SSEF

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Dear Reader

To work as a gemmologist in the SSEF laboratory is a truly exciting and challenging experience. Apart from the scientific side of gemstone and pearl analysis, I am -even after more than 12 years at the SSEF- still astonished at the stunning beauty of many of the prestigious gemstones that we receive for certification. This beauty may be found in a perfect and telling spectroscopic diagram, as much as it may unveil itself in a delicate arrangement of microscopic inclusions, in a vivid and saturated colour of a gemstone, or in the craftsmanship of an artistic jewellery design. With the present SSEF Facette No. 18, we would like to share with you not only the most recent information and research findings, but also our fascination for exceptional gemstones and pearls.

In terms of our business, the year 2010 has been an exciting and challenging one for the SSEF. A main focus were pearls, as we saw the arrival of large quantities of „new“ pearls in the natural pearl trade and finally in our laboratory. Based on our research efforts many of these pearls could be identified as cultured pearls, formed purposely or accidentally during pearl cultivation in pearl farms. This topic was also in the headlines of international trade journals after our press releases in May 2010 (see also inside this issue). Numerous visits to other laboratories, pearl dealers, collectors and pearl farmers have further strengthened our position as the international authority for testing of natural pearls in 2010.

Apart from this, the year 2010 has also been a year of economic recovery for the international trade, but also for the laboratory. With more work and more certificates than ever before, the whole team has contributed to the further development of the SSEF in the last year. In 2010 we have also expanded our on-site services, especially focussing on Asia and Europe with our new office in Paris (see also inside this issue). Based on these experiences, the SSEF has developed a strategy of steady growth into the main international markets, but uncompromising in its commitment to excellence and Swiss Quality in testing as a premium brand for gemstone and jewellery certification.

In 2011, we are confident that new challenges, but also new options for research, development and services are ahead of us. In this spirit, I would like to thank you also for your continued confidence in our services.

I wish you all the best for 2011 and a prosperous and exciting year for your business.

Dr. Michael S. Krzemnicki
Director SSEF

Cover photo:

A horse-conch shell, a necklace of *Pinctada radiata* natural pearls and a loose natural pearl.

Photo © Swiss Gemmological Institute SSEF

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Spinel, a gemstone on the rise

Blue spinel of 84 ct from Madagascar.

Spinel has always been among the most beautiful and valuable gems. Recently, we've observed a new trend for spinels in high-end jewellery. This is also due to the fact that spinel is generally not treated. Found in a wide range of colours, from saturated red to pink, violet to lavender and light blue to cobalt blue, these stones are also often quite pure. This article is a follow-up of the presentation Dr. Krzemnicki gave during the Hong Kong Jewellery Show in March 2010, organised by the HK Trade Development Council.

Vibrant red spinel of 38 ct from Mahenge, Tanzania.

Spinel of 110 ct from Tajikistan certified at SSEF.

The mineral spinel

Mineralogically, spinel belongs to a large group of composite oxides of similar structure (isomorphs), also called the spinel group. This is a large group of minerals with the general chemical formula of AB_2O_2, where A may stand for Mg^{2+}, Fe^{2+}, Mn^{2+}, Zn^{2+}, Ni^{2+}, and B for Al^{3+}, Fe^{3+}, Cr^{3+}. Members of this isomorphic group include the minerals spinel ($MgAl_2O_4$), hercynite ($FeAl_2O_4$), gahnite ($ZnAl_2O_4$), magnetite (Fe_3O_4) and chromite ($FeCr_2O_4$) among many others. Numerous intermediate chemical compositions are possible as these minerals show intense chemical mixing behaviour. Chemically pure spinel ($MgAl_2O_4$) is colourless. However, traces or minor amounts of colouring elements (chromophores) such as chromium (for pink and red), vanadium, iron, and rarely cobalt (vivid blue) are commonly found in natural spinels. These chromophores are responsible for a broad spectrum of colours from pink to red, orangey red to purple and violet, light blue to vivid blue, green to greenish blue and bluish grey, and even black opaque stones.

The spinel structure is cubic, mostly resulting in crystals of perfect octahedral shape (similar to a double-pyramid). Spinels are often twinned along an octahedral plane, thus forming attractive specimens, ideally in the shape of a six-sided star. Due to the beauty of the octahedral shape, traditional Burmese jewellery is often made of entire spinel crystals, resulting in a very clear and even „modern" design of these items, even when they are of historic age.

Historic background of spinel

Spinels have traditionally been used as gemstones for many centuries. The root of the name spinel is not clear. It may be linked to the ancient Greek term spinos (σπίνος), meaning „sparkling" and thereby referring to the bright lustre and brilliance of spinel. Or it may have been derived from the Latin word „spina", standing for „little thorn", to possibly describe so the octahedral „thorny" shape of the crystals. However, in ancient times, spinel was not known as a mineral and many of the large historic „Balas rubies" from Central Asia and Persia were later mineralogically identified as spinels.

The name "Balas" is derived from the name Badakhshan, a historic region comprising parts of what is now northeastern Afghanistan and southeastern Tajikistan in the Pamir mountain range, where since historic times large and beautiful spinels were mined. These large and often just slightly polished and engraved spinels went through the

Red spinels from Burma, SSEF collection.

hands of the kings of central Asia, Persia and India and were only described by a few adventurous European travellers such as Marco Polo and Jean-Baptiste Tavernier and others at that time.

One of the finest examples of a Badakhshan spinel is the Black Prince "ruby" (~ 140 ct) which is mounted in the front of the Imperial State Crown of Great Britain.

Spinel sources

Spinels have been found traditionally in Tajikistan, the Mogok Gemstone tract in Burma (Myanmar) and in Ceylon (Sri Lanka). The spinels from the Pamirs generally display a pinkish red to antique pink colour and are sometimes of superb purity and impressive size. The SSEF has certified a number of these outstanding jewels, both historic

engraved pieces and recently cut stones of up to 110 ct. Although the mines in the Kuh-i-Lal valley are exploited since centuries, there is still nowadays a production of finest material that enters the gem market.
Spinels from Burma show a large variety of colours, including subtle pastel colours of pink, violet, orange and greyish blue. However, the most intriguing and appreciated spinels from Burma show an intense crimson red colour, due to a combination of well-balanced trace elements in the stones, typical and characteristic for spinels of the Mogok gemstone tract. Spinels from Ceylon are often found in pastel colours to pinkish red, deep blue, and rarely in vivid cobalt-blue colours.

Spinels from Luc Yen, Vietnam and spinel beads from Tajikistan with Arabic letters engraved.

Apart from these classical sources, gem-quality spinels have been found more recently in Vietnam, Madagascar and East-Africa. The stones from Vietnam are found in the karsty dolomite marbles of Luc Yen in northern Vietnam. They commonly show delicate pink to light violet and light blue colours. Mostly not very large stones, their fresh colours are highly attractive. In rare cases, vivid cobalt-blue spinels are found.
The spinels from Madagascar are mostly found in secondary alluvial deposits and are in many aspects similar to the findings in Ceylon. The most attractive spinels from Tanzania are found near Mahenge in the Morogoro Province in central Tanzania. These vibrant red to slightly pinkish red spinels may be of impressive size and purity. Part of them had been cut from a gigantic spinel crystal of 52 kg, found in 2007 in that zone. Further spinels are found at Matombo (central Tanzania) and further in the south in Tunduru.

Origin determination of spinel at SSEF

With the increase in popularity and customer perception for these fine gemstones in the market, spinel prices -especially for red colours- have significantly increased. This may also be due to the fact that spinel is commonly untreated, thus representing a true treasure of nature. Due to this recent trend, we see more and more spinels in the laboratory, often of exceptional size and quality. Similar to ruby and sapphires, the trade often requests an origin comment on the gemstone report, especially for spinels from the classic mining sources. Since several years, the SSEF offers geographic origin determination of spinels as a service to our clients. As for other gemstones, we can only determine geographic origin when enough evidences (microscopic, chemical, spectroscopic) are present within a stone.
Knowing the geological background and mining situation is the key to understanding the specific features characteristic for a gemstone locality and therefore for geographic origin determination, for which the SSEF is reputed worldwide. In October 2009, the author had the possibility to visit the Ipanko spinel deposit near Mahenge in central Tanzania. The Ipanko mining zone itself extends along a valley dipping southwards from the Mahenge massif. Although partly exploited directly from the marble, most crystals, including the 52 kg giant spinel found in 2007, are mined from eluvial gravels that are accumulated in pockets of the karstic marble formations. During our visit to the mining area, a number of outcrops were being worked. The mines of different concessionaries and consortia are rowed up next to the other, alongside the small river. We visited the mine pits and were soon surrounded by miners who showed us small and large spinel crystals. Swiss gemmologist Walter Balmer and I were able to collect a large number of spinel samples, together with a few other minerals such as apatite, pargasite, chondrodite and a few rather translucent rubies from a nearby calcite marble outcrop.
Finally, in June 2010, an outstanding collection of large spinels from Mahenge (from the Hatik Gemstone Collection) was made available for testing to the SSEF. Comparing SSEF's reference samples collected directly at the mine with these spinels has added valuable information to our ongoing spinel research, and was also considered a great pleasure due to their colourful beauty.

