The Black Country Geological Society

NEWSLETTER No. 173
October 2005

The Society provides limited personal accident cover for members attending meetings or field trips. Details can be obtained from the Secretary. Non-members attending society field trips are advised to take out your own personal accident insurance to the level you feel appropriate. Schools and other bodies should arrange their own insurance as a matter of course.

Leaders provide their services on a purely voluntary basis and may not be professionally qualified in this capacity.

The Society does not provide hard hats for use of members or visitors at field meetings. It is your responsibility to provide your own hard hat and other safety equipment *(such as safety boots and goggles/glasses) and to use it when you feel it is necessary or when a site owner makes it a condition of entry.

Hammering is seldom necessary. It is the responsibility of the hammerer to ensure that other people are at a safe distance before doing so.

FUTURE PROGRAMME

Lecture meetings are held at Dudley Museum, St James's Road, Dudley. Phone (01384 815575)
7.30 for 8 o' clock start unless stated otherwise.

MEMBERS' EVENING: 28TH NOVEMBER
Please tell Gordon Hensman about your contribution to this evening:
GWJHENSMAN@aol.com
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MONDAY 31ST 0CTOBER *(Indoor Meeting)*

Liam Herringshaw. "Weirdos of the Wenlock Limestone."

About 425 m years ago, the land that was to become the West Midlands lay approximately 15 degrees south of the equator, part of the microcontinent of Avalonia. Warm, shallow waters of the closing Iapetus Ocean covered much of England and a hugely diverse reef and inter-reef ecosystem developed. Fast forward almost half a billion years and this tropical paradise is now the Much Wenlock Limestone Formation, outcropping as a series of hills and escarpments in the West Midlands and the Welsh Borders.

Of all the Wenlock Limestone localities, perhaps the most famous are the three inliers of Castle Hill Dudley, Hurst Hill and the Wren's Nest. The importance of lime as a flux in the iron and steel making industries saw extensive quarrying of these hills during the 18th & 19th centuries. Consequently, a huge number of Silurian fossils were collected and more than 650 species described, many unique to the Black Country. However, despite a long history of palaeontological study, a number of fossil groups of uncertain zoological affinity remain. This talk will introduce a selection of these rare and problematical taxa, with new information on their biology, ecology and systematic position.

Liam was born in Leicestershire. His first geology fieldtrip, whilst studying for his A-levels, was to the Wrens Nest. He read Geology and Physical Geography at Liverpool for his B.Sc., and subsequently spent 6 months researching Carboniferous Turbidites. He obtained his PhD at Birmingham in 2003, researching "Rare and Problematical Fossils from the Much Wenlock Limestone formation."

Liam spent some time in the American South-West studying dry river systems. He appeared in "University Challenge Professionals", as part of the Palaeontological Association Team, before returning to Birmingham this year as an honorary research fellow.

MONDAY 28TH NOVEMBER *(Indoor Meeting)*

Members' Evening.

Members are invited to think about any contribution they feel they may be able to make – no matter how slight – for the 3rd Members' Evening. These have proved to be so enjoyable in the past. Refreshments are provided.

SATURDAY 14TH JANUARY 2006 *(Field visit)*

Visit to the Lapworth Museum of Geology, University of Birmingham, Edgbaston. This visit continues the excellent visit made in December 2004.

MONDAY 6TH FEBRUARY 2006 *(Indoor Meeting)*

Christopher Rochelle: " CO_2 Sequestration and Disposal."

Christopher spoke to us two years ago on the same topic, however, Global Warming, due to anthropomorphic greenhouse gas emissions, has increased public awareness.

Our speaker is a senior scientist at the Geological Survey, and has worked in this field in the UK, Canada and Norway for some time. He will be able to bring us up to date with the latest progress being made to counter what the government's chief scientist has called 'the most serious problem facing us'. This will be a joint meeting with the West Midlands Group of the Geological Association, whose secretary is Adrian Collins, based in Wolverhampton at ARUP.

MONDAY 27TH FEBRUARY 2006 (*Indoor Meeting)*

Professor John Hudson. "The Geology of Eigg and Muck".

SATURDAY 18TH MARCH 2006 *(Field visit)*

Alan Cutler: Barrow Hill and the Dudley Volcano
Meet at the Vicarage Lane Car Park. Further details to follow.

