KENT GEOLOGISTS' GROUP

The Kent Group of the Geologists' Association

KGG

Founded 1990

NEWSLETTER

No.22 - August 2014

Website: www.kgg.org.uk

Officials and Committee Members

Dr Anne Padfield, Chairman, Tel: 01634 686294 email annepadfield@hotmail.co.uk

Oliver Hardy-Smith, Treasurer, Tel. 01732 773878. email oliverrachel@blueyonder.co.uk

John Taylor, General Secretary, Tel. 01634 222320. email jayartroch@btopenworld.com

Ann Barrett, Indoor Meetings Secretary, Tel. 01233 623126. email annbarrettgeo@gmail.com

Field Meetings Secretary, Position currently vacant

Supported by:-

Amanda Bird,
Dr Ed Jarzembowski,
Peter Jeens,
Tony Mitchell,
Dr Adrian Rundle

CONTENTS

THE KENT GEOLOGISTS' GROUP IS A LOCAL GROUP OF

THE GEOLOGISTS' ASSOCIATION

Burlington House, Piccadilly, London. W1J 0DU.

E-mail: Geol.Assoc@btinternet.com

Tel: 020 7434 9298

As a local group we receive details of lectures and field trips organised by the GA and other Local Groups and Affiliated Societies. Copies of the GA Magazine and the Circular with these details are on display on the Secretary's Table at all Indoor Meetings.

MEMBERSHIP OF THE KENT GEOLOGISTS' GROUP

Membership is open to all who have an interest in geology, regardless of qualifications and experience. The annual subscription (which runs from January to December) is £7.00. The subscription for each Additional Member living at the same address is £2.00. There will be only one mailing to each address.

Membership application forms may be obtained from the General Secretary or downloaded from the Kent Geologists' Group website:- www.kgg.org.uk via the "How Do I Join" page.

Editorial

The year 2013 was not a particularly good one for the KGG. In common with most other specialist groups we were losing members. When the country's economy is bad, prices rise, incomes freeze or may even fall and people have less income to spend on non-essential activities. Interest groups have to compete for reduced spending money. The Groups that survive are those offering best value for money. Our task is to make the group attractive.

Since the last newsletter there have been changes in the group. Adrian Rundle had been chairman for about fourteen years and, after a spell of ill health, had expressed his wish to resign as Chairman. He finally resigned at the Annual General Meeting in April 2014. We thank Adrian for his long service to the Group and are delighted that he has been persuaded to stay on the Committee for us to benefit from his experience. He has also agreed to continue with his activities tables that are so popular with the

Cover picture: Flint, invaluable to early man for tools, abundant in Kent in the Chalk of the North Downs but a curse to the modern farmer. Picture shows a field used in World War II as a dispersal location for aircraft at Detling. Photograph taken on the Norman King walk, 21st June 2014.

young at Rock ‘n’ Gem shows and the GA Festival of Geology. Special thanks are due to Dennis Fullwood for transporting Adrian and all of his equipment (and that’s a full car load!) to all of these events. Without Dennis’s support Adrian’s activities would not be possible.

These activities are currently the best way of advertising the group. When the activities arrive at their destination we need volunteers to support them. No great expertise is required, it only involves explaining the activities to visitors and adding cover glasses to the slides they make. However, with up to six microscopes, two seed mounting activities, identification by feel and several visitors wanting to ‘try their hand’ at the tables it is difficult for Adrian and Dennis to cope alone. So please, let us have some more volunteers!

The role of Chairman is vital to the Group. We are very fortunate therefore that we were able persuade Anne Padfield to take on the Chairmanship. As a professional geologist, active speaker, leader of field trips, she is ideal for the role. But Anne is a busy professional and needs the active support of the group. Let us make sure that she gets it.

Former Field Meetings Secretary, Peter Jeens, lives in Kingston, Surrey. With the additional problem of study commitments he found it difficult to get to meetings and had to resign. Peter remains on the committee and attends meetings when he can. Amanda Bird volunteered to take on the role temporarily. However, Mandy has a full time job, is studying at the Open University, can no longer spare the time to plan field events and has had to resign from the post which is now vacant . Mandy, we thank you for responding to our appeal for help, for the valuable input you have made and wish you well with your studies.

Over the last eight years there has a been a gradual drop-off in attendance at indoor and field meetings. Though there was no lack of support, a return visit to Yarwell, arranged by Anne Barrett, had to be cancelled shortly before the event. Several of the members who had indicated their wish to attend the long weekend found, at the last moment, that it clashed with other commitments. A revised date is currently being considered. Anyone interested is urged to contact Ann Barrett.

With the difficulties we were encountering with field meetings it was decided to canvass members for their opinions.

In April 2014, a questionnaire was prepared to determine members’ wishes regarding field meetings and was circulated to all members who had attended an indoor meeting in the past two years. The replies received showed varying levels of support for all of the options suggested but a clear preference was for a one-day event, at the weekend and within reasonable travelling distance. Members wishing to see a report detailing questions and replies should contact the General Secretary.

In the field trips already arranged for 2014 three events fell into this category; a series of three walks in the Bluebell Hill area led by Anne Padfield; a walk by the Bearsted and Thurnham Society, led by KGG member, Norman King; and a walk to look for sources of the East Stour river led by Alison Taylor. It is no surprise therefore that these events that have taken place, were well attended (between nine and sixteen attendees) and thoroughly enjoyed by those taking part.

A brief description of the first of Anne’s walks, with pictures, was added to the ‘Fragments’ page of the website to raise interest in the following two walks as there was then no expectation of producing an early newsletter. If you have access to the internet our website is the best way of keeping up with events; we even include events organised by other similar groups (see the ‘Fragments’ page for details). Descriptions of the walks led by Norman and Alison are reported later in this newsletter.