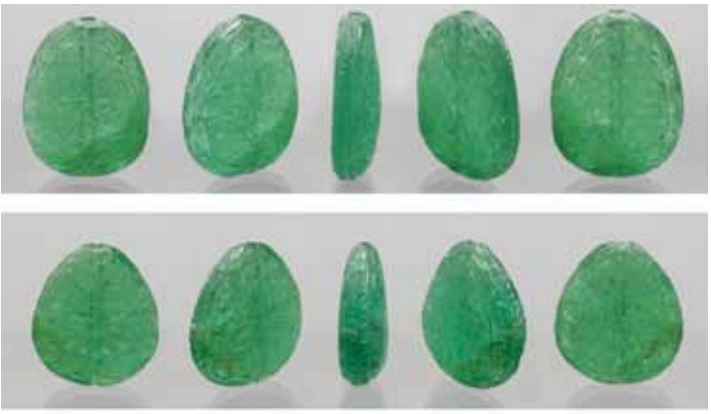
Excellent new book on spinel

There are many indicators showing that spinel is on the rise and is appreciated as an attractive and brilliant gemstone by designers all over the world. Although beautiful and rare, it is important to increase consumer perception and understanding for these stunning stones. In this spirit, the author would like to recommend the interested reader the book "Terra spinel, Terra firma", published recently by V. Yavorskyy and R.W. Hughes. This book is designed as a coffee-table book in its best sense, presenting the reader pictures of some of the most beautiful spinels together with colourful and fascinating photos of the landscapes, the cultures and the peoples from where spinels originate. You may order the book at SSEF or directly from the authors (ISBN 978-0-615-40901-6).

Author: M.S. Krzemnicki

Historic objects at SSEF

Since many years, the Swiss Gemmological Institute SSEF receives historic objects for testing and certification. In the last few months, some of these objects have attracted not only our scientific interest, but have also given us much pleasure in appreciating the craftsmanship and cultural background in which they were created as important signs of power and representation in historic periods.



Emeralds resembling classic Mughal gemstone carvings.

In summer 2010 we received a historic emerald pendant, which by its design and historic references can be traced back to the Spanish renaissance period in the late 16th century. The impressive pendant shows a winged dragon with natural emeralds mounted on the front side and backside. The moving parts such as the red enamelled tongue and the green enamelled salamander at the feet of the dragon, make this jewel an outstanding example of craftsmanship of the renaissance period. From a gemmological point of view, two pearl objects caught our special interest. One is a brooch probably originating from the 16-17th century that consists of hollow pearls, mounted artistically to represent an animal, maybe a sheep, together with red pyrope garnets, possibly of Bohemian origin. The other is a ring, on which two blisters have carefully been set in such a way as to “imitate” a round pearl, covering the joint by a metal lining with diamonds.

Apart from this, a number of royal tiaras originating from early to late 19th century were recently analysed at the SSEF, including two which were richly decorated with pearls and sapphires from Great-Britain. The most intriguing jewellery item certified recently at SSEF is certainly the parure originally made for the royal family von Württemberg in Germany. This parure consisting of a large necklace, a tiara, ear-pendants and two bracelets is set with a large collection of superb pink topazes surrounded by fine old-cut diamonds. The design of this jewel is highly artistic in its floral patterns, highlighting the beauty of the gemstones at their best. To wear such a jewel must have been a true royal pleasure. Another set of brooches of similar age, set with light blue opaque cabochons, was found to consist mostly of odontolite, a material in fashion especially in the early 19th century, when this organic material (fossilized dentine) was exploited in South-Western France and heated to create a turquoise simulant, also known as „French turquoise“. Both, the Württemberg parure and the odontolite brooches will be further described in two publications, which are in preparation at the moment.

Author: M.S. Krzemnicki

Necklace with large pink topazes which forms part of the Württemberg Parure

Muscovite grown after beryl

Recently, the Swiss Gemmological Institute SSEF studied a number of mineral samples (7 – 48 ct), which were said to originate from a pegmatite outcrop in the Northwestern Territories of Pakistan, close to the Afghanistan border (Hindu Kush).
All specimens are characterised by a distinct six-sided outline (see Figure 1), formed by an incrustation of white crystals on a previously existing hexagonal crystal.
They had already been cut in slices from at least two original specimens, thus enabling us to see the hollow interior part of the samples, partly containing a fine-grained powdery filling.
The incrustation consists of stacked tabular mica crystals, forming long columnar piles as it is quite often encountered with micas and which are oriented parallel to the hexagonal 'prisms'. Raman micro-spectrometry, ED-XRF and LIBS identified these micas as muscovite.
These specimens are nice examples to better understand the terms epitaxy (oriented on-growth of a crystal on another crystal) and pseudomorphism (mineral or mixture, replacing an original mineral during geological alteration) as they are interpreted as the result of such processes. After a primary growth of prismatic beryl (e.g. aquamarine), the crystal was covered by a dense and oriented pattern of muscovite mica, preserving the hexagonal and columnar shape of the original beryl crystal.
In a later stage, a pseudomorph of a fine-grained mineral mixture replaced the primary beryl. Based on chemical data and literature, we presume that this fine-grained matrix consists mostly of "sericite", a fine-grained variety of muscovite, and clay minerals such as kaolinite. Similar replacements of Al-rich primary pegmatitic minerals such as beryl, tourmaline, topaz, kyanite, and spodumen, which have reacted with late low-temperature fluids are well-known in literature (Cerny 1968, Deer et al. 1996, Markl & Schuhmacher 1997). Finally, part of the fine-grained filling was washed out by meteoric waters, leaving part of the specimens as hollowed muscovite incrustations.
Although not gem materials, these specimens are very attractive. Firstly, because of the shiny and reflecting appearance, and secondly, because they beautifully unveil a very interesting aspect of mineral formation/alteration dynamics in a pegmatite exposed to late low-temperature fluid reactions.

A more detailed publication on this material will be published in the upcoming Journal of the Gemmological Association of Hong Kong.

Author: M.S. Krzemnicki

Figure 1: An aquamarine crystal as a model to demonstrate its resemblance with the six-sided muscovite incrustation which is interpreted to have grown epitaxically on a previously present beryl crystal.

Update on synthetic diamonds

The successful production of larger synthetic diamond single crystals can be achieved using two methods: HPHT and CVD. With the first technique, conditions of the upper earth mantle are recreated: high pressure and high temperature, at about 50kbar and 1500 °C. Heavy BARS presses heat a small reaction chamber in which the seed, the solvent catalyst and the carbon source are kept. The necessary carbon feed is usually graphite powder, the solvent catalyst is a metallic melt containing iron. Under these conditions on the seed, a synthetic diamond of sectorised cubo-octahedral size grows. After cooling down, the crystal of up to 2 cm size is etched out of the metal catalyst with acid.
That facilities producing HPHT synthetic diamonds exist in Switzerland was new to us, and during a training day of the Swiss Gemmological Society we were allowed to visit the factory in Nidau. The usually yellow crystals of type Ib are generally used for surgical scalpels and mechanical tool production.

Fortunately only one week later I was able to visit a second company, situated in Seddiner See (Germany) where 6 HPHT BELT presses produce synthetic diamonds, again mainly for technical applications. When a larger number of crystals are needed for diamond grit, the technology makes use of spon-

Orange yellow HPHT synthetic diamonds from the Ziemer factory in Nidau, Switzerland.

taneous nucleation and thereby no seed crystal is exposed. The same company also produces blue synthetic 'memory' diamonds. Such diamonds are said to be made from human bone ashes. As bone ashes are mainly calcium (Ca) and phosphorous (P), graphite and boron is added from an external source. The presence of some bone ashes does not disturb the process, and Ca and P is not part of the synthetic diamond.
The second technique to produce larger single crystal diamonds is using the CVD (chemical vapour deposition) process. Cloud methane gas (CH_4) is decomposed in a plasma, and the carbon atoms of this gas feed the seed crystals, which are kept at high temperature. The CVD diamond crystals are thin plates of a few millimetres. A brilliant up to one carat in size is still a great rarity, and identifiable as a synthetic stone in the laboratory. Only a few companies have the technical equipment and the know-how for this kind of production. The resulting crystals are usually of type IIa, and are not very colourless after formation. However, if later subjected to HPHT treatment, they can end up as colourless material. From thin plates of CVD synthetic diamonds, small brilliants and baguettes could be cut. The SSEF diamond department regularly checks large lots of melée diamonds for the jewellery industry, to make sure that no synthetic material or imitations are mixed into the lots.

Author: H.A. Hänni

Stabilized opal

Since many years, the Swiss Gemmological Institute SSEF offers damage analysis as a special service to our clients. A quite exemplary case was investigated at the beginning of 2010. We received a couple of brownish opals from a client, which were found originally near Mezezo, about 150 miles northeast of Addis Ababa, within the Shewa Province of Ethiopia.
These opals are known on the market since the 90s and are mostly characterised by their brownish body colour, containing rounded patches that show a vivid play of colour. They are generally present as nodules, which are found in tuff layers within tertiary volcanic sequences. As with other volcanic opals, the stability of the material is somewhat of an issue, as dehydration may create crazing and cracking.
In the case of the investigated samples, we were informed that an already mounted piece had broken unexpectedly (see Figure 1). We were thus asked for a damage analysis of the material. As was already evident from microscopic investigation all samples, including the broken one, showed a number of cracks filled with a colourless substance. On the broken surfaces, this fissure filling was still partly present as fine colourless and ductile thin films.

Further testing with scanning electron microscope (SEM) at the Centre for Microscopy of the University of Basel revealed that these fillings were not completely solidified, but still viscous, resulting in deformations when hit by the strong electron beam.

Figure 1:Two of the investigated stabilized opals from Shewa, one broken (right), one still in shape (left).

Furthermore, chemical data from SEM-EDS showed that the filling contained no silicon, but much carbon and nitrogen (C, N- see Figure 2). Combined with Raman analyses on these cracks, we could finally identify the filling as a styrene-acrylonitrile resin. Testing on a number of further samples from Shewa from a different supplier showed that fissure filling/stabilization and surface treatment with artificial resins was also applied on part of this material. The reason this was done was obviously the rather low stability of these nodules, which resulted in spontaneous cracking, as they become dehydrated after they had been mined.

