ECOLOGY, GEOLOGY & GEOGRAPHY
FIELD TRIPS TO THE HIMALAYAS
"The Himalayan mountain range stretches over 2500 km in an enormous arc from the Indus river in the west to the Brahmaputra in the east. A paradise for those interested in geography, geology and ecology, here you can see all the processes associated with mountain building in progress and witness the effects these have on the plants, animals and people of the region. The spectacular landscape provides a backdrop of stunning beauty.

Indus Experiences is a specialist tour operator with over 30 years experience in travel to India, Nepal and Bhutan. The company is fully bonded with the Civil Aviation Authority (ATOL No. 4568 and ABTA No. W5240) offering complete protection. As a premier player in tailor-made and special interest holidays, Indus has unrivalled experience in the Indian sub-continent and was awarded 'Best small holiday company to Southern Asia' in the 2013 British Travel Awards.

We are delighted to present a range of special interest holidays/field trips to the Himalayas, offering you the opportunity to see at first hand something of the amazing geology, geography and ecology of the region, as well as its culture. We work with partners in educational institutions, geology and geography societies and independent experts to deliver these trips."

Enquiries: holidays@indusexperiences.co.uk

www.indusexperiences.co.uk/earthsciences
THE HIMALAYAS

A trip to the Himalayas offers a wide range of ecological, cultural, geographical and geological experiences shown in awesome magnitude and fine detail. It is a dynamic landscape, ever changing under the forces of wind, water, gravity and ice and one that challenges all that lives in its shadow.

It is possible to read the history of the landscape through the rock features and the spectacular scenery from glaciers to high altitude deserts. The fascinating cultures and their adaptations to the environment are closely linked both to the underlying geology and the specialised flora and fauna of the region. Looming over the continent the Himalaya is a mountain belt of superlatives and one of the most diverse, fascinating parts of the world. In parts almost untainted by outside influences, it truly is the land of the gods.

“Thank you for the chance to stand with the world at my feet and the heavens on my shoulders. I will truly cherish every tiny memory” – Caitlin Jones, King Edward VI College 2010
THE LIVING CULTURE

The isolated communities dotted across the deeply incised valleys of the Himalayas retain traditional culture and values. The sustainable agricultural and survival techniques that are adapted to the harsh conditions have allowed the people of the region to thrive. However, these are being challenged by changes in both climate and technology and this is a critical time for these cultures.

The rapid changes in altitude, microclimate and soil offer particular issues for plants and animals of the region but also offer the opportunity to see varied ecological niches in close proximity. Life in the Himalaya has adapted in intriguing ways to the specific conditions and these will be on display throughout your trip.

SCIENTIFIC LANDSCAPE

The region is the case study for active mountain building, rapid uplift, vigorous weathering and strong downcutting by rivers. Here you can see the astonishing variety of rock types associated with continent collision - fabulous granites, intriguing schists and gneiss in outcrop or all found together as boulders in river beds.

Witness erosion, sediment transport and deposition at a rate unmatched elsewhere on Earth. There is evidence of mass movement everywhere, from massive scree slopes to the ever-present road-mending teams and more subtly in the lake deposits laid down as landslides temporarily dammed major rivers.
THE MAKING OF MOUNTAINS

Travelling from the urban humidity of Delhi to the verdant foothills of the Himalayas this trip takes you into the heart of a monsoonal landscape and beyond: lush vegetation and natural life abounds while charged waterfalls plunge from high peaks to a dizzying depth. Moving up into the mountains themselves the land gives way to deeply incised valleys and dramatic passes, while monasteries perch with delicate balance above the beguiling moonscape of the high altitude desert. In this arid landscape fortified by distant snowcapped peaks only nomadic people live, tending their flocks in the more clement summer months. The journey finally drops you gently down into the Indus valley, neatly organised with its rich irrigated margins and intriguingly distinctive Ladakhi culture.

**Day 1. TO DELHI**
Travel to Delhi

**Day 2. DELHI**
Arrive Delhi. Take a rickshaw ride through the vibrant Chandani Chowk followed by a coach tour of Delhi giving a flavour of the history and architecture of the city.