This newsletter should have been issued in December 2013 but not a single contribution was offered, - are there no budding authors in the group? But all is not the ‘Doom and Gloom’ that this editorial may suggest. Problems arise in the best organised groups; it is only necessary to recognise problems and tackle them - and we have the team to do that. On a brighter note, membership numbers increased slightly in 2012 - 2014. Recorded numbers at indoor meetings also increased and we have been fortunate to attract a few young new members. Without exception they are bright and keen to learn. However, being either still at school or university, or recently left, they are at a stage in their lives when they are mobile and often move away from the area after being with us for only a year or two.

Special thanks are due to Ann Barrett who continues to arrange excellent speakers with interesting subjects for our monthly indoor meetings.

The Beauty of Fluorescent Minerals

Anyone who has seen a specimen of Willemite, from Franklin, New Jersey, USA, fluorescing brilliant green under short wave ultraviolet (UV) light must be struck by its beauty. Other mineral specimens, under similar conditions, fluoresce in beautiful hues such as red, blue or yellow. In daylight conditions the same specimens frequently have a nondescript, dull appearance. So what causes this transformation in the presence of ultraviolet light?

As long ago as the late sixteenth century observers noted the ability of some materials, particularly plants, to emit light. In 1819 and 1822 different observers reported that fluorite emitted a blue light in strong sunlight.

The general term for an object emitting light is luminescence, from 'lumen' the Latin for 'light'. Over time, as extra knowledge was gained, more specific names were adopted for the different processes that emit light. Some are defined below:-

Thermoluminescence (from the Greek word Θερμον = heat) describes the process in which light is emitted by an object that is heated. Examples are the tungsten filament of an incandescent lamp or a metal object heated in a furnace.

Triboluminescence (from the Greek word τροβω = to rub or scratch) is used to describe light emitted from an object that is scratched, struck or fractured, An example is Quartz that sometimes emits a flash of light when struck sharply.

Cathodoluminescence is light emitted when a stream of electrons from the cathode, or negatively charged terminal, of a vacuum tube is directed onto a sensitive coating. It is the fundamental process carried out in the vacuum tube in our older television sets. Colour television was achieved by the use of separate coatings, on the inner surface of the tube, that produced pure red, green, and blue (RGB) colours. These then combine to produce the coloured picture that we see.

The term *'Fluorescence'* is generally attributed to Sir George Stokes (1819 - 1903) who noticed that a fluorite specimen that appeared green indoors changed to blue when taken out into sunlight. He assumed initially that the phenomenon was a characteristic of fluorites generally, hence the term fluorescence, but we now know that this is not so. Today the term 'fluorescence' applies specifically to visible light emitted by an object in the presence of ultra-violet (UV) radiation.

Stokes was a brilliant mathematician. He graduated with a first class honours degree in mathematics from Cambridge University as Senior Wrangler (gaining highest mark in the final examinations). He was Lucasian Professor of mathematics from 1849 until his death in 1903. Other holders of that prestigious post have been Isaac Newton,1669, Charles Babbage, 1828; Paul Dirac, 1932; and Stephen Hawking, 1979 to 2009.

We are fortunate that Stokes also combined his theoretical knowledge with great experimental ability. As a result, he was able to link theory and experiment and developed a reputation for solving problems of long duration that others had been unable to solve. However, he was not able to explain fluorescence. We would have to wait until the discovery of the electron by J. J. Thompson and Ernest Rutherford's description of the structure of the atom before an explanation of luminescence could be given.

We now know that an atom consists of a central nucleus comprising neutrons and positively charged protons, that together make up virtually all of the atom's mass. Surrounding the nucleus are negatively charged electrons that in number exactly balance the positive charge of the protons.

The electrons surround the nucleus in 'shells' each having an associated energy level. To displace an electron from a low energy inner shell to an outer, higher energy level, shell it is necessary to supply the electron with energy equal to the difference in energy between those two shells. This however, creates an unstable condition. The atom relaxes to a stable state when the electron returns to the lower energy shell. emitting the excess energy as packets of energy called photons. The energy difference can be directly related to the wavelength of the radiation. When the radiation wavelength is in the visible range the energy difference can be related to a colour in the visible light spectrum; in this case the colour of light emitted by the fluorescing mineral.

For those readers not familiar with the physics we can describe the phenomenon with a simple mechanical analogy. If a bell is struck with a hammer, the energy in the moving hammer is transferred to the bell at impact. The excess energy causes the bell to distort to an unstable, higher energy state.

The bell returns to a stable condition by converting some of the stored energy into heat. The rest is released in a decaying vibration that causes pressure waves in the air that we detect as sound. The sound that we hear when a bell is struck is directly analogous to the visible light emitted by a mineral in the presence of ultraviolet light (a source of energy).

The explanation given above, of energy being absorbed and then released in a different form, is acceptable for the mechanical analogy but it raises several questions as an explanation of fluorescence, namely:-

1. Why do some minerals fluoresce while others do not?
2. Why do some specimens of a particular mineral fluoresce while other specimens of the same mineral do not?
3. Why do specimens of the same mineral sometimes fluoresce different colours?
4. Why do different minerals fluorescence different colours? and
5. Does fluorescence have any practical applications?

.Answers to these questions will give a clearer understanding of fluorescence, so we shall address them separately.

Why do some minerals fluoresce while others do not?

Different minerals are composed of different elements. Each element has its own unique atomic structure in which the number of protons in the nucleus is balanced by the number of negatively charged electrons to create a neutral atom. One can visualise the electrons as being arranged in shells at different energy levels, the number of electrons in each shell being determined by the need for stability.

So each atom has its own unique arrangement. Only when the difference in energy between two shells equates to a frequency of visible light will a visible light photon be emitted when an electron drops from the high energy level to a lower one. Otherwise the excess energy will be emitted in a non-visible form.

Why do some specimens of a particular mineral fluoresce while other specimens of the same mineral do not?

Very few minerals fluoresce naturally. Notable exceptions are Scheelite, calcium tungstate, $Ca(WO_4)$, which fluoresces bright bluish-white in short wave ultraviolet light, SW/UV, and Powellite, calcium molybdate, $Ca(MoO_4)$, a member of the Scheelite group, which fluoresces yellow in short wave ultraviolet light. Most other minerals that fluoresce do so because of the presence of impurities called ‘activators’.