Author: M.S. Krzemnicki

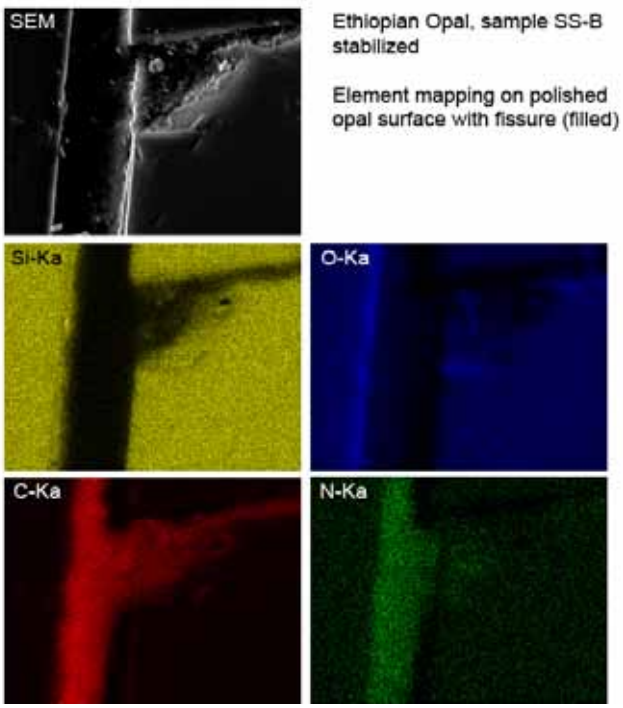


Figure 2: SEM micrograph (top) showing a Y-shaped crack within the opal specimen. The elemental maps (SEM-EDS) of the same structure reveals a concentration (intense colour) of carbon (C-Kα) and nitrogen (N-Kα) and an absence (black) of silicon (Si-Kα). © M. Düggelin, Centre for Microscopy, University Basel, Switzerland.

Pearls in the focus at SSEF in 2010

In the past few months, the Swiss Gemmological Institute SSEF has focussed on pearls in research and communication and thereby expanding its recognised expertise. We are very proud to say that the SSEF is nowadays the international authority in pearl testing and many of the most prestigious natural pearls in the market come along with an SSEF report.

Our research focus is due to the fact that natural pearls, as true treasures of nature, have gained recently high recognition in auctions. With the rising economies in the Middle and Far East as main driving forces, new clientele is interested in high-end jewellery; and pearls, being historically highly appreciated in many of these cultures, have a great potential.
The main reason for our research efforts, however, are challenges which the trade of natural pearls is facing with the supply of large quantities of cultured pearls of high quality which are purposely introduced into the market as natural pearls.

The SSEF has encountered many of these pearls, which are often difficult to identify by classical testing. To inform the gemmological community and the trade, we wrote two press releases and several articles, which were published in international gemmological journals, trade magazines and internet forums:

1) Trade alert on beadless cultured pearls
2) Press release and publication on cultured pearls with new beads, e.g. natural pearls
3) Publication in Gems&Gemology about micro X-ray tomography as a new method for separating natural from cultured pearls.

A direct consequence of these challenges were several visits to the Gem and Pearl Testing laboratory in Bahrain, a major hub of the natural pearl trade in the Middle East. This resulted in the signing of a Memorandum of Understanding (MoU) between the two laboratories to collaborate in research and education in the future. Pearl experts from the most important pearl testing laboratories, including Dr. Krzemnicki and Prof. Hänni from SSEF, were invited to the first LMHC Technical Pearl Commission meeting in Bahrain to discuss and agree on a standardised examination policy and report wording for pearls (see this Facette, News section).

Figure1: Beadless cultured pearls from the Pinctada maxima (Goldlip), showing perfect lustre and homogeneous colour. Internal features have enabled the SSEF to identify these pearls as beadless cultured pearls.

'Keshi' cultured pearls are entering the natural pearl trade

SSEF Trade Alert May 2010

At the beginning of 2010, the Swiss Gemmological Institute SSEF received large quantities of saltwater pearls for certification. These pearls are generally characterised by an almost perfect appearance. The pearls are often accompanied with reports describing them as natural pearls, but their appearance has raised doubt amongst many natural pearl dealers. Having tested these pearls with the most advanced technology, including X-ray radiography, X-ray luminescence, micro X-ray tomography and radiocarbon age dating (see also SSEF Facette No. 17, 2009), we see that many of these pearls are actually beadless cultured pearls.
The cultured pearls in question are a by-product of beaded cultured pearl production (e.g. South Sea cultured pearls in *Pinctada maxima* oysters) and sometimes described as 'Keshi' cultured pearls in the trade. They may form when the bead is rejected after insertion together with a small tissue piece in the oyster. As the tissue (or pearl sac) is still in place, the resulting product is a beadless cultured pearl. They may, however, also form due to accidentally resulting injuries during the grafting surgery procedure at a pearl farm. A common characteristic of all these pearls is that they formed in oysters at a pearl farm, benefiting from the meticulous care and intervention of pearl farmers.
As the trade is currently overflowing with these beadless cultured pearls, the SSEF has taken measures to protect the natural pearl market from this threat. A first step is the use of more rigorous and specific definitions for natural and cultured pearls: a natural pearl is a pearl, which formed in

a wild oyster (mussel) living in its natural habitat. It formed without any human intervention. Any pearl stemming from a pearl cultivation farm is a cultured pearl. The SSEF considers that pearl farming constitutes a form of human intervention.
Although these pearls do not show one distinct feature that explicitly characterises them as cultured, it is the combination of internal and external structures, which enable an identification of this material. The most common internal feature (radiography) of beadless cultured pearls is a small curved dark line or a larger curved cavity at the centre of the pearl. Furthermore, many of these problematic beadless cultured pearls show a round dark core containing numerous fine circular chonchiolin layers on radiographs, often with one or more small white calcium carbonate spots in the centre (Figure 1). It is this last feature, which may be misinterpreted as an indicator for natural growth, and lead to the wrong conclusion that the pearl is natural. As these pearls are often specifically (and often intentionally) drilled so as to hide internal structures, only careful radiography and X-ray tomography analysis may reveal the true nature of these pearls.

The complete press release including photos and radiographies can be found in the news section of our website www.ssef.ch
A much more detailed insight into radiographies and micro X-ray tomographical sections of such beadless cultured pearls in comparison with natural pearls was recently published by Krzemnicki et al. in Gems&Gemology, Vol. 46, No. 2, pp. 128–134.

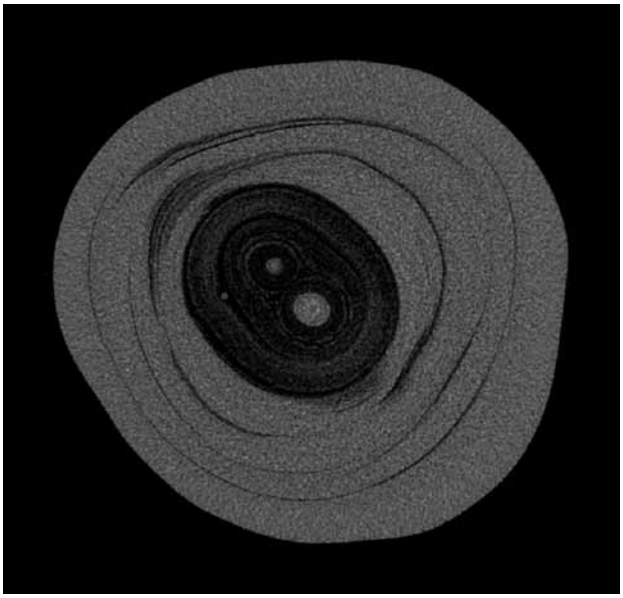
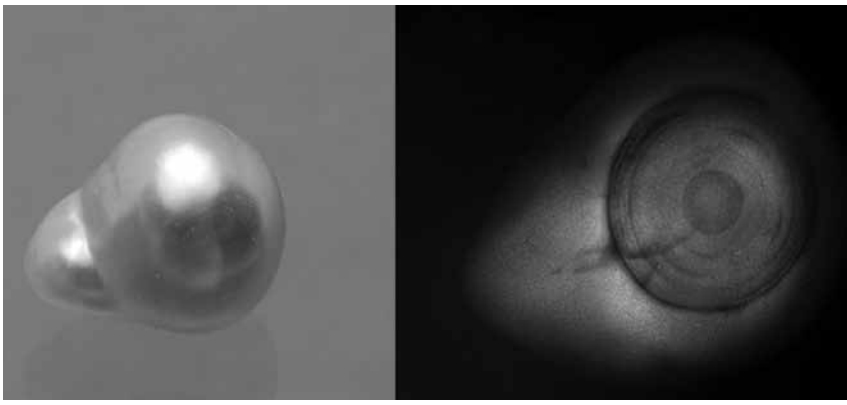


Figure 1: Tomographical section through a beadless cultured pearl which formed as a by-product in the pearl sac of a grafted oyster. The presence of calcium carbonate spots surrounded by layers rich in organic material and subsequent nacre deposition is characteristic of these specific beadless cultured pearls.

... and what happens with the beaded cultured pearls

Trade Alert May 2010 addendum:
Cultured pearls with new bead materials



Cultured pearl showing a natural pearl as a bead material.

Following the first press release on beadless cultured pearls (also called 'Keshi' in the trade), we received many positive reactions from the trade. As there were also questions arising about beaded cultured pearls, we would like to inform the trade that developments in pearl cultivation is not only restricted to the beadless cultured pearls ('Keshi'), but also includes the use of new bead materials in beaded cultured pearls (CP).