**Day 3. DELHI**
Visit the Qutab Minar, a tower and religious complex built of sandstone and marble between 1192 and 1368, a UNESCO World Heritage site. Follow this by a ride on the ultra-modern Delhi Metro and a trip to Raj Ghat, a moving memorial to Mahatma Ghandi.

**Day 4. TO SHIMLA**
Take the Shatabdi Express train across the plains with vast rice fields and some major industrial towns. Keep your eyes peeled for the bright flash of a wild peacock. Change at Kalka to the Toy Train for a memorable journey, ascending through the foothills of the Himalaya, the track passing through lush forest, 102 tunnels and over 864 bridges.

**Day 5. SHIMLA**
The summer capital of British India, Shimla is a town of contrasts. Along the ridge of the Mall are buildings familiar from any Cotswold town while a five metre walk downslope takes you into the bustling bazaar, which is a vibrant melting pot of colours, smells and sounds; a complete assault on the senses. Wander here, take marsala chai to refresh yourself.

**Day 6. TO MANALI**
Today we will travel by coach through sediments eroded from the mountains as they were forming and then deposited by rivers in the foreland. We will also cross a major fault – the Main Boundary Thrust. As we pass over the mountainous landscape you will see how rivers are rapidly cutting down as the land has been uplifted. We will pass through isolated hill communities with their distinctive agricultural practices, but also through rich riverside orchards.

**Day 7. TO KEYLONG**
You will drive over your first major pass today. Rhotang la is at altitude 4114 m and is the boundary between the lush Kullu valley with its predominantly Hindu culture and the high arid valleys with their Buddhist culture in the north. Since 2010 there has been a project to build an 8.8 km tunnel under the pass - an example of how modern engineering is developing infrastructure in the Himalaya. We will see metamorphic rocks, altered by the heat and pressure of the collision between India and Asia, and as we travel further the intensity of these deformations becomes all the more striking. Look out for the spectacular lammergeiers and griffon vultures soaring in the valleys.

**Day 8. KEYLONG**
A rest and acclimatisation day after two days of travel. We will take an exhilarating walk to the Buddhist Khardang gompa (monastery). From there are marvellous views across the valley to a patchwork of fields and glaciers. Keylong is the last town we shall see for many days. Make the most of it by sitting in a cafe to watch the town life pass you by and enjoy an apple pancake with your chai.

holidays@indusexperiences.co.uk

www.indusexperiences.co.uk/earthsciences
DAY 9. KEYLONG
Today is a day of high, wide landscapes, switchback roads, specialised plants and wonderful features. This is a region isolated by the snows for up to eight months of the year. In addition to the (increasingly intensely) metamorphosed rocks, we will see a variety of granites one of which, the Jispa granite, is prized as building stone and seen far from this site. From the window, you will see rocks folded on a kilometre-scale while by the roadside you will see millimetre-scale copies. All around you witness evidence of the effect of glaciers; some ancient but mostly the result of the glaciers you see perched in the high valleys above you. Spend the night in the tented camp at Sarchu.

DAY 10. TO TSO KAR
We pass though high deserts today. The rocks are ancient sediments deposited in the shallow seas between India and Asia before collision. But it will be the more modern sediments that catch your eye, sculpted by wind and water into fantastic shapes. The wonderful landscape, cut by steep river chasms, includes fairy chimneys – the result of spectacular weathering processes. Look out also for Tibetan wolves, wild asses and antelope. Spend the next two nights in the tented camp at Tso Kar.

DAY 11. TSO KAR
You may be woken by the tinkling bells of the pack horses as a group of the nomadic Khampa people pass. Catch, if you can, the richly decorated bridles of the horses and the characteristic clothes of the Khampa men. We will walk to the saline lake, Tso Kar. The lake was once much larger and we shall be walking (and tomorrow driving) across its old bed. The conditions for life here are demanding – high altitude, intense cold high, wind and saline spray - and the plants here are specialised to survive these unforgiving features of the landscape. The lake itself has salinity about half way between that of the oceans and that of the Dead Sea but even so there is plant life here and many species of birds stalk the shores seeking insects.

