossible) and time consuming on the rock sections of climbs.

At the very beginning we split into two groups which operated more or less independently during the whole expedition. **Group 1:** Olly , Alex and Pierre. **Group 2:** Loic , Kerim and Jan.

Description of the most important trips undertaken from the first base camp follows.

Introductory peak (4400m) - group 1 plus Loic. Attempted in a single day from preliminary base camp. Set off at 7am under covered sky. Good progress up the moraine until the North-Eastern ridge (10:30am). Difficult terrain met on sharp ridge: loose rock and patches of ice without crampons. Alex and Olly attempted independent solo efforts from 4200m up. They reached just underneath the snow lip of the summit. Back safely at camp in the evening.

Ice-climb peak (4650m) - group 1 minus Pierre. Beautiful but somewhat hazy day. First section of climb was a vertical section of ice. Pierre stayed behind at the foot of the peak on the upper part of the moraine. Alex and Olly reached the summit glacier by 3pm. The ice-fall had partly turned into a water-fall by then, so the last part of the ice-climb was actually made on the adjacent extremely loose rock. The summit was reached by approximately 5:30pm. To the great

relief of group 2, whose members considered this endeavor a bit too risky, Alex and Olly got back safely before dark.

Measurement peak 1 (4400m) – group 2. Acclimatization trip up to an easy peak with an excellent view over the whole area. Summit reached at about 3pm. Kerim went back to the base camp while Loic and Jan bivied in a col to spend the whole of the next day doing UV measurements at 4000m.

White peak (4600m) - group 2. One day trek to the Karasay valley to the south-west of the base camp. The ridge was crossed with very heavy rucksacks at high altitude just under the peak Olly and Alex climbed two days earlier. A desperately unrewarding scree slope had to be climbed. On the other side we had to sacrifice altitude gain for a decent camp. Beautifully situated camp (3720m) above a torrential mountain stream covered by snow bridges. White peaks in the background. Next day crevasse rescue training on the glacier above. On the following day we attempted a 4600m summit. Good progress up the southern side ridge. Moderately steep terrain required some running ice-protection. Retreat decided 20m down / 100m along the final sharp mixed snow and loose rock ridge as bad weather was closing in. Ironically, as we had retreated, the sun came back in spells The trek back to the main base camp took almost 12 hours and was pretty tiring. We went almost all the way down one valley and back up the other (and yet still missed the lowest crossing point!).

Measurement peak 2 (4640) - group 2. Decided to make high altitude measurements combined with climbing. Set off in the afternoon of the July 23rd. First night on sharp rock half way up on the way to the western col. Second night on snow just below the col. Next day up to a flat bump below an extended snow and loose rock ridge leading to the summit (4800+). Measurements were made from dawn to dusk at 4640m in front of breathtaking scenery of two valleys with glaciers and glacier lakes. We identified lots more hidden peaks. Next day more measurements at 4400m and back down to the base camp in a few hours.

After three weeks in the first base camp the truck came from Karakol to bring some supplies and to take us to Pik Dankova region to the south-west of the Khrebet Borkoldoy. Overall, the change of base camp proceeded without major problems, thanks to a group of hunters equipped with a radio that we used to contact Sergey (our radio broke down after the first week). The truck was only two days late. Because we had been a little over-zealous with food rations at the beginning, we ran out of “proper” meals, but because the hunters were successful in their trade as well as being friendly and generous, we survived without bigger problems.

Pik Dankova region - Khrebet Kokshaal-Tau (2 August - 17 August)

Region of Pik Dankova (5982m) is situated approximately in the middle of Khrebet Kokshaal-Tau which runs all way along the border with China. It is larger and higher range than the Borkoldoy with most peaks over 5000m. It also gets a lot more bad weather. We approached the range from the north entering the main valley from an army base at Uzengegush river. The idea was to set up a base camp below the glacier leading to the east of Pik Dankova, to give us access to all of the lower peaks with the option of attempting Dankova itself.

Unlike the Borkoldoy, the Dankova massif has been visited several times by foreign expeditions (we learnt that from the officer in the nearby army base). Since the first exploratory expedition of the late fifties the activity has been limited only to the faces of Pik Dankova which provided place for higher range practice during the Soviet days. There are still many excellent peaks left to do that would be first Western ascents or even first ever ascents.