- Beadless saltwater cultured pearl ('Keshi') as a bead in a cultured pearl
- Beadless freshwater cultured pearl from China as a bead in a cultured pearl
- Beaded saltwater cultured pearl as a bead of a cultured pearl

and most recently,
- Natural saltwater pearl used as a bead of a cultured pearl

These last developments show, that there are some individuals who purposely try to produce cultured pearls with internal structures to be confused with natural pearls. Again, as for the beadless cultured pearls ('Keshi'), most of these pearls come with reports as natural pearls. However, we can say, that they are certainly only in a very limited amount on the market, contrary to the beadless cultured pearls ('Keshi') described in the previous press release. But this may change in future.
Our research on these cultured pearls with 'new' beads revealed some intriguing external features, which in combination with radiography and micro X-ray tomography enable us to distinguish them from their natural counterparts.
A complete report including photos and radiographies can be found in the news section of our website www.ssef.ch

Tomography research article in G&G

Since 2009, the SSEF is using micro X-ray tomography as a tool for pearl identification (see also SSEF Facette 17, 2009). Apart from research specimens, we have analysed in the last 18 months more than 60 pearls from clients. We published our findings in a summer 2010 article (Gems & Gemology, Vol. 46, No. 2, pp. 128–134) entitled 'X-ray computed microtomography: Distinguishing natural pearls from beaded and non-beaded cultured pearls'. This publication summarises the results of our research with this new analytical tool. Tomographic movie can be assembled from tomographic pictures. These films allow you to virtually travel to the crucial spots of the analyzed natural or cultured pearl (online on the Gems & Gemology Data Depository, http://www.gia.edu/research-resources/gems-gemology/data-depository/2010/krzemnicki.html and in the news section of our SSEF website).

Largest natural pearl tested at SSEF in 2010

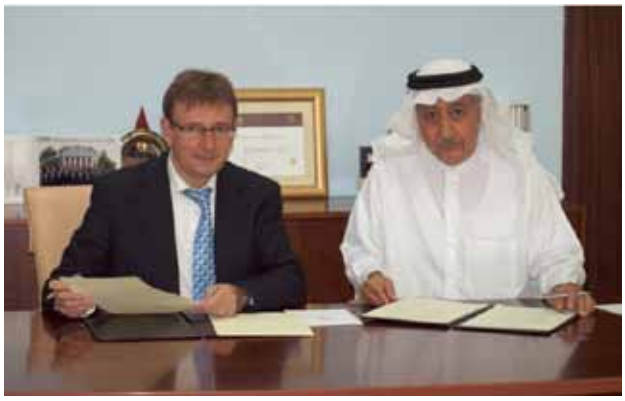
In summer 2010, the SSEF received a drop-shaped pearl for certification with a highly impressive size (approximately 84 mm long) and weight of approx. 260 cts (1040 grains). Based on our records, it is the largest natural pearl ever certified by the SSEF. The non-nacreous pearl shows a subtle colour gradient from white to brownish at the bottom of the drop and is characterised by fine striations and surface spots. It formed in a mollusc that contains no mother-of-pearl. It is to this day not possible to scientifically prove from which mollusc species this pearl originates. However, the combination of trace elements found in this pearl, leads us to conclude that this pearl was formed in a marine mollusc. The pearl was on display in the beginning of 2010 at the Pearl Exhibition in the Museum of Islamic Art in Qatar and pictured in the book, which was published for this exhibition (see also page 23).

Drop-shaped pearl of approx. 260 ct.

Research partnership with Bahrain

The Swiss Gemmological Institute SSEF, and the Directorate of Precious Metals & Gemstone Testing, Ministry of Commerce Bahrain (GPTLB), signed a Memorandum of Understanding (MoU) in September 2010 that formalizes the laboratories' collaboration in pearl research that began some years ago. The MoU was signed during a working visit by Dr. Krzemnicki to Bahrain in August.

SSEF and GPTLB are both internationally renowned laboratories reputed for their expertise in pearl research, identification and certification. Bahrain has a long history of pearl trading and remains a major hub for the natural pearl trade in the Arabian Gulf.



Dr. Michael S. Krzemnicki, Director of the Swiss Gemmological Institute SSEF and Mr. Ali Safar, Director of the Directorate of Precious Metals & Gemstone Testing, Ministry of Commerce of Bahrain signed a Memorandum of Understanding (MoU) in September 2010.

We feel that while the natural pearl trade is being challenged by increasing amounts of beadless saltwater cultured pearls - also called Keshi cultured pearls - it is crucial that laboratories collaborate internationally in pearl research, so as to maintain the confidence of the consumer in this true product of nature. It is the purpose of this MoU to establish mutual cooperation in research and training on pearls and to harmonize the testing of pearls, especially concerning the development of criteria for distinguishing natural pearls from cultured pearls. We are confident that this collaboration is in the interest of the international natural pearl trade and both parties are looking forward to a successful partnership.

SSEF SWISS GEMMOLOGICAL INSTITUTE

GPTLB

Update on beaded cultured pearls

When the Japanese Mise and Mikimoto experimented with marine shells to produce cultured pearls before 1900, they both realised that the know how of nacre production lies in the mantle epithelium. They used small bits (saibo) of that shell-forming organ and grafted them into recipient shells. By adding spherical beads from shell material, these were rapidly overgrown with a layer of nacre. This was the classical Japanese cultured pearl Akoya. The purpose of creating a beaded cultured pearl is to produce an object of given shape and size, coated with nacre to appear like a natural pearl. In the classical Japanese Akoya cultured pearls the excellent nacre of the *Pinctada fucata martensii* oyster can cover the nucleus with less than a millimetre of deposition, this is only a thin paintwork to hide the nature of the core. Cultured pearls of better qualities usually have more than a millimetre of nacre overgrowth. With this body the bead grows in size and visual attractiveness. Other shell species with different characters of nacre have been used to subsequently produce beaded cultured pearls: *P. maxima, P. margaritifera, P. mazatlanica*, and most recently *P. radiata*. A further development of this idea has led to the usage of other beads than spherical shell nuclei. Our own experiments started three years ago, when round freshwater cultured pearls began to be used as cheaper alternatives to classical beads. Latest developments have produced natural pearls with an overgrowth of *P. radiata*. These developments present interesting research opportunities to further refine criteria that help us in separating natural from cultured pearls.

A cultured pearl with a natural pearl bead. © H.A. Hänni

Author: H.A. Hänni

Polynesian pearl farming

Laurent Cartier recently visited pearl farms in French Polynesia within the context of his university research. This was an ideal opportunity to visit pearl farms on different atolls, understand current problems and opportunities in pearl production and trade, and benefit from exchanges on the subject of pearl gemmology with grafting technicians and pearl farmers.

Pearl farms in the lagoon of Ahe. © L.E. Cartier

Since the shift from over-exploitative shell fishing up until the first decades of the 20th century, to the setting up of the first pearl farm on the atoll of Manihi in the 1960s, the art of culturing pearls in Polynesia has undergone great transformations. The 1980s were the golden days, the days of the pearl 'rush' then followed. The year 1999 saw a peak in allocated marine concessions (2745 concessions), for spat collection and cultured pearl production. Since 2000, there has been a great decrease in the number of farms that are located in French Polynesia. At present, 28 of the 118 islands and atolls that Polynesia counts produce cultured pearls. In absolute terms, it is mostly small-sized farms that have gone out of business as prices for harvested pearls have markedly dropped. However, it is clear that many middle-sized and large-size operators are also facing economic challenges. Forecast to

Different bead materials- Mississippi shell (left), Pinctada maxima (middle), US White (right). © L.E. Cartier

have produced 16 tonnes of pearls in 2010, French Polynesia still faces overproduction of its reputed black pearls in order to be in balance with market demands. French Polynesia produces over 90% of the world's black-lipped pearls (*Pinctada margaritifera*). Other minor producers are the Cook Islands, Fiji and Micronesia. These pearls come in a myriad of hues. In French Polynesia, the industry is not dependent on hatcheries, unlike pearl farming in other areas of the world. Fishing of natural oysters is banned, as these are vital for reproduction and the production of oyster larvae and juvenile oysters that are collected as spat. Spawning usually peaks twice a year, triggered by seasonal temperature changes, and the spat is collected in the lagoon using artificial collectors. This spat collection activity has become the livelihood basis of a great number of families

Harvesting a first generation pearl. © L.E. Cartier

in the Tuamotan lagoons. These juvenile oysters are usually kept 24-30 months until they reach a graftworthy size.
Traditionally it has been the Tuamotan lagoons (such as Ahe, Fakarava, Manihi, Takapoto, Takaroa etc.) and the Gambier archipelago that have been the centre of the pearl industry. In recent years, the Gambiers have risen to greater prominence producing pearls with slightly different colours and lustres. The Gambiers, located 1600km from Papeete and at higher latitudes, are subject to lower sea temperatures and different current and nutrient conditions due to their island character. It is evident that environmental conditions are a critical factor in cultured pearl production.
A number of innovative pearl farms such as Gauguin's Pearl on Rangiroa and Kamoka Pearls on Ahe, amongst others, were visited. There, he was generously welcomed and was able to spend time on the farms. The fundamental techniques of culturing pearls have lost little of their brilliance. However, there are many small steps that can be optimised and result in considerable improvements in pearl quality, retention rates and oyster mortalities. These pearl farmers are trying to improve their harvests by concentrating on producing pearls of higher quality rather than quantity, and striving to improve their techniques. The grafting procedure is critical in determining the pearls that will be produced, alongside genetic factors of both the donor and host oysters. Current research by IFREMER and the University of French Polynesia (UPF) is seeking to understand the role of genetics and ecological parameters in pearl quality and colour. Furthermore, research is being conducted to replace the use of Mississippi shell material by using composed *Pinctada margaritifera* shell material as beads.

Selection of black pearls from French Polynesia. © L.E. Cartier

At a gemmological level there are a number of interesting issues that deserve more research. The development of new bead materials, developments in beadless cultured pearl production, and refining the understanding of nacre self-assembly present significant research challenges and opportunities. Assisting and understanding developments in cultured pearl technology permits gemmological laboratories such as SSEF to remain at the forefront of pearl knowledge. Ultimately, a better understanding of the growth of cultured pearls permits gemmologists to better understand and distinguish the differences between natural and cultured pearls.