The answer to the question is therefore “The specimens come from different locations and contain different actuators or impurities because of their origin”.

Why do specimens of the same mineral sometimes fluoresce different colours?

From the previous answer it should be clear that the two specimens come from different locations and contain different impurities or activators that produce different coloured fluorescence.

Why do different minerals fluorescence different colours?

The fluorescence colour of a mineral specimen is determined either by its own atomic structure or that of an impurity/activator. Since most minerals do not fluoresce naturally, one may assume that different activators are most frequently the cause of different minerals fluorescing different colours.

Does fluorescence have any practical applications?

We mentioned above that Scheelite is one of the few minerals that fluoresce naturally. Scheelite also happens to be one of the major ores of the metal tungsten that is used in the manufacture of high grade steel. Before World War II the USA obtained most of its tungsten from the Far East. With the outbreak of war another source had to be found. Fortunately there are many sources of the ore down the west coast that are exposed on the surface. Using earth-moving equipment fitted with powerful UV lamps, and working in the dark, the USA was able to use fluorescence to locate many valuable new sources of the precious metal.

Activators are claimed to be the means by which most fluorescent minerals emit visible light when they are radiated with ultraviolet light. Before going on to the colours of fluorescence and the role of actuators however it is necessary to say a few words about visible light and how we perceive it.

Pure Colour

To be precise, a colour must be defined by its frequency of oscillation, or its inverse, wavelength expressed in nanometres.. Readers having access to the web may care to look at the picture of a spectrum on the KGG website showing wavelength in nanometres (click on the ‘fluorescence’ link then on the spectrum under the heading ‘The Electro Magnetic Spectrum’). Without a spectrometer that displays wavelength we have to rely on perception.

We use three parameters to describe our perception of colour; they are hue, saturation and brightness.

Hue

Hue is the name we commonly give to a colour, e.g. red or blue. When Sir Isaac Newton first used a prism to split white light into the colours of the rainbow that we describe as a ‘spectrum’ he thought that it comprised seven discrete colours, namely, red, orange, yellow, green, blue, indigo and violet. Our own experience tells us that there are more colours than these. We now know that the visible spectrum is only a small part of a much wider continuous spectrum of electro-magnetic radiation that includes, infrared, ultraviolet, X-rays and gamma radiation. What we perceive is limited by the physical characteristics of the human eye. Individuals may have different limits to the visible range and may also see the same pure colour differently. Insects and hummingbirds can detect light in the ultraviolet range so see the colours of flowers as totally different from what we see. We normally use the seven colours of the rainbow, extended as necessary, with mixes such as red/orange or blue/green to describe the colours that we see.

Saturation

Saturation is a measure of the ‘intensity’ of a pure colour in the spectrum. Thus at full saturation, red would be seen as a bright red; at a lower level of saturation it would appear as pink, while at zero saturation it would be colourless. There are no adequate terms for precisely describing the saturation level of a hue so we have to rely on made-up terms such as pink or whitish-blue. The interpretation of these terms will vary between observers.

Brightness

Brightness is an indication of the strength or weakness of the light source. The inherent brightness of a fluorescing mineral is a function of the energy being radiated but the apparent brightness is determined by the ambient lighting. This is because the pupils of our eyes open or close to provide a constant level of illumination at the retina in much the same way as an automatic camera adjusts exposure. Thus in strong daylight a source of red fluorescence may be almost invisible yet shine as a bright red in darkness. It is for this reason that fluorescent minerals are best displayed in a closed, darkened cabinet in which the only lighting is that coming from the fluorescent mineral radiated by the ultraviolet source.

Because the perceived fluorescence is subjective, it is recommended that collectors see fluorescent mineral specimens before purchase if possible. If purchased from a dealer’s list, a mineral described as fluorescing yellow may, on receipt, appear to fluoresce cream.

Appearances are deceptive; minerals that are not fluorescent may appear to be so when in close proximity to a fluorescing mineral because of visible light,emitted by the mineral, reflecting off crystal faces of the non-fluorescent mineral. The ultraviolet source can also be a problem.

The Ultraviolet Source

Ultraviolet light is defined as that portion of electromagnetic radiation between visible light and X-rays, having a wavelength between 10 nm and 400 nm. The name indicates that it has a frequency higher (ultra) than violet, the nominal limit of visible light for human beings. Ultraviolet radiation comprises about 10% of the sun’s radiation and is produced by electric arcs as emitted by electric arc welding equipment. However, ultraviolet radiation for viewing fluorescent minerals is produced by a miniature version of the domestic fluorescent tube light that is a mercury vapour discharge tube with the inside surface of the tube coated with a phosphor. These tubes also produce visible light. To block visible light the UV lamp either incorporates a separate filter or has the outer surface of the tube coated by a filter layer. It is recommended that anyone wishing to build a collection of fluorescent minerals purchases a good UV light source that produces negligible radiation in the visible range. Minerals that fluoresce are sensitive to different wavelengths of radiation. Some fluoresce only in long wave, others only in short wave, some in both but with different intensity and a few in both but in different colours. To fully experience each of these variations a collector requires a UV light source that can cover the range. Though the UV spectrum between the limits of 10 nm and 400 nm is continuous, these wavelenths are only available in expensive research equipment; moreover UV light with a wavelength less than about 210 nm is ionising. It thus poses a health hazard, requires protective clothing and should be avoided by mineral collectors. Commercially available UV lamps have tubes that emit radiation at different wavelengths. When the source contains more than one tube the light source can be switched to one of three wavelengths that cover all of the needs of a mineral collector. These are usually 254 nm (Short wave), 305 nm (Medium wave) and 365 nm (Long wave)

Serious collectors should avoid the temptation to purchase a cheap UV source, such as those used by beauty specialists. These cheap light sources emit significant radiation in the blue end of the visible light spectrum making it difficult to detect the blue fluorescence produced by some fluorites for example. It also increases the visible ambient light level thereby reducing the perceived brilliance of the actual fluorescence.