The day after our arrival at the base camp group 1 set out for an 8 day stay at the the glacier west of Dankova about a day's walk up from the base camp.

During the first few days on the glacier the team was plagued by poor weather that made climbing annoyingly limited. The climbing conditions were far from ideal for the first few days, with snow knee deep on average. Only after about five days on the glacier the days became sunny and the evenings clear.

In the mean time group 2 stayed at base camp to attempt some of the surrounding peaks and explore the area. Much more lucky than group 1 with the weather.

End of ridge peak (4850m) – group 2. Set off to reach the ridge above base camp at 6am with a view to attempt one of the peaks of that ridge. Early morning work on steep scree to get to the ridge. Traverse on a lightly snowed ridge till midday. Clouds and bad weather closing in from 10am onwards. Midday 20 minute lunch before the last section. Loic and Jan carry on roped up. Kerim waits at the foot of the last section. More difficult, uninspiring snow conditions (prone to avalanche) due to recent snowfall. Ice traverse and an attempt to move further in waist deep snow. Protection only found from the underlying ice-sheet when digging into snow. Managed to get to the opposite side of the small final snow face. Conditions not favorable. Snow and weather getting worse. Retreat at 5pm within 100m from the summit. Maybe we could have made it by choosing a slightly different route. The return home was memorable. We decided to down climb directly below the peak instead of retracing our footsteps. As we were approaching the valley below us, we came to a dead end: nasty looking cliffs. We decided it was very risky indeed to abseil down with a single 50m rope. Dusk settled in. Alternatives were either trying to find a non-cliff section further on, in difficult terrain with no idea of what was round the corner, or retracing all our footsteps up to the ridge and along the ridge back home. The latter was chosen by 2 votes to 1. Horrible return journey back up 500m on rock and scree to reach the ridge. At that point, all three of us were absolutely exhausted, hungry and dehydrated (we had only drank 2 liters of water between 3 for the entire day) and group spirit was approaching zero. Back along the ridge. Good piece of navigation and return home by midnight. Drank large quantities of tea, without the need to eliminate any surpluses from our bodies. Fell fast asleep instantly.

Snowy peak (4900m) – group 2. Very round looking peak visible from the base camp. Proceeded to conquer it in a single day. Didn't quite realize how far and high it was! Set off at 6:30am. Kerim hates early mornings because Norwegian mountaineers never usually wake up early (although Loic tried to explain that 6am was a pretty late start). Walk up the valley up close to where the main glacier started and proceeded on the side of a gorge up to the gentle face of the snowy peak. Chose the option of the East ridge as we stepped onto the white slopes of the mountain. Went up a nasty gully cutting steps through snow. Slow but constant progress. No real rest. Finally reached the col north of the peak. Again the weather closed in, but we decided to

continue a bit more. Soft snow followed by patches of ice. Very slow progress. Blizzard sets in. We continue a bit further. Agreement that we should come back down again. No frustration (we were getting use to retreats by now). Back in time for late dinner.

After these two trips group 2 followed group 1 onto the glacier. Just before leaving the base camp we met a party of six Russians (5 men and a woman) supposedly only trekking through the region. The last stretch of fresh food was used to invite them for lunch. Lively discussions were held. We had lots in common because almost all of them were science students from the Moscow University. A decision was made to go together up the glacier and possibly attempt a peak together.

Next day trekking up the glacier with the Russians on an unpleasant moraine and ice terrain with very heavy rucksacks filled with food and equipment for eight days, plus extra rations of food and petrol for group 1, who requested more on the radio. Finally settled in the early evening at the base of the eastern granit wall of the local Matterhorn peak (Pik Alpinist – 5462m). Lots of stone falls at hand. The view on the glacier was very beautiful. A long trail of ice with a central moraine, crowned by glittering white peaks, most of which seemed to be climbable. After radio contact in the afternoon group 2 met with group 1. Exhausted by the difficult weather and snow blindness of two members of the group they left next day for the base camp.

Pik Druzby (5330m) – group 2. The next day saw a fairly late start at around 8am with a view to reach the col under Pik Druzby. Good progress through crevassed terrain. The col was not readily accessible, being over a very steep ice wall. In early afternoon, we pitched the tents instead on a flat bump at the foot of the last section of Druzby. We spent part of the evening making steps in the snow for an easier start on the next morning. It was decided to climb independently from the Russians who had a totally different approach to climbing.