DAY 12. TO LEH
After the barren More Plains, we will cross the second highest navigable road at Tanglang la (altitude 5328 m). From here we will drop into more fertile country and you will see houses again! At Lato we will see rocks so highly folded that they are vertical and we will be close to the suture between India and Asia. Eventually we will come to the river Indus and follow it downstream to Leh, passing stunning gompas and massive outcrops of white granite which formed as the continental rocks melted during the collision.

DAY 13. LEH
After the demands of high-altitude travel, today is a day to relax and sample the distinctive culture of Ladakh. We will visit Thiksey monastery with its astonishing complex of white buildings and the breathtaking 15m statue of the Buddha. Chat to the monks about the monastic life. Back to Leh and an opportunity for you to explore the town.

DAY 14. DAY TRIP TO THE ZANSKAR VALLEY
We will drive to the confluence of the rivers Indus and Zanskar then along the Zanskar valley to see the marvellous rock formations and the engineering feat that is the road clinging to the valley sides or admire the bravery of the people who use the basket method of crossing the river. There will be an opportunity to undertake some fieldwork here – interpreting complex sedimentary sequences or exploring slope stability.

DAY 15. LEH
A day of leisure, to do more exploring of the town, visit the Tibetan market, watch daily life from a rooftop restaurant and gather your thoughts before returning home.

DAY 16. LEH – DELHI – LONDON.
Depart to London via Delhi.

holidays@indusexperiences.co.uk
www.indusexperiences.co.uk/earthsciences
NEPAL

This trip covers the section of Nepal from the Kathmandu valley high up into the Himalaya, mostly in the region of the Kaligandaki river. This ancient river was flowing southward through the area before the Himalaya formed and cut through the mountains as they rose. It now has the deepest valley on Earth with 8000m high peaks on both sides and a 6000m relief. From south to north you will see an amazing change of geology, topography, climate and vegetation. These spectacular natural features have made the proposed route to Jomsom one of the most popular trekking routes in the Himalaya. The walks along the valley provide an exhilarating opportunity to experience the essence of the natural beauty, fascinating geology, geography, flora and fauna together with the diverse cultural heritage of the Himalayan people. For the plant-lovers, we need only quote Kipling: “And the wildest dreams of Kew are but the facts of Kathmandu”

**DAY 1. TO KATHMANDU**
Depart London/Manchester for international flight to Kathmandu.

**DAY 2. KATHMANDU**
Arrive Kathmandu. Transfer to hotel. Rest of the day at leisure.

**DAY 3. KATHMANDU CITY, PATAN AND SWAYAMBHUNATH**
Kathmandu and Patan are two of the three Royal cities in the Kathmandu valley. The superb architecture and fine works of art, especially in copper and silver will start to give you a feel for the culture and history of the valley. Swayambhunath - the ‘Monkey Temple’, founded over 2500 years ago, is the oldest shrine in the world and one of the most sacred Buddhist pilgrimage sites.

**DAY 4. DRIVE TO POKHARA**
This is a 210km route through a subtropical region with annual rainfall of 3350 mm. We will stop at Nagdhunga with its beautiful views across the entire Kathmandu basin to set the scene for the geology of the valley and the surrounding mountains. From here the drive passes through Precambrian sediments which retain the structures from their deposition and evidence of early life.

Pokhara is Nepal’s second largest city and lies on an ancient trade route between China, Tibet and India. The dominant feature here is the view to Machhapuchhre and the Annapurna range. In addition, there are the lakes Phewa and Begnas surrounded by dense forests. Evening boat ride at Phewa Lake and see the mountains reflected in the waters.

**DAY 5. DRIVE TO TATO PANI**
The route today rises sharply from 500 m at Pokhara to 1249m at Tato Pani through subtropical forest of rhododendron and banyan. This is a day of stunning earth science with a variety of metamorphic rocks on view and with evidence of landslides, ancient and modern. We will see lake sediments deposited when palaeo-landslides temporarily dammed major rivers. Around the villages, there are tiers of terraced fields allowing arable farming on the steep slopes. At Tato Pani the hot springs (65 Celsius – go on, indulge yourself, it has been a long day!) are thought to be related to faulting in the underlying rocks

**DAY 6. TO GHASA/KOKHETHATI**
We will start to follow the Kaligandaki valley, cut deeply into the main ranges of the Himalaya. The valley is narrow with steep slopes and the flow of river is fast reflecting the 1300m altitude difference in this section. This area is a laboratory for metamorphic rocks with a wide range on view. The geologists will delight in the mineralogy while the others will marvel at their sparkling beauty. As we climb, we will be moving climatically from subtropical to temperate zones and the vegetation will change rhododendron to pine forest which in turn gives way to sparse bushes.