Diver moving the oyster nets to other lines for biofouling removal by fish nearer to shore. © L.E. Cartier

Author: Laurent E. Cartier

Visit to a Pearl Farm in the Arabian Gulf

In June 2010, Dr. Krzemnicki was invited by RAK Pearls LLC to visit their pearl farm in the Ras-Al Khaimah, located in the United Arab Emirates in the Arabian Gulf close to Dubai. The operation has been developed as a joint-venture between Mr. Daji Imura from Japan and Mr. Abdullah Al Suwaidi from Ras-Al Kaihmah.

The pearl farm is located in a small bay close to a natural reserve which is rich in wild shells of *Pinctada radiata*. With a small group of Japanese and local workers, thousands of shells are implanted with a small piece of external mantle tissue from a donor oyster together with beads made from Mississippi freshwater shells. This grafting with a bead is similar to the Akoya cultivation technique.

Although the pearl farm is still rather small, first results are quite promising, as the local climate favour growth of lustreous nacre in rather short times.The visit was very informative, as the whole process of implementation and pearl harvest was shown to Dr. Krzemnicki for documentation. In the mean time, the Swiss Gemmological Institute SSEF has tested and certified hundreds of these beaded cultured pearls, mostly intended for the local market.

Exceptional collection of non-nacreous pearls

In 2010, the SSEF received a large collection of exceptional non-nacreous white pearls for testing. The most striking feature of these 31 pearls was their impressive size and weight, which reached up to 59.380 ct (237.52 grains). Apart from this they exhibited a highly matching white to slightly cream colour. As non-nacreous pearls, they were formed in a mollusc that contains no mother-of-pearl, but forms a shell consisting of densely interwoven tiny calcium-carbonate (aragonite) fibres, such as for example the Giant clam (*Tridacna gigas*). It is this fine texture of fibres which leads to the delicate patchy to flame-type structures that could be seen on all these pearls. Similar structures are well known from a number of species, including the Queen conch from the Caribbean Sea. In most of the investigated pearls, the flame structures radiate from a central spot at the top of the pearl. This results in a very appreciable reflection effect similar to chatoyancy (cat's eye effect) in gemstones, when observed under a light source. Furthermore, some of the white pearls revealed overtones of iridescence colours, again due to the fine texture of these pearls. Although these pearls do not show the classical pearly lustre, their fine surface texture unveils a delicate beauty to the attentive observer.

Learn more about pearls

To learn more about these pearl issues, the SSEF offers a highly specialized pearl course, where you learn how natural pearls and cultured pearls form and techniques used to separate these. For more information see page 14.

Mr. Al Mahmood, natural pearl dealer from Bahrain has donated a number of natural pearls and shells that we use for our courses.

SSEF Courses in 2011

The SSEF courses were once again a success in 2010. Many jewellery and gemstone professionals, alongside gemmologists seeking to deepen their gemmological expertise, attended our courses. The feedback we have received from course participants confirms the interest in us sharing our gemmological knowledge, and also how important our varied and exhaustive courses are for the trade.

In 2011, the SSEF will continue to offer a wide range of courses that deal with the whole field of gemmology. The SSEF Basic Training Course (2 - 17 May) and the SSEF Basic Diamond Course (24 - 28 October) offer good introductions, and participants can graduate with a diploma following theoretical and practical examinations. For those interested in a combined theoretical and practical approach to understanding more specific issues such as treatment detection, origin determination of gemstones and pearls, and quality control of small diamonds, SSEF offers Advanced Training Courses on coloured stones (17 - 21 October), pearls (11 - 13 April and 21 - 23 November), diamonds (31 October) and small diamonds (1 - 3 November). SSEF remains the only institution that offers training for laboratory gemmologists with its Scientific Gemmology Course (31 January - 4 February and 15 - 19 August) and Scientific Diamond Course (27 June - 1 July). This is an opportunity for advanced gemmologists to learn how to use sophisticated gemstone testing methods. The participants (not more than 4) learn during the week of this applied course how spectrometry (FTIR, UV-Vis-NIR, Raman, EDXRF, LIBS) and methods such as SEM, X-ray luminescence, and X-ray radiography can be used for gemstone identification, treatment detection and origin determination.

Dr. Michael S. Krzemnicki, Deepa Srinivasa, Hrvoje Nad, Denise Adelaide Sjuman, Jonathan Ibarbo Betancur, Chiara Parenzan, Franz J. Wolf and Pierre Lefèvre following the ATC Coloured Stones.

Advanced Pearl Course

This three day pearl course (11 - 13 April and 21 - 23 November) is ideally suited for participants (max. 6) who want to know more about how pearls are formed, about possible treatments, and how natural and cultured pearls can be identified and separated. SSEF's important collection of shells and pearls will offer a good opportunity for practising and expanding your skills and knowledge. The course also offers an introduction into the use of UV-Visible spectrometer, EDXRF, X-ray radiography and luminescence for pearl testing in a scientific laboratory.

Small Diamond Courses

The SSEF small diamond course, devoted to diamonds with a diameter between 0.7 and 4 mm, mainly used in the watch industry, will enable participants to perform themselves the quality control of such small diamonds. These courses are aimed at people working in the jewellery and watch industry, and these courses can be tailored to your company's specific needs. Previous gemmological experience is welcome but not a requirement.

Jean-Pierre Chalain and Deepak S. Nachankar following the completion of the SSEF Scientific Diamond Course.

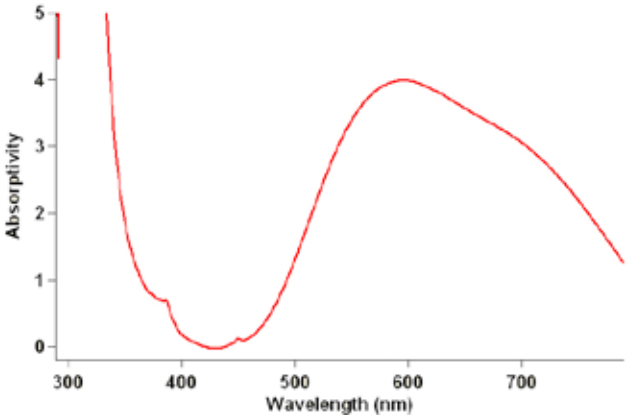
Scientific Diamond Course

The one-week SSEF Scientific Diamond Course (SDC) course brings participants to the forefront of synthetic diamond and treatment identification. Modern analytical equipment is demonstrated and the participants practice the various techniques themselves on interesting samples. The studied methods include infrared spectroscopy (FTIR), absorption spectroscopy in visible and ultraviolet light (UV-VIS) at low temperature (-120°C), and photoluminescence spectroscopy (PL) at low temperature. In 2011, this expert course will take place from 27th June to 1st July with a maximum of 4 participants. They will receive the course manual that contains numerous spectra and also two valuable tables, which summarise the „Defect Induced Vibrational Bands“ and the „Optical Bands“. A list of reference books is also given.

SGC course in August 2010. Michael Krzemnicki, Gagan Choudhary, Iurii Gaievskyi, Bruce Jones, Franz Herzog, Keith Conrey, Jean-Pierre Chalain.

Scientific Gemmology Course

In 2011, the one-week Scientific Gemmological course will take place twice (31 January - 4 February and 15 - 19 August). During this course, participants learn about techniques and applications of instruments such as X-Ray fluorescence spectrometry, UV-Visible-NIR spectroscopy, LIBS (Laser Induced plasma Spectroscopy), Raman and FTIR spectrometry in the field of gemmology, as performed at the SSEF Swiss Gemmological Institute. Advanced gemmological education is necessary.



UV-Vis spectrum of a Kashmir sapphire

SSEF à la carte courses

The SSEF Swiss Gemmological Institute can personalise a course based on your or your company's specific requirements. This course format is especially suited for companies that need specific gemmological training for their employees. In recent years, several companies, such as Caran d'Ache and Christie's, have benefited from such courses which were tailored to specific topics such as small diamond quality control or learning to identify coloured gemstones from different origins. If you or your company are interested, please contact SSEF to discuss how a gemmological course can be tailored to your needs (admin@ssef.ch, or tel. +41 61 262 06 40).

Congratulations

SSEF Swiss Gemmological Institute wants to express its congratulations to the following persons for getting:

SSEF Basic Gemmologist Certificate:
- Roland Eberli, Basel
- Elisabeth Peter, La Serlas AG, Zürich
- Beat Schmid, Luzern
- Thorsten Weber, Steinmaur
- René Widmer, Luzern
- Nadja Wagner, Wagner GmbH, Reinach

SSEF Basic Diamond Certificate:
- Friedrich Aeschbach, Rheinfelden
- Caroline Maridor, MGI Luxury group, Bienne
- Claude Michelin, Rochefort
- Dina Patricio, MGI Luxury group, Bienne
- Elisabeth Peter, La Serlas AG, Zürich
- Phornthip Saksirisamphan Rimml &
- Manuela Simmen,
  both Münzhandlung E. Dietrich, Zürich
- Nadja Wagner, Wagner GmbH, Reinach

Only participants that pass the final exam receive the SSEF Basic Gemmologist or Basic Diamond Certificate. The qualification requires theoretical knowledge as well as practical skills in gemstone testing or diamond grading.