On the next morning we woke up at 4:30. Tea brewed for much too long. We departed at 6:00am. While the Russians moved straight up the first section, we traversed on some rocks on the ridge. Slow but good progress was made, placing constant running protection. A dramatic moment saw Kerim lose one of his crampons which slid down the hill, fortunately stopping 100m below. A multi-stage lowering down workshop was swiftly organized. Kerim recuperated his crampons below an ice step. Loic aided him and the party was back on route, having lost an hour or so. Good progress made up on the rocks on ridge and up the finally steep slope. By 3pm we reached just below the final summit cornice. Kerim decided to stay while Jan and I were going to traverse under a small bit of the cornice along to an easy passage to the top. Loic made it but a communication breakdown between the two ends of the rope created some confusion as what was exactly happening. Kerim and Jan thought for a moment Loic might have disappeared into a crevasse on the summit slope, judging by the tension on the rope. It turned out that he was safely waiting for Jan to come and join him on the summit proper. Summit left at about 5pm. Good bye to Russians on the way down as they were traversing over the summit to descend to the neighboring valley. Back to the camp on the snowy bump in the evening. Back to the central glacier next day.

Final Peak (5148m) – group 2 minus Kerim. Two days left to go and we decided to explore the other side of the glacier and climb, take measurements or both if possible. All depended on the

weather. On the following morning we reached the col after only a few hours walk up a tributary of the main glacier. The night saw pretty strong winds, enough to make us check the tent anchors several times. But the next morning was absolutely clear and after intense boot defrosting activity, Jan and Loic set off for an attempt of a snow face with a summit at 5148m. Deep snow but good ice anchors underneath the snow cover. By 2pm we reached the summit on a beautiful clear day. Magic moment and lengthy photo session. Back to Kerim who has been taking measurements whole day at 4pm.

Back to the base camp next day to have a rest and prepare for the way home.

On the way home

Karakol (15 August - 21 August)

Our truck was due in on the evening of the 15th August and, in fact, turned up on that very evening, thanks to good radio contacts with Karakol. The return journey through the mountains took the whole day of the 16th August. We then proceeded to stay for 6 days at the Hotel Karakol, which, in pure post-soviet style, had more maids than customers. The initial idea was to do some tourism within and around Karakol. However, due to the prevailing state of exhaustion and a few seemingly contagious stomach infections, we did not achieve as much as we wanted.

It is fair to say that the main concern for all of us was to recuperate from a seven weeks' stay in the mountains, with nothing to eat but dried tasteless/packaged/powder "cuisine". As a matter of fact, fresh food had been our prime conversation topic throughout the expedition. A consequence of this obsession was that we ate as much as we could (far beyond reasonable) upon arrival. During the week, our main activity in the town was to try out all its numerous eateries (thoroughly recommended). We probably got close to having tried them all. On top of that, we usually went to the market at least twice a day for more food.

Activities during our stay in Karakol also included an enjoyable afternoon in one of the local hot springs, in a nearby alpine Akssu Valley. We also indulged into some bathing on the shores of the lake.

Bishkek (21 August - 26 August)

Long distance buses leave almost every hour to Bishkek, but taxis and mini-buses can also be hired. With a group of six and a lot of luggage, the easy and cheap option was to rent an 11-seater mini-bus, which provided enough space for everyone and everything. After a day's ride along the northern shores of Lake Issyk-Kul, through arid country and mountain passes, we reached Bishkek, the capital of Kyrgyzstan. The city is radically different from smaller provincial towns such as Karakol: western influence is all pervading and the city centre is gradually getting submerged by new imports.

Not really self-conscious enough to notice that we had been gradually upgrading our hotel standards since the beginning of the trip, we chose to stay at the comfortable (but by no means

expensive by western standards) dormitory of the new Bishkek Business School, in the centre of town. By the time we got to Bishkek, there was less and less drive for doing tourism. Our visits of the city were very much biased towards food and strolling in the sun. We ate lots of kebabs and, believe it or not, also lots of ice-creams.