MARCH ?? *(Indoor Meeting)*

It is planned to hold a debate: "Evolution or Creationism/Intelligent Design, are they Equivalent Hypotheses?"

SATURDAY 20TH MAY 2006 *(Field visit)*

Andrew Rochelle: Periglacial Landscape and Ice Sheet Debris in East Shropshire.
Meet at the Car Park in Water Lane, Newport. Grid Ref. SJ 744 194.
Come and see the bluebells!
Further details to follow.

EDITORIAL

A word I came across recently is *neocatastrophism,* a concept that is becoming very relevant in modern geology. *Catastrophism* was an idea generally accepted in the early part of the 19th century that said that large changes to the physical environment were due to infrequent catastrophic events of a short duration. These ideas were largely replaced by *uniformitarianism* championed by Charles Lyell, in which the Earth is slowly changed by relentless forces over a long period of time.

These ideas have sometimes been interpreted as being influenced by the political thought of the time. The late 18th century and first part of the 19th was the time of great violent revolutions in Europe, and many radicals believed that changes in society could only take place rapidly, and with violent uprising. More conservative thinkers believed that changes came about slowly and evolved, and Charles Lyell, along with most of the geological hierarchy, tended to be of that view, both politically and geologically.

Uniformitarianism held sway throughout most of the last century, but evidence soon emerged that everything was not always slow and relentless. In sedimentology the recognition of turbidity currents and major surges of water in any environment, can obviously deposit or remove large volumes of sediment in a matter of hours. One only has to look at the results of the tragic happenings in the Far East and America recently for cogent evidence. Even the speed of evolution, surely too slow to see, has had to be reassessed after recent studies showing that apparently unchanging life forms can change rapidly when forced to adapt to new conditions.

But surely Granites slowly cooling and rising in orogenic belts is an example of the slow workings of the Earth? Well, apparently not. Modern ideas* question this, magma moves upwards mainly through dykes, and the intrusion is made bigger by 'ballooning' – similar to blowing up a balloon. High speeds could be reached by the magma in dykes, and it is calculated that it would take between 5 hours and 3 months to ascend 20 km. Even more surprising are the calculations regarding phenocrysts. These large crystals in plutonic rocks were thought to be formed very slowly - thousands of years – in the slowly cooling magma chamber. Modern work on the growth rates of crystals suggest that a Plagioclase Feldspar crystal, 5mm. long, could grow in as short a time as 1 hour, and certainly no longer than 25 years. *Neocatastrophism* must be taken seriously.

*CLEMENS J.D. 2005. Granites and Granitic magmas: strange phenomena and new perspectives on some old problems. *Proceedings of the Geologists' Association,* **116,** 9-16

Bill Groves

MEETINGS REPORTS

Field Visit 17/09/2005 - The Annual Coach Trip to North Wales.

The morning promised well for weather. Pick up points at Dudley, Wolverhampton, Telford and Shrewsbury resulted in twenty six happy trippers.

There was a background theme to the outward journey, beginning with our departure from Telford. Apart from discussions regarding landscape and geology, we would also remember that our route would follow Telford's Holyhead road and pass other constructions, which celebrate the great engineer and surveyor.

Between Telford and Shrewsbury the Shropshire and mid Wales landscape can be seen to great advantage. From the low summit of Overly Hill, the Wrekin and Ercal, Wenlock Edge, the Stretton Hills, Stiperstones, Long Mountain, Briedon Hills and the Berwyns, the gateway to North Wales, can all be seen.

A comfort stop was made at Oswestry and close-by good views of Old Oswestry, an Iron Age Hill Fort, were noted. A short stop at the Chirk Aqueduct impressed on the party Telford's innovations and engineering skills. A little further along the highway we could view the larger Pontcysylte Aqueduct, but a visit was not possible on this trip. On our way through Llangollen and towards North Wales note was made of the Telford toll houses, now often bijou holiday dwellings.

Soon views of Snowdonia could be seen and members identified the prominent summits. A short stop between Pen-y-Gwryd and Llyn Gwynant and a little discussion led by Mike Williams and Andrew Rochelle on geology and glaciated landscapes took place before continuing our journey via Pen-y-pass down the rock strewn Pass of Llanberis.