Activators

From the initial questions and answers we deduce that fluorescence in minerals is seldom a natural characteristic of the mineral but is mostly caused by the presence of impurities/activators, so what are these activators?

The structure of an atom and its bonds determine how atoms pack together to form minerals. The resulting structure sometimes allows an atom of similar size but different element to replace an atom in the mineral. It is these replacement atoms that are the activators in an otherwise non-fluorescing mineral.

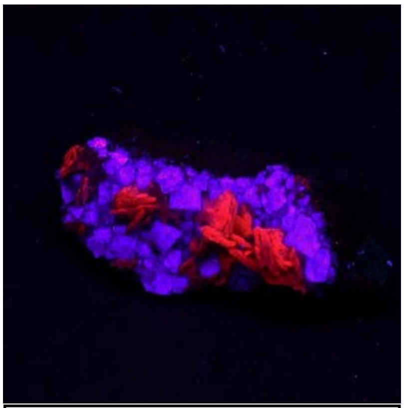
Table 1 below lists some well known fluorescent minerals with their fluorescent colour and probable activator.

Table 1 Minerals, their Fluorescence and Activators

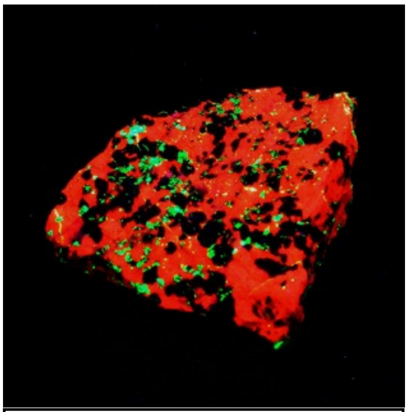
Mineral	Fluorescent Colour	Activator
Adamite	Green	Uranyl ion impurity
Apophyllite	Green	Uranyl ion impurity
Calcite	Orange-Red	Divalent Manganese (with co-activator)
Fluorapatite	Yellow-Orange	Divalent Manganese (with co-activator)
Fluorapatite	Blue	Divalent Europium
Fluorite	Blue	Divalent Europium
Fluorite	Green	Uranyl ion impurity
Opal	Green	Uranyl ion impurity
Powellite	Yellow	Molybdate (self-activated)
Ruby	Red	Trivalent Chromium
Scheelite	Blue-White	Tungstate (self activated)
Sodalite	Orange	Sulphur
Willemite	Green	Divalent Manganese
Uranium minerals	Green	Uranyl ion in the uranium minerals

The term ‘probable’ activator has been used because still only little is known about activators and how they function. Most knowledge on activation has been gained from research on synthetic minerals. Sometimes it is the transfer of energy between energy levels of the activator that produces the fluorescence and sometimes the activator is believed to aid the transfer of energy between the energy levels of the host mineral. Whatever the mechanism of energy transfer it is known that maximum fluorescence is achieved at relatively low levels of activator or impurity, typically less than 10%. Also, even when a natural mineral and a synthetic one appear to behave the same, one cannot be certain that the physical process is the same.

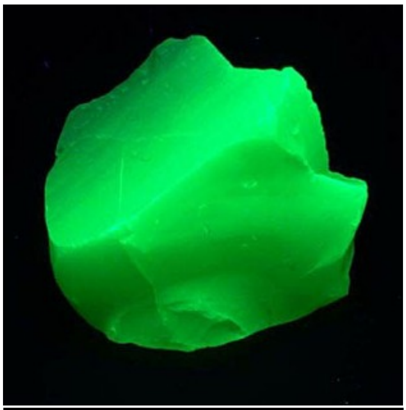
A selection of minerals, from the author’s collection, fluorescing in Short-wave ultraviolet light is shown below:-