**DAY 7. TO TUKCHE**
Today we will cross the major normal (extensional) fault of the Himalaya, the South Tibetan Detachment Zone. It is well exposed, with limestones on one side, gneiss on the other. Tukche was once the stopping-off point for caravans carrying salt from Tibet. Here there are large houses built around a central courtyard acting as a caravanserai. From Tukuche we will have views of the Annapurna, Dhaulagiri, and Ruwachaur ranges with peaks above 7000m and permanently snow-capped.

**DAY 8. TO JOMSOM**
We are in the cold temperate zone today, passing through pine, cypress and juniper forest. Rocks are sedimentary and in great variety. We will see evidence of deposition in lakes, rivers, oceans (with fossils) and by glaciers together with awesome large-scale folding. During the drive, the features of the natural hazards associated with mountain terrain will be on display: river-bank erosion, rockfalls and landslides. The route passes through the apple orchards at Marpha and no doubt you will have the chance to sample the products.

holidays@indusexperiences.co.uk
www.indusexperiences.co.uk/earthsciences
Jomson is built on a mixture of glacial and lake deposits and surrounded by a series of river terraces. The views to the high mountains are stunning. To the southeast the serene early morning view of the beautiful snow covered Nilgiri Range will be sure to leave a memorable impression on everyone.

**DAY 9. TREK TO KAGBENI**

This 10 km section is in the dry rain-shadow of the Himalaya with only about 250 mm of rain annually. The area is barren with only sparse vegetation. The valley is an ancient, wide glacial one and includes a fine set of glacial deposits. As we walk upstream, look out for ammonite fossils – these are sacred to the Hindus, who call them “shaligrams”.

**DAY 10. TO MUKTINATH**

We will see folded rocks today, squeezed to such an extent that the folds are recumbent, overlain by undisturbed, horizontal beds. The landscape is still one of bare, eroded hills, the vegetation being specialised to the hostile conditions. At Muktinath, the Hindu temple has an everlasting flame, thought to be the result of natural gas leakage.

**DAY 11. RETURN TO JOMSOM**

Return to Jomsom

**DAY 12. FLY FROM JOMSOM TO POKHARA.**

Excursion around the Pokhara Valley
We shall drive along the valley with its karst topography, taking in the beautiful Davi’s waterfall, and the Gupteswor caves. We will visit the Mountain museum with exhibits relating to mountaineering, Himalayan geology and environment, ethnic people and culture. In the evening participate in a cultural program offered by local ethnic people.

**DAY 13. TO KATHMANDU**

After breakfast transfer to Pokhara airport for flight to Kathmandu. Met upon arrival and transferred to your hotel. Remainder of day at leisure. Evening Farewell Dinner at a Nepalese restaurant with a Cultural show.

**DAY 14. TO LONDON**

Transfer to the airport for international flight back to the UK.
Join us for an adventure into the Hidden Kingdom of Bhutan. The fortress of the gods, the heights of the Himalayas surrounding you on all sides and creating breath taking views with a window into a living culture not tainted by extrinsic factors. In this trip we will explore the sovereign nation and delve deep into its rich culture with visits to Buddhist monasteries which do not only offer a fascinating insight into the people but are back dropped beautifully by the dramatic landscape.

On our route we will pass through an extensive arc of Eastern Himalayan Alpine shrub gravitating to the perpetually snow-capped peaks which rise so impressively, *pinacled* by the Masang Kang (7200m) to the North.

**DAY 1. TO DELHI**
Departure from London to Delhi

**DAY 2. DELHI**
Transfer to hotel Taj Ambassador with time in the afternoon for sights of New and Old Delhi.

**DAY 3. DELHI – BAGDOGRA – PHUTSHOLING**
Today we fly from Delhi to Bagdogra where we will be picked up and taken across the border of Phutsholing, beginning our adventure into the hidden kingdom of Bhutan. Take in the spectacular architecture as we cross from India into Bhutan, the border demarcated by a rather charming gate.