Almaty (26 August - 28 August)

We decided to return to Almaty one day in advance to avoid any disappointment involving missing a plane. The spare day was spent by some of us in the amazing Almaty public baths. We thoroughly recommend the Russian sauna section. The first night in town was spent at our friend Wolfgang's apartment, whilst the last night was spent sleepless at the airport. The return flight leaving at 5am went well, apart from the fact that Olly, Kerim, Pierre and Alex showed up literally only as the bus was leaving the terminal because they had been waiting in the wrong place.

Medical problems

The travelling part of the report will be closed by a list of medical problems we have encountered. Fortunately none of them was too serious and we all fully recovered within several weeks after the return to Europe.

- Loic, Jan and Alex suffered from bacterial stomach infections. These were cured using antibiotics from our medical kit.
- Olly and Pierre got minor snow blindness on the glacier. They had to spend one whole day in the tent with their eyes covered in order to recover.
- Pierre fell and suffered a minor sprained ankle, lots of cuts and bruises. Basic first aid was used on the ankle and cuts. Antibiotics were administered to prevent infection.
- Alex suffered from what was believed to be a self-limiting tropical virus. Upon return he was admitted to the Hospital for Tropical Diseases for 3 days.

Science Project – UV-B monitoring

Ultraviolet (UV) solar radiation reaching the earth's surface has received considerable attention during the past 10 years due to the decrease in stratospheric ozone. UV radiation is the part of solar radiation with a wavelength in the range from 100nm to 400nm and UVB, sometimes called the damaging UV radiation, has a wavelength between 280nm and 320nm. UVB radiation is the part of the UV radiation reaching the surface which is most harmful to biological systems. Consequences for humans are sun burns, skin cancer, snow blindness, and mutations in the exposed skin (malignant melanoma) [3].

To evaluate the impact of UVB radiation it is necessary to take into account the effects of stratospheric ozone, latitude, season, time of day, aerosol content, cloud cover and altitude. Several projects have dealt with these topics, however conventional instruments, such as spectroradiometers, used for measuring UVB radiation are bulky and heavy. Therefore, there have been done very few measurements of UVB at high altitudes. The only known measurements above 2000m have been carried out in the Chilean Andes (5500m) [6], at Jungfraujoch in the Swiss Alps (3576m) [1], and at Mauna Loa on Hawaii (3397m) [4]. To contribute to this research the objectives of the science project carried out during the expedition were as follows:

- To develop a hand held instrument capable of measuring UVB radiation.
- To test the instrument under extreme conditions and at high altitudes.
- To measure direct and diffuse UVB radiation at high altitudes.
- To investigate the change in the intensity of UVB radiation at various altitudes.

Materials and Methods

Because UVB only represents a tiny fraction of the total incoming radiation from the sun, it is difficult to filter the incoming radiation in the instrument. By utilising a new silicon carbide photodiode detector, the design was considerably simplified compared to conventional instruments. Due to intrinsic properties, silicon carbide has a filtering effect much needed for UVB measurements. The result is a broad band UVB instrument which fits into a 1m long, watertight tube weighing only ca. ½kg.

The incoming radiation on the photodiode is translated into cumulated counts on the digital display. Readings are therefore zero level data. This simple design was preferred to a more complex one, which would be more vulnerable to failures. The frequency window of the instrument is centred on 313nm, with a width of approximately 7 - 10nm. The angular window is 20 steradians due to the sharp angular response of the interference filter and the difficulty in finding a high quality diffuser.

Calibration of the instrument is an important and a demanding procedure. The instrument was approximately calibrated (10% to 20%) prior to departure. An appropriate post-expedition full calibration of the instrument is beyond the financial limits and technical abilities of the expedition. However, the lack of calibration was not thought to cause large inaccuracies in the planned measurements.

A set of measurements consisted of a series of 3 and sometimes 4 readings taken every 30 minutes from dawn to dusk (approximately 60 - 70 readings in one day). The 3rd and 4th readings were added after gaining experience in using the instrument, therefore these are not present in the early runs. The sequence of readings is described in Table 1.

1st Reading	Direct radiation	Instrument pointing directly at the sun for 100 seconds.
2nd Reading	Diffuse radiation at $\theta = 30^\circ$ to the horizontal.	Instrument pointing opposite the sun for 100 sec.
3rd Reading	Diffuse radiation at $\theta = 60^\circ$ to the horizontal.	Instrument pointing opposite the sun for 100 sec.
4th Reading	10 min diffuse radiation at $\theta = 60^\circ$ to the horizontal.	Instrument pointing opposite the sun for 10 min.