At Llanberis arrangements had been made for members to visit the pump storage power station at Dinorwic. Later after lunch we were able to visit the National Slate Museum, with its wonderful industrial archaeology. After lunch the party travelled through Nant Ffrancon, along the "new" Telford highway, for a short walk around Cwm Idwal. Classic glacial features and some geology were described by Mike Williams.

Fish and Chips at Whittingham completed a good day. Thanks to all for their participation and to the coach driver, Mike, for his long hard day.

Andrew Rochelle

CONSERVATION MATTERS

A Geodiversity Action Plan for the Black Country

A communication from Alan Cutler

Local Geodiversity Action Plans (LGAPs) provide a new and effective route to achieving geoconservation. Importantly they can involve a range of groups, organisations and individuals in agreeing priorities and actions. Geodiversity is a relatively new term that includes the geological diversity or the variety of rocks, fossils, minerals, landforms and soils, along with the natural processes that shape the landscape. It is also the link between people, landscape and their culture: it is the variety of geological environments, phenomena and processes that make the landscape and provides the framework for life on earth.

LGAPs are, in part, developed from the model of Biodiversity Action Plans. What is often forgotten or misunderstood is that Geodiversity underpins Biodiversity. In fact Biodiversity (the variety of life on earth) relies on Geodiversity, and soil is the link between them. Whilst each LGAP will differ in detail and will be tailored to suit the variation of local geology, LGAPs share a common approach and underpinning philosophy: the conservation and enhancement of

geodiversity. A LGAP breaks down the complex nature of geodiversity into smaller, manageable actions to achieve sustainable outcomes.

But why do we need a GAP here in the Black Country you may ask? For more than 50 years, but particularly in the last 25 years, geological exposure has been continuously lost to landfill or redevelopment. Sites that were taken for granted have been lost. This isn't just of concern to a few geologists, there are wider issues at stake. Geology influences human settlement, the location of industry and centres of work and prosperity. Geology characterises the local scene and the built environment. This is particularly true of the Black Country where the rocks have provided coal (the energy source); ironstone and limestone for the iron industries; limestone for agriculture, cement and aggregate; fireclays for general refractory use, crucibles for the glass industry, pipes and sanitary wares; clays for house bricks and engineering bricks; moulding sands, building sands and gravels; dolerite for road aggregate. Limestone, sandstones (Triassic and Coal Measures) and dolerite have been used for churches, walls and other buildings, kerbstones, paving and cobbles.

In fact relative to its size the Black Country has the most diverse geology of anywhere in the world. A diversity that has directly contributed to prosperity and wealth creation for the region and which has also contributed to scientific knowledge and understanding on an international scale. All of this leads to our local distinctiveness and cultural heritage which deserves to be enhanced and celebrated.

A bid in the spring of 2004 for funding from the Aggregates Levy Sustainability Fund (ALSF) had been unsuccessful but English Nature's Environmental Impacts Team was particularly keen for the Black Country to be at the leading edge of this new approach to geoconservation and approached Alan Cutler and Graham Worton to discuss the way forward. English Nature decided to kick start the work by providing funding for six months to employ Alan on a part time basis as Project Coordinator to initiate the development process under the supervision of Graham as Dudley Museum Geologist.

Just as this work was beginning in October 2004 the ALSF Grants team approached Alan with the invitation to resubmit a bid on the understanding that whatever was funded had to be completed between November and mid-March 2005, and also could only relate to existing or former aggregates sites. A revised and considerably modified scheme was put forward and was accepted. This greatly assisted with overheads and allowed the establishment of a temporary project office without which much of the work would have not been possible.

Initially Alan set about setting up a small steering group comprising a representative from each of the four Black Country boroughs (contacts established over many years) and who had previously indicated their support. In addition the Wildlife Trust for B'ham and the Black Country were included together with Graham from the Museum who chairs the meetings. An unexpected bonus was that the Wildlife Trust is heavily involved with the Black Country Consortium which is a body set up to steer planning policy and regeneration on a sub regional basis over the next 30 years. The significance of this will be evident in due course.