Geologically we will be crossing the main boundary thrust (MBT) a very young structure which is still seismically active, most of the Himalayas earthquakes occur on this boundary. The radical change from India will become apparent, witness praying Bhutanese in the centre of town and get a feel for the traditional values that still remain an integral part of life here.

**DAY 4. PHUENTSHOLING – PARO**
Now travelling north of the (MBT) we will see geological evidence of the ongoing seismic activity that is so prominent in the Himalayas. The main central thrust MCT exposed in a ~10km section represents movement of 100s of kilometres under thrusting and exposing sediments beneath high-grade Neoproterozoic schists and gneisses of the High Himalayan Crystalline Series. These give us a great insight into the intense pressures and heat which have occurred in the process of building the Himalayas. Our interest is not only geological on the road to Paro, the illustrious monasteries which we will see dotted across the valley offer breathtaking views of the pastoral valley which is famous for its red rice as well as the unique geology. Guests can visit the famed Kyichu lhakhang set among the bucolic rice fields, this monastery is revered amongst the Bhutanese people.

**DAY 5. PARO TO PUNAKHA**
Today we travel to Punakha which until 1955 was the capital of Bhutan. Views of the high Himalaya including the Masang Khan (7200m) to the north are stunning. The beautiful architecture of the Dzong located at the confluence of Pho Chhu and Mo Chhu (confluence) rivers that flow around its border make a picturesque representation of Bhutanese life. The geology in this area offers a viewing of a range of metasediments including metapelites and quartzites.

**DAY 6. PUNAKHA**
Day at leisure, enjoy some more of the sights and the town which is festooned with elaborate and gaily painted house facades

**DAY 7 PUNAKHA – DAMJI - GASA TSACHHU**
We will be embarking on an 18km drive to Tashitang (1840m elevation) north of Punakha continuing along the great Mo Chhu river. We will witness the subtropical vegetation, wild orchards and wild banana trees represent the fertile landscape and the climate which has such a great impact on it. Geologically we will see deformed granites of Cambrian age changed so greatly by the forming of the Himalaya. The road continues through gorges, meadows and rice terraces. During which we pass some picturesque village houses and guests can visit and see examples of rural life in Bhutan

**DAY 8. GASA TSACHHU – PUNAKHA**
We will make full use of the thermal springs that rise to the surface here. They are warm and carbonated and are reputed to have strong healing properties. This is a typical Bhutanese village not served by a road, complete with a dominating dzong, archery ground, teashop and small bazaar.
**Day 9. Punakha – Pele La – Punakha**

Today we travel through the Chekha Formation of gneisses, granite intrusions and a sedimentary series. We may also see some Devonian fossils (corals, brachiopods, trilobites) these are all representative of massive movement during the onset of mountain building. From the top of the Pele la (3400m) it may be possible to see the sacred mountain of Jomo Lhari (7314m) to the north west.

**Day 10. Punakha – Thimphu**

A short drive retracing our steps to Timphu. After lunch there is a half day for shopping and sightseeing. See how the garnet migmatite gneiss is utilised as local building stone for the massive dzong. Thimphu has developed greatly in recent years and the bustling town offers great opportunity for exploring.

**Day 11. Thimphu – Paro**

We now travel back to Paro crossing our highest point via a southern road to Haa. The chelela pass is home to the blue poppy and guests may take short hikes around this area or a longer hike to the Killey goemaba monastery which is perched in the mountain side overlooking the valley. We will stay in Paro for 2 nights as there is much to see here.

**Day 12. Paro – Taktshang – Paro**

Examine the core rocks of the Himalayan orogeny. A steep walk through the pine forests brings us to the cliff-top monastery (Taktshang Gompa) – an outstanding example of Bhutanese architecture. With an optional visit to a Bhutanese fort. For our final night we will have a bonfire and celebratory dinner with a cultural troupe performing masked and ethnic dances.

**Day 13. Paro – Delhi**

Flight to Delhi

**Day 14. Delhi – London.**

Depart to London.