Table 1: The sequence of readings taken every 30 min from dawn to dusk.

Sets of measurements were taken at altitudes of 3240m, 3460m, 4000m, 4400m, 4640m, and 4760m. Further partial sets at some of these heights include cloudy days, rainy days, and days where only a limited number of readings were taken.

Results

Initially, only the two first readings described in Table 1 were taken every 30 min. It was thought that taking the diffuse readings at 30° to the horizontal would prevent the direct radiation interfering with the results. However, it was soon discovered that in a mountainous region this resulted in pointing the instrument at surrounding mountains or sides of valleys. It was therefore decided to make the diffuse measurements at 60° to the horizontal instead, but to continue with the 30° readings as a control.

A typical set of measurement from a full day is shown in Figure 1. From the figure it can be seen that both the direct and diffuse UVB radiation follow a nearly Gaussian curve during the day. The maximum was observed at about 13:00, however this was the local time and not the true solar time. The same Gaussian shape was also observed for UVB measurements made on Hawaii [5].

When comparing all the sets of measurements of direct UVB radiation, there does not appear to be a rising trend in the number of counts (Figure 2). This is because the measurements were all taken at different days. The result is that the solar zenith is different for each of the various

altitudes. When comparing the dates of the different measurements, it is found that the readings done at 3240m, 3460m, 4400m, and 4640m were all done within the same week. The measurements taken at 4000m and 4760m were done one week before and two weeks after the other altitudes respectively.

During the passage of one week the solar zenith is not thought to significantly influence the readings. The result when plotting the maximum values for the direct UVB radiation at 3240m, 3460m, 4400m, and 4640m can be seen in Figure 3. As can be seen, the data follows an approximately linear trend with a slope of 0.6 ± 0.1 counts/second 1000m. This is equivalent to an increase in the direct UVB radiation of ca. 15 to 25%/1000m, in this altitude range. The increase is significant and corresponds well with similar research carried out in the Alps and in Chile: Reiter et al. (1982) found that the daily sums of solar radiation between 310 and 340nm increased with ca. 14-27%/1000m from data collected at 700m, 1800m, and 3000m in the Alps [7]. Blumthaler et al. (1992) found an increase of 19%/1000m for direct UVB in the Alps [2]. Piazena (1996) found that direct UVB radiation in the Chilean Andes increased by 8-10%/1000m whereas the diffuse UVB decreased by ca. 2-4%/1000m from data collected at 0m, 2310m, 2450m, 3850m, and 5500m [6].