On a strategic level it was necessary to agree geographical limits and to formulate the Aim and Objectives of the developing plan. It was agreed that the BCGAP would be confined to the four boroughs Dudley, Sandwell, Walsall and Wolverhampton, but that would not preclude the inclusion of sites or communities outside the boundaries if there was a traditional link. The reason for producing a BCGAP has been expressed in the Partners' Vision Statement. In addition seven Objectives have been formulated for the sustainable delivery of the plan. These are reproduced below.*

On a more practical level Alan was required to carry out an audit of Black Country Aggregate Sites which was completed through a combination of desk studies, trawling over old maps as well as some field surveying. In fact Alf Cole was able to render some assistance in the less familiar surroundings of deepest Walsall!

Over 180 mainly historic sites were identified across the region. These had yielded sand, gravel or dolerite. Some limestone was quarried for aggregate in a few places for local needs where the stone was unsuitable for the iron industry. Sand and gravel was extracted from Triassic and Permian age formations located mainly along the western or eastern boundaries of the coalfield

and from a variety of glaciofluvial deposits which appear in localised patches. The northern part of the coalfield (from Wolverhampton to Walsall and extending into Sandwell) is also characterised by extensive sheets of glaciofluvial and till deposits which cover the Coal Measures of Carboniferous age. These were important sources of both building sand, sharp sand and gravel, sometimes occurring together as at Moxley. Dolerite, a hard igneous rock, was intruded into the Coal Measures in the late Carboniferous Period. It has been exploited at Barrow Hill, Pouk Hill and notably in the Rowley Hills where as the Rowley Rag(stone) it has been quarried for 300 years or more. Today there is only one working quarry in the Rowley Hills and that has but a short life ahead. Many of the sites identified have disappeared through redevelopment but sites with potential for educational or community use have been highlighted and will be the subject of further assessment and detailed surveys as part of the next phase.

News was received in June that funding of Alan as Project Coordinator by English Nature was to be continued until March 2006 in what is now termed BCGAP Phase 2. Strategically this means identifying actions needed to achieve the objectives, agreeing the timetable and addressing any associated funding issues. Key aggregate sites will be surveyed and an exciting outcome will be the production of some new informative leaflets all to a strict timetable. The concept of a Black Country Geopark, which had already been expressed by Alan and Graham has been seized upon by the Steering group and Black Country Consortium, and is one of the ideas from the phase 1 that needs to be progressed but more about all that in another edition.

*The **AIM** of producing a Black Country Geodiversity Action Plan is expressed in the Partners' Vision Statement, ***"To make a positive contribution to the enrichment of the Black Country environment and quality of life, by conserving, enhancing and managing the region's Geological Heritage & Diversity for the benefit of all."***

OBJECTIVES:

1. To have Geodiversity included as an integral part of all Black Country sub-regional and local strategies, plans and policies.
2. To develop and maintain a comprehensive Geodiversity data resource integrated with other data sets.
3. To protect the geological resource by appropriate designation of geological sites and features commensurate with their local, regional, national or international importance.
4. To manage existing geological resources and create new geological features in association with project partners.
5. To increase public appreciation and awareness of the Black Country Geodiversity Heritage.
6. To maximise the opportunities for Black Country Geodiversity to contribute to all levels of education including Life Long Learning
7. To establish appropriate mechanisms to secure the continuity, sustainability and effectiveness of the BCGAP process.

Alan Cutler

OTHER NEWS

The Chinese Contribution to Geology.

We are rightly proud that the basic principles of geology were laid down in Great Britain. However, it is salutary to learn that these basic ideas were anticipated by the Chinese hundreds of years ago.

In 1785 James Hutton published his, "Theory of the Earth," in which the principles of modern geology were outlined. Apparently his work evoked little response until a summary of it was published in 1802, by his friend John Playfair, called, "Illustrations of the Huttonian Theory of the Earth". Hutton's book was later summarised by the great Victorian Geologist Charles Lyell, in his,

”Principles of Geology” published in 1830. Lyell gave a copy to Charles Darwin, and this is reputed to have inspired him.

Hutton was the first to put forward the idea that sedimentary rocks were laid down on the floor of ancient oceans. He also explained how they could be raised up and folded into mountains with intrusions of molten rock into cracks in the buckled strata. He also asserted that all land was subjected to erosion due to atmospheric processes, the eroded material then being transported back to the oceans to form further deposits.