Barite on Fluorite
Weardale, County Durham

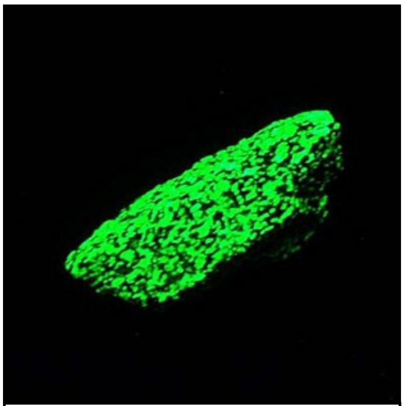


Franklinite with Willemite
Magnet Cove, Arkansas

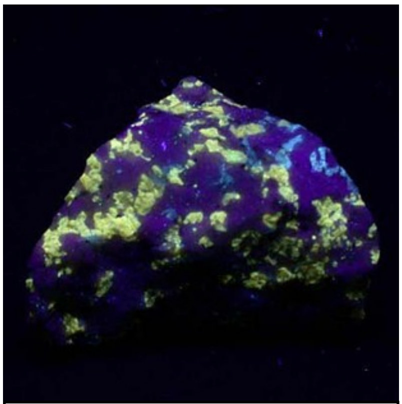


Opal
Unknown site, Nevada

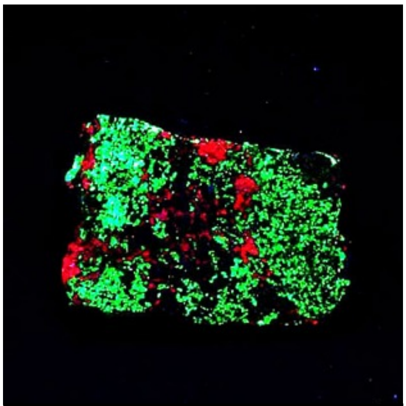
Calcite
Langban, Sweden



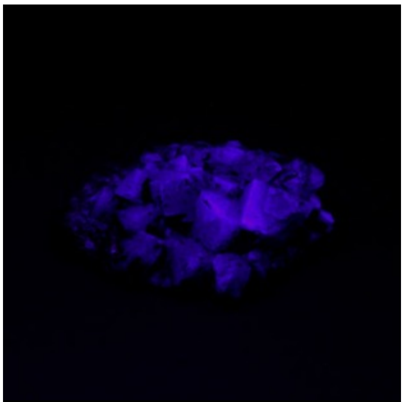
Willemite
Franklin, New Jersey, USA



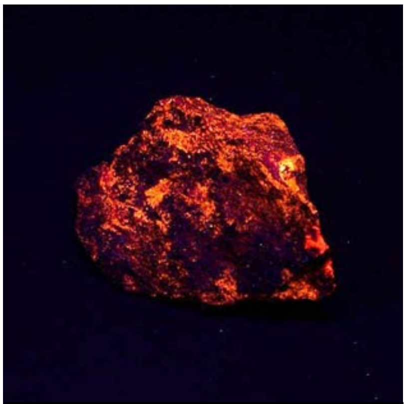
Norbergite
Ogdensberg, New Jersey



Willemite
Franklin, New Jersey



Fluorite
Weardale, County Durham



Svabite
Langban, Sweden

References

1. **Fluorescence**, Gems and Minerals Under Ultraviolet Light, Manuel Robbins, Geoscience Press, Inc, Phoenix, Arizona, 1994.

   This is an excellent technical guide giving detailed information on fluorescence, a survey of the major sites worldwide, a catalogue of fluorescent minerals with descriptions and a section on activators - an essential purchase for anyone wishing to build a collection of fluorescent minerals

2. **Collecting Fluorescent Minerals**, Stuart Schneider, Schiffer Publishing Ltd., Atglen, PA. 2004

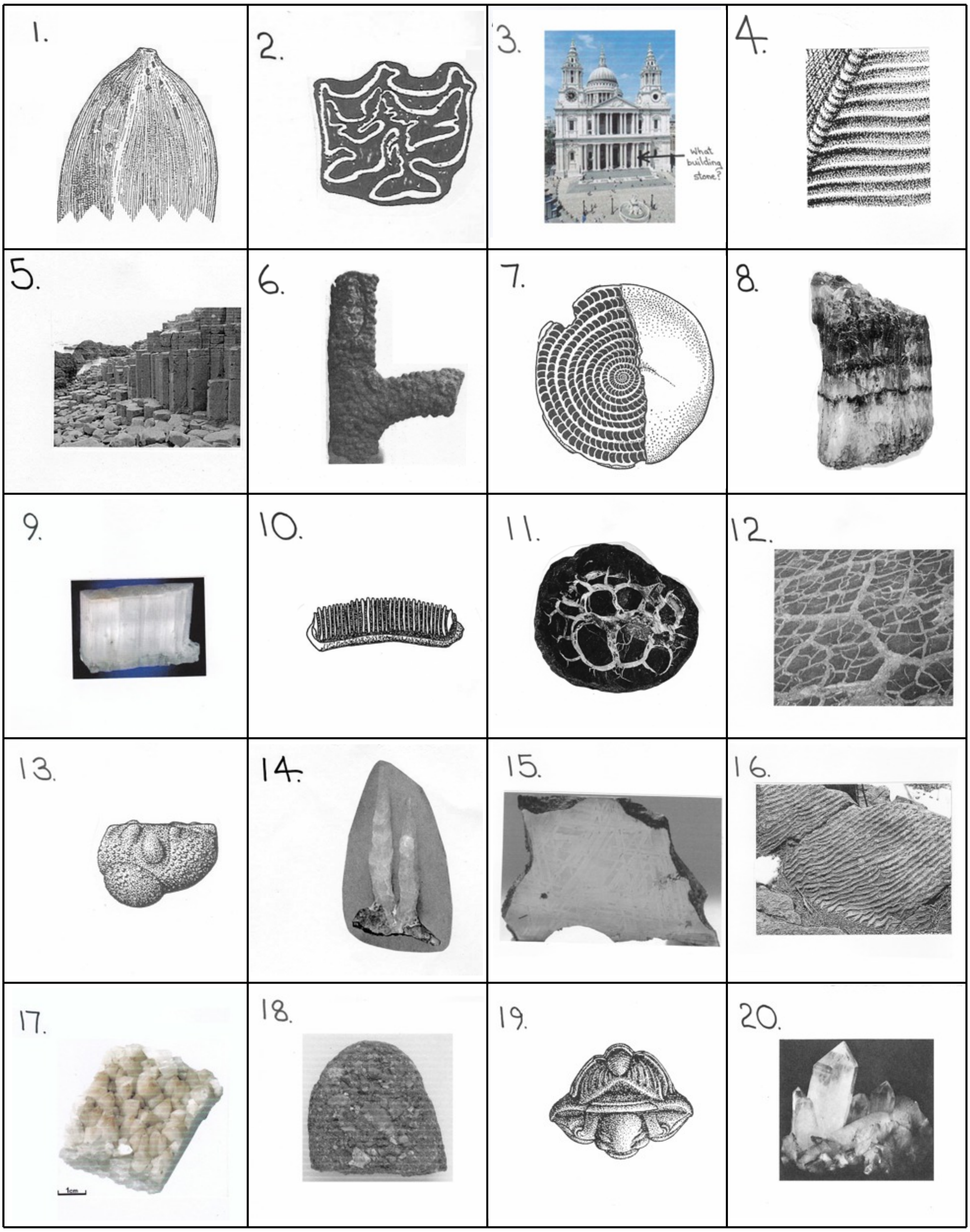
   Primarily a picture book, thirty one pages dealing with all aspects of collecting fluorescent minerals are followed by 155 pages of superb photographs.

Christmas Quiz - 2013

Once again our Chairman tested our knowledge at the December meeting with the, now customary, Christmas Quiz. As usual twenty cards had been hidden around the meeting room. The task was to find the cards and identify the 'geological' object illustrated on the card. I have to admit that I did not even manage to find all of the cards. Points were awarded for each correct and sufficient answer, as determined by Adrian. The winner this year was Tony Mitchell.

Try your hand at the quiz. How many of the objects illustrated below you can accurately identify?