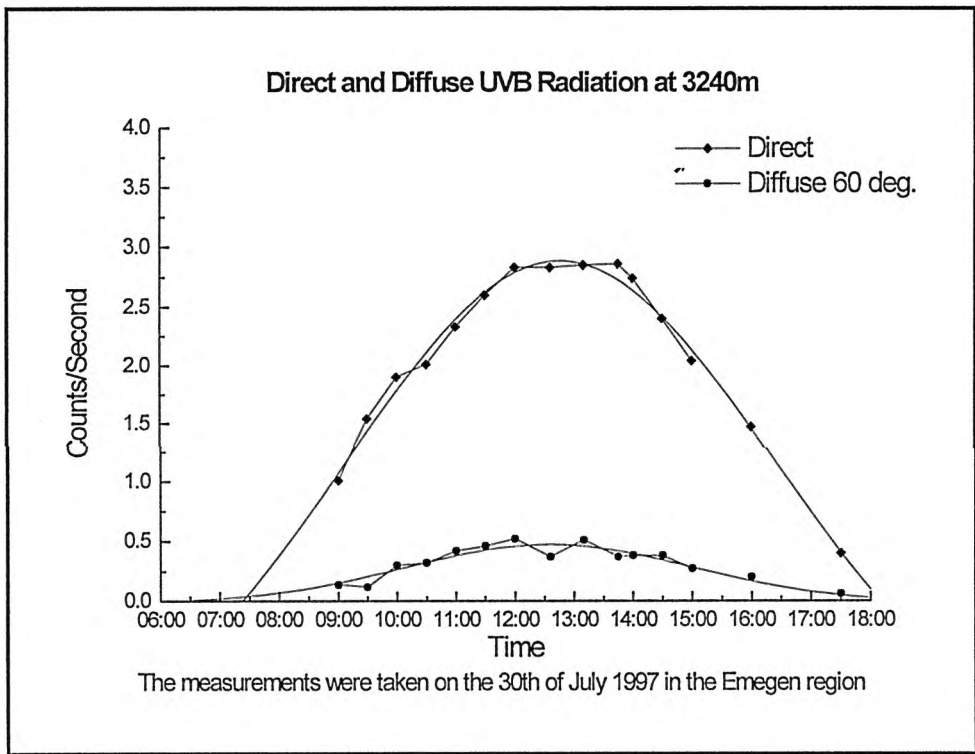


Figure 1: Example of data collected during a days measurements. The curves show counts/second of direct and diffuse radiation at 3240m, fitted with a Gaussian. The diffuse readings are the 3rd readings described in Table 1.

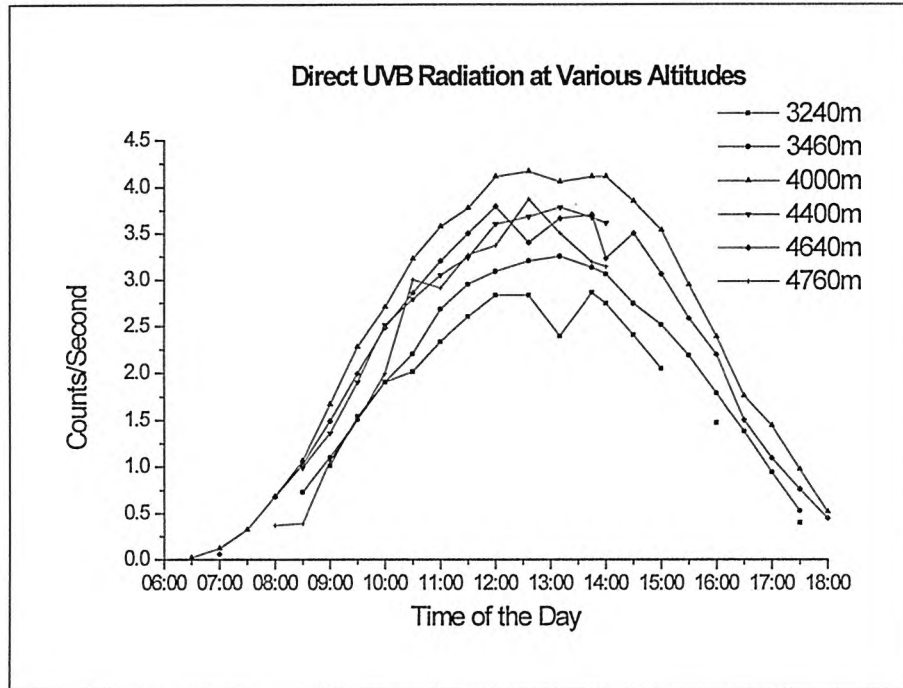


Figure 2: Plots of the measured direct UVB radiation at all the different altitudes.