These were revolutionary ideas in the West but had been enunciated in 1086 AD by Shen Kua in his,”Dream Pool Essays”. He described lofty peaks as having originated as a result of, ”-----the mountain torrents having rushed down, carrying away all sand and earth, thus leaving the hard rocks standing alone.”

He accounted for what we now call sedimentary thus: “-----in the northern cliffs of the T’ai-Hang Shan mountain range, there were belts containing whelk-like animals, oyster shells and stones like the shells of bird’s eggs (fossil echinoids). So this place, though now a thousand miles west of the sea, must have been made of mud and sediment which was once below the water. The Yu Mountain, where Yao killed Kun, was, according to ancient tradition, by the side of the Eastern Sea, but is now far inland. Now the Yellow River (Hwang Ho, the Chang Shui, the Hu T’o, the Cho Shui and the Sang Ch’ien are all muddy, silt bearing rivers. In the west of Shensi and Shansi the waters run through gorges as deep as a hundred feet. Naturally mud and silt will be carried eastwards by these streams year after year, and in this way the substance of the whole continent must have been laid down. These principles must certainly be true.

Shen Kua did not originate these ideas as they can probably be traced back to the Buddhists who believed that the world was often created and destroyed. The Chinese concept was of sang t’ien, or, mulberry grove. This described patches of dry land in the mountains, which had once been under the sea. About 320AD wrote his book, “Lives of the Divine Hsien.” (Hsien were men who became immortal).

“Since I was last invited here I have seen the Eastern Sea has turned into mulberry groves. This change has occurred three times. The last time I arrived at Mount P’eng-Lai, I noticed that the sea was only half as deep as it had been at the previous meeting. It looks as if the sea will again be turned to mountains and dry land. The sages all maintained that where the sea is now, the dust will one day be flying.” The ideas were even older than this as there is a reference to them in the Chin Dynasty (265 – 420 AD), and in all probability existed much earlier.

Gordon Hensman

WREN’S NEST PHOTOGRAPHIC COMPETITION

This is now finished, and has been judged. The winning entries are on display on the top floor of Dudley Museum.

HOLIDAY GEOLOGY

A summer in the West.

This summer marks the 75th anniversary of the evacuation of St Kilda. I was 18th on the waiting list to go with the National Trust for Scotland on their anniversary cruise. I thus made arrangements for my daughter and myself to travel by a smaller boat with a crew of three, carrying eleven passengers, from Oban.

We set off from Oban on a Saturday and moored for the night at Tobermory before travelling to Berneray and Mingulay next day. Basking sharks, Dolphins and birds of all shapes and sizes were a feature of the voyage. The weather was perfect and we enjoyed the landscape, wildlife and history. The geology of the islands was mainly Lewisian Gneiss.

After a night moored in a protected bay in the Uists, we travelled over the open Atlantic towards St Kilda. The cloud was low as we approached the main island of Hirta, but we were able to view, rock stacks, caves, grottoes and towering cliffs of the eroded caldera. On landing we were greeted by our first sighting of the St Kilda Wren (Trogladytes Trogladytes Hertensis).

The geology of the islands.

Nothing remains of the great central volcano, except a series of crystallised and cooled magmas. Erosion has removed all the lava flows and ash deposits, which were the products of the eruption. At St Kilda the first intrusive stage took place a little more than 60 million years ago and its cooled remains in the eroded roots of the volcano complex occur as a gabbro found over the whole area of the archipelago. The gabbro cooled slowly to form large crystals of dark blue or purple olivine and pyroxene minerals, together with lighter plagioclase feldspars. This rock is distinguished by its very coarse grain and dark colour, and is responsible for most jagged cliffs and stacks.

The area was subject to a downward and inward collapse known as cauldron subsidence. The subsidence initiated renewed activity, with intrusions of magma seeking out and forcing into new lines of weakness. These new intrusions cooled and left dykes often in curved sheets. These rocks are finer-grained and darker than the gabbro and form outcrops on Mullach Bi. The curved sheets are inclined gently towards the centre of the complex.

About 56 million years ago a different type of magma was injected into the complex, forming three large intrusions seen only now on Hirta. These rocks are cream, grey and pink in colour, and known as granophyres. Fine mineral specimens can be found formed from cooled hot liquors remaining. Quartz, orthoclase, magnetite, epidote and bright green actinolite are common.