Answers are given on page 16



Thurnham and Bearsted Walk, 21st June 2014

It was during planning of field trips for 2014 last year that the then new member Norman King told us he led monthly walks for the Bearstead and Thurnham Society and issued an open invitation to KGG members to join the walks. The walks are only open to society members but the membership is a trivial £2.50 per year! Norman suggested that KGG members could bring additional knowledge to enhance these walks.

We decided to give the June walk a try. We arranged to park our car and meet Norman in Bearsted, then travel with him in his car to the Coldblow Equestrian Centre to meet up with the rest of the party. We could not have known that there would be a cricket match on the village green that day. We could not see Norman anywhere and one could not have parked a bicycle let alone a car!

Making our own way to the equestrian centre at Coldblow we found a group of people who looked as though they had gathered for some event - we had arrived. Norman arrived shortly afterwards and, after paying our subscription for 2014, we were ready to go!

Turning right out of the stable yard we continued up Coldblow Lane for a few yards then turned left to take the footpath westwards along the northern edge of the woods towards Friningham. At the top of the hill the field on our right was a mass of flint (see the picture on the front page!). It is difficult to see how anyone could grow a crop in those conditions. Norman told us that, during World War II, the field had been used as a dispersal area for aircraft based at Detling. Continuing we took the course of an old track bed to the White Horse Wood Country Park. This involved crossing a field of oilseed rape that was close to being harvested. It was therefore high, dry and had collapsed across the path, which made the going slow and unpopular with a few of the group. We entered and crossed the country park then turned left to take a footpath to the remains of Thurnham Castle. There we met a group of students on a hike with their tutor and enjoying a lunch-break and rest.

A nearby notice board gave a nice write-up on what little is known of the castle's history and is partly reproduced below for information.:-

"The history of Thurnham Castle is mysterious. It was first mentioned in a document of 1225, but the castle may be much older than this, perhaps dating to the late 11th century. The first owner is believed to be Ralph de Courbépine, a tenant of Bishop Odo of Bayeux (brother of William the Conqueror). Stephen de Thurnham, great grandson of Ralph de Courbépine, held the manor in the 12th century. By the 14th century the castle had passed to the Northwood family and then to Robert Corbie.

The castle was abandoned by the 15th century for Corbier Hall, south-west of Thurnham village."

After reading the history of the castle we pressed on, following the North Downs footpath that gave us superb views to the south before we descended to Detling. We took a footpath diagonally across a recently harvested field before heading eastwards across another field of oil seed rape to get to Thurnham Church. Norman had arranged that the retired church warden would have tea and cakes for us when we arrived, which was a very welcome surprise. Though very old the church was considerably altered by the Victorians who added a spire and rearranged the interior. It is lovely inside and I asked the former warden if it was acceptable to take photographs. Photography is generally welcomed in most churches as long as one respects the wishes of other visitors. I think you will agree from the attached photograph that the interior was beautifully cared for and worth photographing.

Suitably refreshed we walked up through Thurnham village, turned right and followed the road until we came to a footpath on our left that cut diagonally up across the downs to emerge on Coldblow Lane just below the Equestrian Centre. The weather had remained bright and sunny all afternoon, we walked about six miles and nobody complained (except about the oil seed rape!),

Wherever we go Stephen and I look out for wildlife. Below are three photographs we took of flowers. The Basil Thyme was spotted at the top of the downs just before Coldblow Lane and is a rarity. It is not listed at this location in the latest edition of 'The Atlas of Kent Flora' and only two previous sightings have been recorded in that ten kilometre square. Pyramidal orchids have been abundant this year and Viper's bugloss is a common plant on chalk though none the less beautiful for that! We thank Norman for a most enjoyable afternoon. For more information about Thurnham see:-

http://www.thurnham.org.uk/thurnham/view/26/A-Brief-History-of-Thurnham

The group at Thurnham Castle

Enjoying the view from the North Downs

Descending from the North Downs

Returning from Detling

Oilseed Rape, on the way to Thurnham

Interior of St Mary's Church, Thurnham

Basil Thyme

Pyramidal Orchid

Viper's Bugloss

A Search for the Tributaries of the East Stour River

The Kent Geologists Group field trip for 5th July 2014 was advertised as “A search for the tributaries of the East Stour river in the Stowting region of east Kent”. It was to be led by Alison Taylor in the area around her farm in Fiddling Lane.

Some of the most satisfying field trips that Stephen and I have been on were the Darenth Valley (14th June 2008, led by Ann Barrett and Nick Baker), Chafford gorges (28th June 2008, led by Di Clements), Field Trip to Herne Bay (25th June 2011, led by Adrian Rundle) and Bluebell Hill Walk (7th June 2014, led by Anne Padfield), all reported in the Group’s website. A factor that all of these field trips had in common was that they were relatively local geomorphological study events, lasting one day and led by a person with knowledge of the area. They were also made in mid-summer with a prospect of pleasant walking in warm weather. It is perhaps not surprising that this type of field trip was judged to be the most preferred in responses to a questionnaire recently sent out to all KGG members who have attended an indoor meeting in the last two years.

Alison’s planned walk seemed to ‘tick all the boxes’ and to be too good to miss.

Nine KGG members met at Alison’s house to be greeted with cups of tea and an array of Geological maps, Ordnance Survey maps and books covering the East Kent area. Alison explained that the Stour river rises in the area north of Stowting from a number of springs that initially flow southwards before turning westward towards Ashford, The Stour then flows northwards to Canterbury, then eastwards, finally entering the sea at Pegwell Bay, having turned through more than 270 degrees before completing its course. Initially known as the East Stour, the river changes its name to Great Stour between Ashford and Canterbury.

A second source of the Stour appears about a mile or so north of the sources at Stowting and flows directly northwards to join the Great Stour between Canterbury and Sandwich and is called the Little Stour.

Rain water falling on the North Downs percolates down through the various layers of chalk until it reaches an impervious layer. It then follows the gradient of the impervious layer until it emerges at the surface as a spring. Most frequently, but not invariably, the impervious layer is the Melbourne rock at the base of the middle chalk, or the Gault clay deposits below the chalk. Storage of water in the chalk is a major aquifer and springs of water coming out of the chalk have long been a valuable source of clean water to people living nearby.