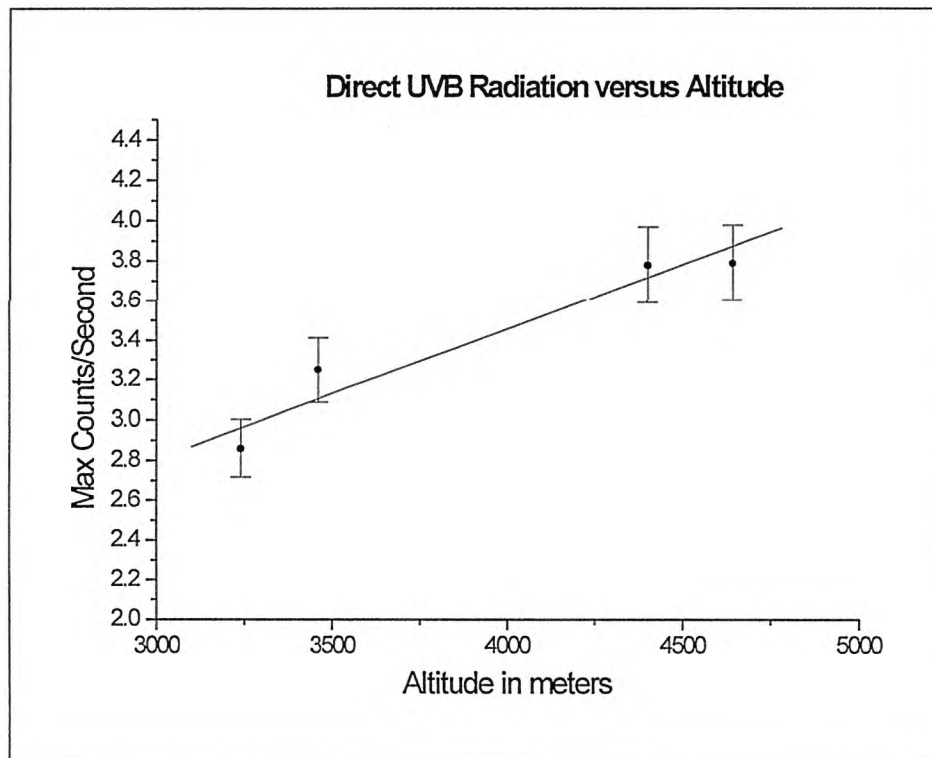


Figure 3: Direct UVB radiation versus altitude. Only the data from the measurements done at 3240m, 3460m, 4400m, and 4640m are included. These were all collected in the same week. Errors related with the measurement method are shown, not errors caused by ozone, aerosols, etc. To find the exact relationship these factors will have to be taken into consideration.

The data for the diffuse component of UVB was not as complete as the readings for the direct radiation. Therefore it was not possible to evaluate whether it decreases, or increases with altitude. However, it is probable that the decrease in the number of scattering molecules and particles at higher altitude results in a decrease in the diffuse solar radiation and an increase in the direct solar radiation. It should be noted that to perform accurate measurements of diffuse radiation a 360° diffuser is needed.

Conclusion

As the results show, the scientific part of the expedition was a success. The instrument was found to function satisfactorily and endured many weeks of trekking in the harsh conditions encountered on the mountains. Although the procedure for taking measurements was crude, the data collected for the direct component of UVB radiation gave good results. The analysis proposes that direct UVB radiation increases with 15 to 25%/1000m, which corresponds well with data collected by other research groups. To verify these results the ozone content and the solar elevation have to be taken into account. This work is currently being done in co-operation with the Atmospheric Physics group at Imperial College.

Several improvements can be made for future use of the instrument. The three most important are to construct a simple data logger, to attach a motorised stand capable of tracking the sun, and to include a 360° collector for the measurements of diffuse UVB.

The results clearly show the need for mountaineers to be cautious when exposed to the sun at high altitudes. The direct solar radiation at 5000m, could increase by as much as 100%, or more, compared to that at sea level. At one point during the expedition, sun lotion was accidentally smeared on the filter of the instrument, causing the readings to drop dramatically. This proves that it is essential to bring an adequate supply of sun lotion, as well as wearing hats and shirts to protect the skin from severe burns.

References

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Budget

The expedition accounts have not been fully closed yet as there will be more expenses with the production of the final report. An overview of the income and expenses is given here while the full listing will be provided in the final report.

Income

IC Exploration Board	£2,500
British Mountaineering Council	£200
Mount Everest Foundation	£500
Harlington Trust	£3,000
Convocation trust – University of London	£575
Private donors (USA)	£100
Private donors (Hong-Kong)	£550
Sotuma (France)	£350
Personal contributions	£3,000
Total	£10,920

Expenses

Group equipment	£2,980
Group consumable equipment	£200
International travel	£2,765
Food	£650
Pre-expedition	£455
Visas	£390
Science	£330
KG - hotels	£500
KG - inter city travel	£480
KG - truck hire	£1,300
KG - Sergey's services	£170
Gifts	£100
Post expedition (anticipated)	£800
Total	£11,120

Summary

In conclusion, as pointed out in the introductory section of this preliminary report, the expedition was on whole what we consider to be a success. Although the mountaineering objectives were not fulfilled as much as we would have liked, they are still fulfilling. In particular, we are in the process of giving a name to a summit in the Pik Dankova through the Russian Alpine Association. The science data is currently being analyzed by Kerim and is promising. We will be working on the final report as well as on a separate science report shortly, based on what has been written and analyzed so far. Also, presentation has been scheduled with Imperial College Exploration Society for 22 January 1998.