Advanced Gemmologist Certificate:
Courses on pearls
- Flavio Butini, Istituto Gemmologico Nazionale, Rome, Italy
- Charlotte Languennou, Bonneville, France
- Phornthip Saksirisamphan Rimml, Münzhandlung Erwin Dietrich, Zürich

Quality control of small diamonds:
- Pedro Serodio, Piaget SA, Geneva

Courses on treatment and origin of coloured stones:
- Jonathan Ibarbo Betancur, Medellin, Colombia
- Annalisa Furini, Rome, Italy
- Alessandra Marzoli, Rome, Italy
- Lucia Musilli, Rome, Italy
- Hrvoje Nad, Supernatural Gems & Jewelry, Zagreb, Croatia
- Denise Adelaide Sjuman, Unique Brilliant Limited, Hong Kong
- Deepa Srinivasa, Dubai
- Franz J. Wolf, Lucerne

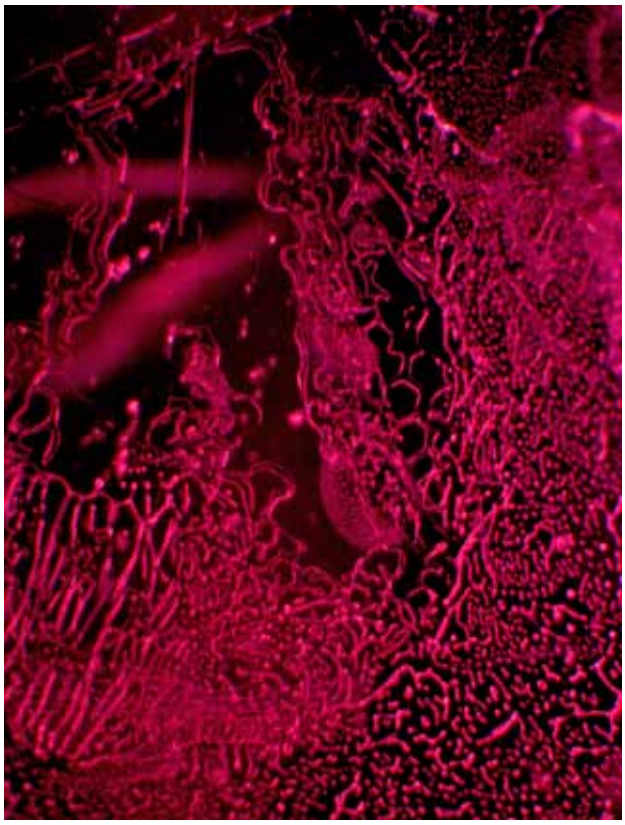
SSEF Caran d'Ache "À la carte" Course:
- Sabine Betemps
- Alexandre Blachon
- Yves Miche
- Boris Quinodoz

SSEF Scientific Diamond Course:
- Deepak S. Nachankar, Mumbai, India

SSEF Scientific Gemmological Course
- Gagan Choudhary, Gem Testing Laboratory, Jaipur, India
- Keith Conrey, Evergreen, Colorado, U.S.A.
- Iurii Gaievskyi, State Gemmological Center of Ukraine, Kyiv, Ukraine
- Bruce Jones, GemScience Research, Rathdrum, Idaho, U.S.A.

We wish all successful participants a bright gemmological future!

SSEF education



Heated ruby with moderate residue.
Come to learn more about treatment detection with SSEF Education.

SSEF Courses 2011:

24 - 28 Jan	Scientific Diamond
31 Jan - 4 Feb	Scientific Gemmology
11 - 13 April	Advanced Pearl Course
2 - 17 May	Basic Gemmology
6-7 June	Practical Training
27 June- 1 July	Scientific Diamond
15 - 19 Aug	Scientific Gemmology
17 - 21 Oct	Advanced Coloured Stones
24 - 28 Oct	Basic Diamond
31 Oct	Advanced Diamond
1 - 3 Nov	Small Diamonds Quality Grading
21 - 23 Nov	Advanced Pearls

2012

9 - 10 Jan	Practical Training
23 - 27 Jan	Scientific Gemmology
30 Jan - 3 Feb	Scientific Diamond

SSEF at CIBJO Congress in Munich

In 2010, SSEF was present at the CIBJO congress, organized in Munich, and at the LMHC meetings in Milan and Bangkok. In February, Dr. Cavalieri opened the CIBJO annual congress at the International Congress Centre of the Munich Exhibition centre. This year, the gemmological commission launched a special 'ruby day' conference. Thanks to Dr. M. Superchi and Mr. K. Scarratt this afternoon session was very successful and was attended by more than a hundred traders and gemmologists. Dr. M.S. Krzemnicki, director of SSEF, gave a very informative presentation entitled: 'Heating and diffusion processes on rubies: characteristics, detections and declarations' which can be downloaded from the news section of our website www.ssef.ch. CIBJO's agenda was extremely rich. Aside the General Assembly, the meetings of the board of directors and several steering committees, the following meetings took place: Presidential Council, Executive committee, Diamond commission, Coloured Stone commission, Pearl commission, Gemmological commission, Precious metal commission, Association Executives Networking Commission, Marketing commission, Sectors 1, 2 & 3. More information and important trade documents are available on www.cibjo.org. Among these documents, there are the 'Diamond, Coloured Stone and Pearl Blue Books'; the 'Ruby, Sapphire and Emerald Guides'; the 'Retailer's Guide To Trust' and the 'Retailer's Guide To Marketing'.
At the CIBJO congress, the GPTLB (Gem & Pearl Testing Laboratory Bahrain) laboratory expressed its concern about the differentiation of natural pearls and saltwater beadless cultured pearls. As a consequence, an extraordinary LMHC pearl technical committee was formed and met in June.

LMHC

This year, the LMHC - Laboratory Manual Harmonization Committee met twice. It is made up of representatives from CISGEM (Italy), GAAJ (Japan), GIA (USA), GIT (Thailand), Gübelin Gem Lab (Switzerland) and SSEF Swiss Gemmological Institute (Switzerland). Prior to the first LMHC meeting, on January 17th, the Vicenza fair organized a public conference on gemmological certification. It was co-chaired by Mr. Bossi (President of the Milanese Chamber of Commerce, President of CISGEM), Mr. Diri (President of the Vicenza Fair) and Mr. G. Cavalieri (President of CIBJO – the World Jewellery Confederation). Each LMHC member gave a short presentation on this important topic.
The first LMHC meeting took place on the 18th and 19th of January in Vicenza, Italy. The second meeting was organized between the 23th and 25th of September in Bangkok.
LMHC's ongoing work includes, but is not limited to, the qualification of a Padparadscha masterset, the qualification of a ruby to pink sapphire masterset, emerald filler quantification, andesine/labradorite, amber treatment nomenclature, jadeite treatments nomenclature. LMHC has also worked towards completing information sheets, updating wordings and launching a LMHC website.
http://www.lmhc-gemology.org/

Pearl meeting in Bahrain (LMHC Pearl Committee)

Due to new challenges in pearl identification and after an urgent request by the Gem & Pearl Testing Laboratory of Bahrain, a LMHC Technical Pearl Committee was formed and met in Bahrain at the Ministry of Industry and Commerce on the 1st and 2nd of June. It was organised by the Gem & Pearl Testing Laboratory of Bahrain. The goal of the meeting was to discuss criteria that separates certain cultured pearls from natural pearls.
The following worldwide reputed experts in the field of pearl research attended: Ahmadjan Abduriyim (GAAJ), Abeer Tawfeeq Al-Alawi (GPTLB), Ali Al-Attawi (GPTLB), Elena Gambini (CISGEM), Henry Hänni (SSEF), Stefanos Karampelas (GGL), Stephen Kennedy (independant expert), Michael Krzemnicki (SSEF), Thanong Leelawatanasu (GIT), Tom Moses (GIA), Ali Mohammed Safar (GPTLB), Kenneth Scarratt (GIA), Nicholas Sturman (GIA), Margherita Superchi (CISGEM), Pornsawat Wathanakul (GIT).

Each participant presented research findings, focussing on the separation of natural from cultured pearls. The meeting was very informative and successful. The labs decided to issue a LMHC Information sheet on pearl identification (in preparation), which in many aspects follows the statements the SSEF previously made in its two press releases on pearls (see previous articles on SSEF pearl press releases). In adopting a harmonized approach and language for pearl identification we are sure that laboratories have better means to protect the pearl trade against present and future challenges.

SSEF welcomes Nicky Pinkas to the Foundation Board

In November 2010, Nicky Pinkas from Andrew Cohen SA in Geneva was elected as a new member of the SSEF Foundation Board. It is our great pleasure to have in Mrs. Pinkas a strong and committed member, who is by her personality and her long-established experience in the gem business a perfect addition to the board.
Mrs. Pinkas has replaced Mr. Hans-Peter Husistein, who retired from the board at the end of 2010.
The current members of the SSEF Foundation Board are: Marc Alain Christen, President, Berne; Charles Abouchar, Geneva; Nik Bieri, Schaffhausen; Horst Edenhofer, Freiburg; Adrian Meister, Zurich; Nicky Pinkas, Geneva; Ronny Totah, Geneva.

Farewell to Hans-Peter Husistein

Hans-Peter Husistein, after serving as a SSEF board member for 20 years, has stepped back from this position in December 2010. As a keen gemmologist and gemstone dealer, he has always had a close contact to members of the trade and we have greatly benefited from his expertise over all these years. The SSEF team would like to thank Hans-Peter Husistein for his years of support and would like to wish him all the best in his future business projects. We do hope that as a true “Basler” by origin, he will in future also find time to visit the SSEF in Basel.

IGC 2011 in Switzerland

The 32nd International Gemmological Conference (IGC) will take place in Interlaken, Switzerland 13-17 July 2011. Following Dr. M. S. Krzemnicki’s appointment to the IGC executive board during the last conference in 2009 in Arusha (Tanzania), he proposed for the 2011 conference to be held in Switzerland. It will bring together leading international gemmologists to discuss current issues in gemmological testing and research. The IGC was set up in 1952 by a small group of gemmologists in Locarno, Switzerland. It is the second time in IGC history that this event will be held in Switzerland, following the 1972 Vitznau conference. The event is co-organised by SSEF and supporting this conference is very much a part of SSEF’s mission to also promote gemmological research. Participants have already registered from a wide range of countries and this invitation-only event promises to be a highlight for the gemmological community in 2011.