Alison said that our aim was to investigate some of the springs around her land, and note their characteristics as well as enjoying a walk in the lovely countryside around Stowting

We started by walking eastwards across the field behind Alison’s house towards Boldens Wood after which her house is named. Here we met another of Alison’s interests, two llamas, two alpacas and some rheas from South America. The llamas have an initially disturbing habit of galloping up to investigate newcomers, looking you in the eyes and then snorting in your face to indicate approval before returning to what they were doing. They are quite friendly and harmless! The rheas are also peculiar. The female lays her eggs then abandons them to the male that has the task of incubating them. At the bottom of the field, just before Boldens Wood, Alison has a lake with fish that rise to the surface when she feeds them. We could see from the lower slopes that the base of the lake was clay.

At the western edge of the wood was a shallow stream flowing southwards. The stream had originally flowed along the edge of the adjacent field but Alison had reached an agreement with the farmer to divert the stream through her wood to the satisfaction of both parties. The source of the stream was clearly further north and was our next destination.

We returned to the house then drove a few hundred yards up Fiddling Lane, parked our cars at the side of the road and took a footpath eastwards across the middle of a group of four fields, two to the north and two to the south of the footpath to look for springs.. We were not being lazy, but had planned to continue onwards to Stowting! We followed the northern edge of the first field until we came to a dividing hedge on our left. Following this southwards we passed a few trees then came to some low hedge growth. At first the ground below the hedge was just damp and muddy; a little further on we could see water beneath the hedge. At the bottom of the field we came to a low concrete structure that had probably once been a sheep dip but now grows watercress (picture 1 below). Ahead of us we could see one large field that logically should have been two, but now had a slight depression across it (picture 2 below). Alison explained that the stream had been piped here, presumably to allow the farmer to improve efficiency by ploughing a larger field. Beyond that field could be seen a line of hedges continuing southwards to Boldens Wood at the bottom of Alison's garden, so presumably we had found the source of her stream.

Returning to the footpath, we continued westwards until we reached trees forming the western boundary of our four fields. Here the footpath turns south. Following the hedge on our right we came to a gap that led to a footbridge across a stream; the footpath then continues westwards (picture 3). Retracing our steps we climbed up to the more western of the two northern fields and followed the hedge on our left. Eventually we came to the end of the hedge and trees. The trees seemed to be at the bottom of a cup-shaped hollow. This is the classical shape of a spring in which emerging water


1. Sheep dip with watercress


2. Depression of piped stream


3. Footpath to the bridge

carries away sediment from the surroundings. Over time, this causes an unstable bank in which higher level sediment falls into the eroded hole to form a more stable slope (picture 4 right).


4. Cup-shaped Depression

By now we had been so enthusiastic in tracing water sources that we were running late and Alison suggested we return to her house for refreshments before continuing to Stowting. Though The Black Horse at the bottom of Fiddling Lane serves meals, we had all brought packed lunches. In addition Alison had cooked soup for us all.

After a pleasant lunch we drove up the lane towards Stowting to look for more springs.

5. Site of former Motte and Bailey

Bearing right at the top of Fiddling Lane, we then took the left fork to Stowting and, after about 100 metres, parked at the side of the road opposite a public footpath bearing north to the corner of the field (Map 5 left). We followed this footpath around the field edges, with high hedges on our right. Soon we reached a path through the hedge. Taking this path we emerged into another field. On our left was a high tree-topped mound. This is all that now remains of a Motte and Bailey possibly dating from Norman times (see map left). This defensive structure was introduced to England by the Normans in the eleventh century. It consists of a mound, typically 10 - 15 feet high (the Motte), on which was built a wooden, then later a stone, castle. The Motte was located in, or adjacent to a Bailey, a flat defensive area surrounded by a palisade. Returning to the footpath, we followed the trees on our right. Near the end of the trees a gap exposed a steep slope descending to a shallow stream. Peering round to our left at the bottom of the steep slope we had descended, we could see water emerging. We had found another source of the Stour. The bottom of the slope was clay, very slippery and clinging, indicating that once again clay was the impervious layer below the porous chalk. If the Motte and Bailey had been protected by a moat, this spring could have supplied both drinking water and an additional defence. After examining the spring we continued on the footpath to emerge onto a road descending to the village of Stowting (the North Downs way).


Source of Spring in Figure 5

We completed a clockwise circuit of Stowting to return to our parked cars. We admired the charming village school, the church and noted some evidence that still remained of a mud slide that engulfed the lower parts of the village in the previous winter.

Our next destination was Pent Farm on the road from Stowting to Postling. From 1899 to 1920 this had been the home of Polish-born Joseph Conrad, the author of several successful novels many of which, such as ‘Heart of Darkness’ and ‘Lucky Jim’, have been converted into equally famous films. It was then known as ‘The Pent’. George Bernard Shaw and H. G. Wells often visited Conrad here. However, our visit was more geologically inclined. We parked in the yard, south of the road to Postling and walked across the grass towards a stream. There we saw a shed housing pumping equipment that took water from the stream and pumped it up to the attic of the house as a source of domestic water. Nearby was a stone tank-like structure about six feet square with walls about six inches thick. We thought that this could have been a filter for spring water. Sediments that were not filtered out by passage through chalk would settle to the bottom of the tank leaving water at the top of the tank clear.

Our final stop was a few hundred yards further down the hill where a metal fence stopped vehicles and pedestrians from falling off the road into the valley below. Here we could peer through the trees and see a substantial stream flowing away from the steep hillside behind us - another source? After exchanging farewells, we made our separate ways home.

We wish to thank Alison for all her efforts in planning and leading our trip; for the data she made available, both as originals and as handouts for the walk; for the tea she provided and for the soup she prepared for our mid-day break. We also wish to thank Alison’s son and daughter-in-law for accepting our invasion of their home, making us welcome and helping Alison with the domestic arrangements.