The final intrusive stage was completed about 35 million years ago when extensive sheets of basalt and dolerite were injected. The present landscape owes much to the influence of the last ice age, which in this region was completed about 10,000 years ago. There does appear to have been small and shallow glaciers on the island and erratic boulders from the eastern Hebrides have been found.

The Island and the remaining uninhabited buildings are maintained and administered by the National Trust for Scotland, but sadly buildings used to operate the military radar station on the summit disfigure the village area. A visit to the Puff Inn during the happy hour was marked by the cheapest double whisky available for sale in the UK. A cruise around the islands next day enabled a study of the largest gannet colony in the world and wonderful coastal geomorphology.

We then set course for the Monarch Isles. The most beautiful desert islands of white sand and wild untouched nature. Seals were singing and crakes craking, the only sounds to break the peace. The islands are only a maximum of 19m metres above sea level and are mainly dunes and sand over a low reef and it is thought that they may be the first dry land in the UK in danger of disappearance due to sea level rise and the increase in more disturbed weather. The hurricane of January 11th 2005, which saw sustained wind speeds of 125 mph for nearly twenty four hours, caused some erosion and left considerable ocean debris in the dune slack on the islands. During the tempest five lives were lost on South Uist, the nearest landfall to the east.

Our next islands were the Shiants, an extension of the same geological formations as seen in the Giant's Causeway and at Staffa. The basalt columns are higher than those at Staffa, but less regular. The islands have a population of Black Rats (Rattus Rattus), the plague rat, but they were not seen.

We returned via the Sgeir of Eigg, a mooring in Rhum and Mull and on to the busy port of Oban. A wonderful journey of new experiences.

Reading.

St. Kilda. Alan Small. National Trust for Scotland. 1979.
St. Kilda. Meg Buchanan. HMSO Edinburgh.1995.

Andrew Rochelle

GEOBABBLE

TANZANITE may not be a familiar name to most geologists, because the mineral was only discovered in 1967. It is now considered to be one of the most valuable gemstones in the world, ranking alongside diamond, emerald, ruby and sapphire. In fact it is rarer than diamond.

It is a variety of *Zoisite,* $Ca_2Al_3(SiO_4)_3(OH)$, which has been known for over 200 years. Zoisite has never been considered a gemstone of particular value, although it had been used as an ornamental stone. In 1967 a bright blue variety was discovered near Arusha, in north Tanzania, close to Mount Kilimanjaro. The unique thing about it is that in its natural form it is a dull grey-brown colour, but when heated up to 300^0 – 500^0 C. it becomes bright blue. The Masai living in the area had noticed specimens on the surface in areas where there had been natural bush fires, although gemmologists now induce the blue colour by heating it in a furnace. The distinctive colour is produced by traces of Vanadium in the structure.

It is only found in a 13 square kilometre area, and this is believed to be the only occurrence in the world. The mineral is found in veins in a bedrock of gneiss, and beyond that I cannot find any more detail. The main company exploiting this mineral is *TanzaniteOne* and it was first shown at the New York Jeweller Company Tiffany. They declared it to be a sensational gemstone, but with an eye to marketing suggested a change of name. It was originally called 'blue Zoisite' but this reminded them of the word 'suicide' and so Tanzanite was chosen.

New Scientist: Vol 187. No 2518. 24 September 2005. p52.
http://mineral.galleries.com/minerals/silicate/Zoisite
http://www.gemstone.org/gem-by-gem

Bill Groves

CONTACT US

As ever we would love to hear your news and views so please put pen to paper or fingers to keyboard and give us your thoughts. Notices that appear in this Newsletter will remain in future editions until the date of the related meeting or event has passed. In order to include material in the December Newsletter, please send or give it to one of the Editorial Team by ***Monday 5th December 2005***

If you are able to submit something it would be most welcome. If you have access to a computer, the easiest way to send it is as an attachment to an e-mail to Bill Groves, or to send or hand a floppy disk to him. If you do not have computer access, please send a paper copy, preferably typed, or drop it in at Dudley Museum for Bill's attention, or hand it to one of the other members of the Editorial team. Rarely is a piece longer than a side of A4, 1½ sides at the most, so please edit your own article before submitting it, or divide it up so we can make it a 2 or 3 edition serial.

EDITORIAL TEAM

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BCGS Website now at www.bcgs.info