SSEF in Paris

For more than one year, the Swiss Gemmological Institute SSEF travels to Paris several times annually to offer clients on-site testing services. Our office is located at rue Taitbout (9th arrondissement), between place Vendôme and rue Lafayette. Equipped with our mobile instruments and spectrometers we can ensure that all coloured gemstones are meticulously analysed before certification. Please note that diamonds and pearls are not tested in Paris. This service is by appointment only. We ask interested clients to contact us by email (gemlab@ssef.ch) or telephone (+41 61 262 06 40) to regularly receive our Paris newsletter that offers information about precise testing time slots. For details of our 2011 on-site testing dates, please see page 22.

New SSEF shuttles: Paris & Antwerp

We are pleased to inform you about our latest update concerning shipping options.
In addition to the established shuttles from destinations like London, New York, Bangkok, Paris and Hong Kong we can now offer new round-trip services at attractive rates for several new destinations. So please ask for our latest shipping instructions if you would like to send us your diamonds, coloured stones, pearls and jewellery items from Paris, Antwerp or if you are interested in using FedEx.

What do SSEF partnership shuttles offer you?
- prompt round-trip
- attractive rates
- includes the handling of all customs formalities
- fixed schedule (weekly or even daily)
- easy & convenient
- secure
- extensive experience

Prooftag authentification used regularly by clients

Since summer 2009, all SSEF reports come with a Prooftag label and can be identified by their serial number. This unique authentication solution can be checked online from a computer or a mobile phone and assures clients that the SSEF report they hold is not counterfeit or false. Of course, any certificate from which a label tag has been modified, or partially or totally removed would show evidence of tampering.

The response of our clients has been positive, as many appreciate being able to check the authenticity of SSEF reports on the spot. This service is regularly used when an important gemstone that has a SSEF report is purchased.

By using the Prooftag label, we strive to provide you the best possible protection for your business now and in future.

Reminder: Sign your SSEF order forms

We would like to remind clients to use the 'blue' SSEF order form for any shipment of gemstones, pearls or jewellery to the SSEF. For insurance reasons it is important that you sign the SSEF order form at the bottom right side, thereby confirming that the stone/pearl/jewellery is insured by you against all risks during transportation and evaluation at the Swiss Gemmological Institute SSEF.
You may download the SSEF order forms from the services section of our website (www.ssef.ch) or contact our administration to receive the form by mail (phone +41 61 262 06 40, fax +41 61 262 06 41, admin@ssef.ch).

SSEF Photocard Showtime for your stones

The beauty of a gemstone is its greatest selling point. While we have been testing and certifying thousands of stunning stones and jewels we have also been developing our photography skills, taking high quality pictures of gems.
Since last year, the SSEF offers the SSEF Photocard to the trade. The SSEF Photocard is an additional service available for any item (loose stones or jewellery) certified by the SSEF. Normally of postcard size, you may also choose other formats up to poster size.
In the last few months we have produced a number of poster size SSEF Photocards for our clients, highlighting the beauty of outstanding stones and jewellery.

Chemistry of Gems: new EDXRF at SSEF

At SSEF chemical analysis is routinely done for every gemstone that enters the laboratory. The main requirements for such an analysis are:

• The analysis has to be non-destructive
• Possible for mounted and loose gemstones
• The analysis covers a large range of elements, especially those of interest for origin determination.

The analysis by Energy Dispersive X-Ray Fluorescence (EDXRF) spectroscopy fulfills all these conditions. But what is EDXRF?
By exposing a gem (or any material) to X-rays of a given energy the atoms making up the compounds are excited. These atoms de-excite in two ways:

either they emit X-rays by themselves or they lose their excitation energy via collision with neighboring atoms producing dissipating heat. Of course, the two mechanisms may occur simultaneously. It is the first mechanism that is used in XRF: every atom emits a characteristic pattern of X-ray radiation when excited by a given energy and these spectra (peak intensities versus excitation energy) are recorded by a detector. As the concentration of an element in the irradiated probe can be correlated to the peak-height of the measured intensities, this method can be used for quantitative (as well as qualitative) chemical analysis. The EDXRF method allows for multiple excitations (from low energies to high energies for light to heavy elements) and thus a large range of elements can be measured.
EDXRF has been used at SSEF for many years. We have replaced our old EDXRF with a Thermo Fisher Quant'X EDXRF Analyzer which was installed in SSEF in Spring 2010. Between May to July the analysis parameter setups for the different gemstone species were created and calibrated and since then the new instrument is 'productive' and fulfills the highest standards for chemical analysis at the Swiss Gemmological Institute SSEF.

Author: F.A. Herzog

New iPhone App: GemExplorer

SSEF launches an interactive guide to the world's gemstone mining areas
GemExplorer, a recently launched iPhone application, now offers users the possibility to plan their next gemstone holidays or just to navigate the world's major sources of coloured gemstones, diamonds and pearls.

Based on SSEF's knowledge, visits to gemstone producing areas and collaborations in geographic origin determination, this programme is an interactive compass to these areas. The application shows users a compass indicating the geographic direction and distance between the user's current location and a great number of mining regions. Mogok, the classical source of rubies is East and 8072 km from Basel, Switzerland, whereas natural pearl oyster beds around Bahrain are Southeast and 4416 km near. For those who have long wondered how far the sources are from the market, of where the next gem treasures may lie, GemExplorer is a stimulating compass. Not only is it possible to see which are the six nearest gemstone-producing areas, as the database also provides a search function based on different gemstone categories. This application serves as a source of inspiration for gemstone lovers. We have developed this for those with an interest in gemstones and their sources, pursuing our mission to share gemmological knowledge since 1974. It is available for free in the iTunes app store (http://itunes.apple.com/us/app/gemexplorer/id411642847?mt=8),

The Fascination of Colour: Christie's Spring Auction Lecture

On the 30th of May, Dr. Krzemnicki, director of the SSEF, was invited by Christie's Hong Kong to give a lecture as part of their spring 2010 lecture series, organised in conjunction with their Hong Kong Spring sales.
The lecture was highlighting the fascination of colour in gemstones, i.e. the velvety blue of sapphires, the saturated red of rubies, the emerald green of jadeite-jade and the vivid colours of fancy diamonds.
The cause for these colours is not less fascinating. The lecture focussed on some of the most outstanding gemstones and pearls, tested recently at the Swiss Gemmological Institute SSEF, including some of the most important jewels on offer during the auction in Hong Kong. This talk was a great success as Dr. Krzemnicki explained the magic and fascination of gem colours and the science behind it to a broad and interested audience of buyers.
You can download the full presentation given at the Christie's lecture series on the SSEF website.

Hong Kong delegation visits SSEF in Basel

A delegation of the Federation of Hong Kong Watch Trades & Industries and the Hong Kong Watch Manufacturers Association came to visit the Swiss Gemmological Institute SSEF in June 2010. Within the context of a training course on 'advanced technologies in Haute Horlogerie: manufacturing, processing, and chronometer quality control for watches made in Switzerland'. The delegation came to visit the SSEF to learn how quality control of small diamonds is done, seeing how meticulously the 4C grades and the authenticity of small diamonds that are used in the jewellery and watch industry are controlled.

SSEF presence in Bangkok and Hong Kong

In 2011, the Swiss Gemmological Institute will further strengthen its presence on the Asian market with more on-site services than ever:

In Bangkok, we will be testing your prestigious gemstones in our Bangkok office at the Silom road on 17-22 January, 23-28 May, 22-27 August. Please check our website regularly or send an email (gemlab@ssef.ch) if you would like to be informed

Bangkok dates to remember!

regularly about our on-site services in our office at the Manesaap Building II in Bangkok.
With the steady rise of the Chinese and Indian economies, Hong Kong is becoming one of the most important hubs for the gemstone and jewellery trade. That's why the SSEF is focussing its Far East operations on Hong Kong, and where we will be more active than ever in the coming months. In 2011 we will be present at the three major jewellery fairs in Hong Kong in March, June and September. At the September show we will again have a booth at the AsiaWorld Exhibition Centre

Hong Kong dates to remember!

(Airport) and in the Convention Centre in Wanchai. Apart from testing your gemstones at the Jewellery Fair, we also offer each time a pre-Show testing service at our HK business centre. This pre-show service is only by appointment, so please contact us (phone +41 61 262 06 40, gemlab@ssef.ch) if you need further information about our Hong Kong services or to confirm an appointment.

Apart from offering our on-site services regularly in Hong Kong, you may also use our shuttle service to send us your gemstones, pearls or jewellery smoothly to the SSEF by using Malca Amit or FedEx (for details see shipping instructions on the services section of our website www.ssef.ch)

Close up: Dr. Franz Herzog

Since two years, the Swiss Gemmological Institute SSEF is in the lucky position to have a physicist in its team. Dr. Franz Herzog, who apart from having a PhD in theoretical physics, also has huge working experience in IT management. However, most importantly, he has been interested in the study of minerals and gemstones since his youth.

He enjoys travelling to gemstone mining areas of the world, having visited Argyle and Yogo Gulch for example. In a very short time, he has become our indispensable master of spectrometers. He has further developed and calibrated new procedures, which enable the SSEF to analyse gemstones with the highest accuracy. Franz is an early-bird, starting work very early in the morning, so that when the gemmologists arrive at their working desk, the gemstones he analysed have already unfolded many of their mysteries.
Franz Herzog has many talents. Just to mention his artistic skills as carpenter, resulting in two large hand-made wooden tables for the SSEF meeting room. The growing SSEF team has now the pleasure to drink coffee, to have lunch and to discuss gemstones on a masterpiece of its own.