Thanks are also due to Ann Barrett who walked the course with Alison before the event and made suggestions. I also wish to thank Paul Wright and Dave Talbot for supplying photographs of our trip.

Without their efforts we would not have had such an enjoyable day and there would not have been a newsletter article.

The Attraction of Minerals

John Taylor

My interest in minerals started some fifteen years ago when I was helping my granddaughter to build a collection. Liking what I saw, I started my own collection and joined the Kent Geologists Group to learn more about them. However, I found myself in a small minority; most members being interested in fossils. So what is the attraction of minerals?

For me it is the beauty of their crystal forms and often vibrant colours. Pictured left is one of my favourites, a specimen of Mesolite, $Ca_2(Fe^{2+}, Mn^{2+})[PO_4]_2.2H_2O$.

An added attraction is that there are only 4400 or so recognised types - a great reduction from the seemingly infinite number of fossil types. So what is your main interest in geology? Send me a few words, preferably with a picture and I will add it to the next newsletter.

The view from Alison's garden

Some of Alison's pets in her garden

More pets….

The male rhea incubates the eggs

Site of the stream in the second field

We also studied the local flora

The view towards Stowting

The Old Rectory, Stowting

Gallery of photographs taken by Dave Talbot on the 'Stour Sources' walk

Indoor Meetings Programme, 2014

Ann Barrett

Please bring any interesting material to Indoor Meetings. It does not have to be related to the subject matter of the day's talk. It could include recent finds, specimens for identification and books, maps, photographs, etc. of general interest.

Details of forthcoming field trips will also be announced at Indoor Meetings.

Tea and coffee is available at 20p cup. Non members are always welcomed but are asked to donate £1 to the Group's expenses, unless joining on the night. For any queries concerning this programme, or to suggest speakers or subjects for talks, please contact:-

Indoor Programme Secretary: Ms. Ann Barrett.

Tel. 01233 623126, e-mail annbarrettgeo@gmail.com

16th September 2014	**Dr Anne Padfield**. 'The Chemistry of Change.'
21st October 2014	**Dr Geoff Turner**. 'The Jacques Deprat Affair - Trilobites and Trouble.'
18th November 2014	**Ann Barrett**. 'Agate.'
16th December 2014	**Christmas Evening (3rd Tuesday).** Please bring labelled fossils, minerals and rocks for sale for the benefit of the Group and any other specimens found during the year for display. Members may also care to bring in refreshments.

Field Meetings Programme, 2014

Mandy Bird

6th September 2014	Anne Padfield's Bluebell Hill Walk No.3: The Vineyard Walk: Starting at 2.00pm. From Old Chatham Rd, to Eccles, then outskirts of Burham and back.
7th September 2014	Visit to Smokejacks Brickworks..Meet at 10.30 a.m. in the car park at Smokejacks Brickworks (Wienerberger Limited - Ewhurst Works). Smokejacks is just south of Walliswood (4 km southwest of Ockley), Surrey. O.S. map 187 - 1:50,000 series. Grid reference TQ 116 372. Postcode RH5 5QH for those with SatNav. All wishing to attend MUST book through Peter Austen. For details see website 'Fragments' page
1st November 2014	Geologists Association, Festival of Geology. University College London (UCL), Gower Street London. The Kent Geologists Group usually shares a large room with a display by the junior geologists 'Rock Watch' group and has up to ten tables, requiring lots of support. Help in manning these tables will be appreciated.
Important Notice:	Members wishing to join an event must contact the leader well before the event so that he/she can plan for the numbers coming and, on the day, knows who to expect and who is missing.

Christmas Quiz - Answers

1. Top of fruit of Eocene Stemless Palm (*Nypa burtinii*)
2. Occlusial view of Pleistocene horse tooth (*Equus sp.*)

3. Portland Stone (on St. Paul's Cathedral)
4. Part of Jurassic bivalve (*Trigonia costata*)
5. The Giant's Causeway in Northern Ireland (columnar basalt)
6. Burrow of Cretaceous shrimp (*Ophiomorpha nodosa*)
7. Large Middle Eocene forminiferan (*Nummulites laevigatus*)
8. Blue John (a form of massive Fluorite)
9. Satin Spar (a form of Gypsum)
10. Underside of Eagle Ray tooth (*Myliobatis sp.*)
11. Sectioned septarian nodule.
12. Fossil mudcracks.
13. Silurian Ostracod (*Beyrichia kloedeni*).
14. Stalactite (Calcite).
15. Iron/Nickel Meteorite (showing Widmanstatten pattern on etched surface).
16. Fossil ripple marks.
17. Dog-tooth spar (a form of Calcite).
18. Breccia.
19. Silurian trilobite (*Calymene blumenbachi*). The 'Dudley Locust'.
20. Quartz crystals.

Word Search

How many words of Geological interest can you find in this standard word search puzzle? (complete words are in straight lines; vertical, horizontal or diagonal). Twenty plus words is 'not too bad'; 30 plus is a good haul; ;approaching 40 is 'excellent'. Happy hunting!

E	M	E	R	T	O	N	O	M	E	V	R	A	V
D	E	C	N	I	D	A	R	I	A	E	S	U	E
I	D	A	W	O	S	P	L	A	I	N	L	E	T
S	Y	H	T	E	T	P	R	V	W	C	T	V	I
N	D	L	E	I	H	S	U	E	A	O	A	E	C
E	O	C	E	N	E	C	N	N	N	R	P	I	L
K	P	I	T	O	N	L	I	O	I	E	E	N	A
C	O	Z	T	E	O	S	T	S	R	N	G	Z	N
I	I	O	P	C	M	T	C	I	E	I	M	E	A
L	H	O	K	I	U	A	O	H	L	C	A	G	W
S	C	I	Z	H	N	D	C	C	I	L	T	N	D
H	A	D	N	O	G	A	B	R	A	S	I	O	N
N	R	V	A	R	E	N	I	U	S	N	T	P	O
O	B	H	P	A	R	G	O	M	S	I	E	S	G