Visit us in 2011 for On-Site SSEF reports

In 2011 we will be exhibiting or/and offering our testing services at the following events:

Bangkok	17 – 22 January
Paris	14 – 18 February
Munich (Inhorgenta)	25 - 26 Feb (no reports)
Hong Kong Fair	1 - 8 March
Basel World	24 – 31 March
Paris	11 – 15 April
Geneva Sales	16 - 17 May
Bangkok	23 – 28 May
Paris	6 – 10 June
Hong Kong	20 – 26 June
Bangkok	22 – 27 August
Paris	5 – 9 September
Hong Kong Fair	15 - 23 September
Geneva Sales	14 - 16 November
Paris	28 Nov. – 2 December

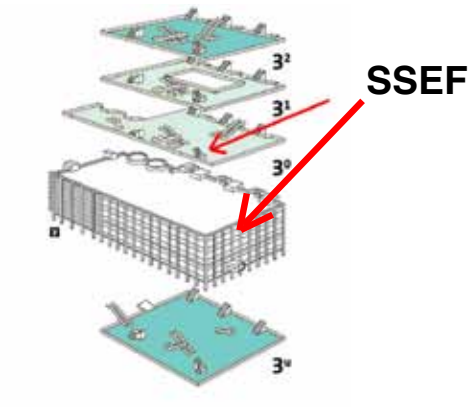
Further on-site services will be communicated through our website and in newsletters.

Basel World 2011: 24h Express Service

During BaselWorld 2011 (24 - 31 March), the SSEF will once again be offering its much appreciated Express Service: get a test report within 24 hours!

Located at the same place as last year on the first floor in Hall 3 (Hall of Elements), you will easily find us close to the moving stairways.
The booth number (3.1 / N07) and the phone number at the booth (+41 (0)61 699 51 29) remain the same, as does our high quality express service, which may even include a nice cup of coffee and some Swiss chocolate.

We are looking forward to meeting you at our booth and to testing your stones during the Basel Show. If you would like to have a number of stones analysed, we suggest you call us in advance at the SSEF office (tel. +41 61 262 06 40) to fix an appointment.



4th European Gemmological Symposium in Paris

The 4th European Gemmological Symposium was held on September 6th 2010 in Paris, held jointly with the Rencontres Gemmologiques de Paris of the French Association of Gemmology (AFG). The location of the conference, at the French Senate, was impressive and the event was well attended. Laurent Cartier gave a talk on the Marosely corundum deposit in Madagascar, presenting research results that were the fruit of close collaboration between the SSEF and the universities of Basel and Berne.

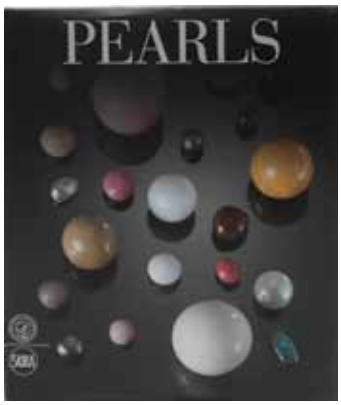
SSEF invited at Gem-A Conference in London

At the beginning of November 2010, Dr. Michael Krzemnicki was invited by the Gemmological Association of Great Britain to give a talk about “news from the laboratory” at their annual Gem-A Conference in London. The presentation was a summary of recent findings and new materials, which were tested by the Swiss Gemmological Institute SSEF, spanning from rubies from Mozambique to Mogok, from synthetic opals to natural ones from Ethiopia, and from natural to challenging cultured pearls. Apart from research results and oddities, it was also a prefect moment to share with the audience the beauty of some of the most important gemstones and historic jewellery sets which the SSEF has analysed for its clients in 2010, including a perfectly matching pair of Kashmir sapphires of 14 cts each, the El-Itoco emerald crystal of 472 cts, and the Württemberg Topaz Parure. You can download the full presentation given at the Gem-A Conference from the news section of our SSEF website www.ssef.ch

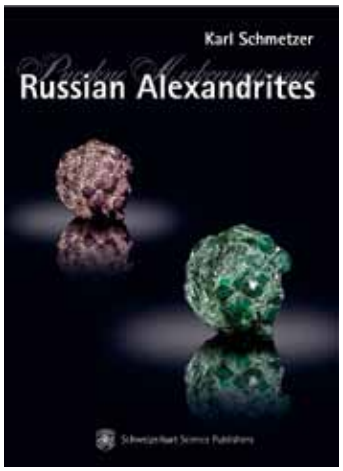
Dr. M.S. Krzemnicki with the El-Itoco emerald crystal which was presented during the Hong Kong Jewellery Fair in March 2010 at the booth of Crown Color Ltd.

New Books on sale at SSEF:

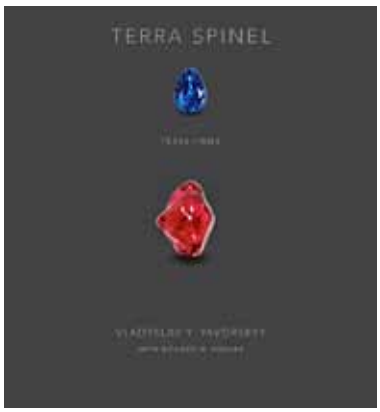
For the interested gemmologist we offer three new atractive books.
The first book has been edited by Bari, Lam & Fried and is an impressive publication on pearls, which was published in conjunction with the pearl exhibition at the Museum of Islamic Arts in Quatar in 2010. This exhibition had on display some of the most outstanding pearls, including many non-nacreous pearls from Conch, Melo and plenty of other molluscs, presented for the first time to the public in such quality and quantity. The book contains many superb photographs of these pearls, many of them certified by the SSEF, but also numerous pictures of pearl sections, which have been cut in half by Prof Hänni from the Swiss Gemmological Institute SSEF. These cross-sections provide an insight into the pearls, thus revealing specific features of natural or cultured pearls.



The second book we would like to promote is about Russian alexandrites and has been written by Dr. Karl Schmetzer. The book compiles historical reports of the discovery of alexandrite in the Ural mountains in the early 19th century. It then focusses on the morphology and twinning, the colour-change and colorimetry, inclusions and growth structures, and finally the chemical characteristics of Russian alexandrites. This book is a complete and highly valuable reference for any gemmologist. Part of the samples analysed and documented in the book were loans from SSEF’s research collection.



The book “Terra spinel, Terra firma”, was recently published by V. Yavorskyy and R.W. Hughes. This book is designed as a coffee-table book in its best sense, presenting the reader pictures of some of the most beautiful spinels together with colourful and fascinating photos of the landscapes, the cultures and the peoples from where spinels originate.



These books and more have been added to our list of products for sale and can be ordered at SSEF (website: www.ssef.ch, see service section; phone +41 61 262 06 40, email: admin@ssef.ch).

Publications 2010

In 2010 we again published numerous articles in gemmological journals and trade magazines. For reprints, please contact SSEF (gemlab@ssef.ch)

Chalain, J.-P. (2011) Les types des diamants: Distinction et identification des traitements. Gold'Or, 1, 58-61 (in French and German)

Krzemnicki, S.M., Friess, S.D., Chalus, P., Hänni, H.A. & Karampelas, S. (2010) X-ray computer microtomography: distinguishing natural pearls from beaded and non-beaded cultured pearls. Gems & Gemology, Summer, 128-134.

Krzemnicki M.S. (2010) "Keshi" Zuchtperlen: Eine neue Herausforderung für den Perlenhandel. Goldor, Vol. 2010, No. 6, 58-61 (German & French)

Krzemnicki M.S., Hänni H.A. (2010) Neu im Handel: Rubine aus Montepuez, Mosambik. Gold'or, Vol. 2010, No. 4, 66-69 (German & French)

Krzemnicki M.S., Parenzan C. (2010) Grüsse aus dem Weltall oder doch sehr irdisch? Künstliches Glas mit interessantem Farbeffekt. Gold'or, Vol. 2010, No. 2, 69-71, (German & French)

Hänni, H.A. (2010) Zuchtperlen mit zerbrochenem Überzug. Z. Dt. Gemmol. Ges. 59/3-4, 90-92

Hänni, H.A. (2010) Beschadigingen aan geslepen edelstenen (deel 1 & 2).- Holland Gem, 16, 1 & 2, 3-18. (in nederlands)

Hänni, H.A., Krzemnicki, M.S. & Cartier, L.E. (2010) Zuchtperlen mit neuem Kernmaterial. Z. Dt. Gemmol. Ges. 59/1-2, 19-29

Hänni, H., Krzemnicki, M. & Cartier, L. (2010) Innovation in bead-cultured pearls.- Gems&Jewellery, Summer, 19, 2, 6-7.

Hänni, H.A., Krzemnicki, M.S. & Cartier, L.E. (2010) Appearance of new bead material in cultured pearls. J. Gemm. GB Vol. 23, No. 1-4, p. 31-37.

Hänni, H.A. (2010) Chrysoberyl: a gemstone with many faces. The Australian Gemmologist, 3rd quarter, 24,3, 68-70

Hänni, H.A. (2010) Chrysoberyl: a gemstone with many faces. Jewelry World, November, Vol. 38, 90-93, Taiwan, in Chinese.

Donations 2010

We would like to thank the following people, who have made donations of gemstones or instruments in the past year. We announce their names in recognition of their generosity:

- Ronny Totah (Geneva), Thomas Färber (Geneva), Mr. Ali Mohammed Safar (GPTL Bahrain), Mr. Abdul Razak Al Mahmood (Bahrain), Jeremy Norris (Oasis Ltd., USA), Mr. Imura Daiji & Mr. Abdulla Al Suwaidi (RAK Pearls LLC), José Casares (Shanghai Gems; Geneva), Patrick Flückiger (Swiss pearls; Geneva), Wolf Bialoncyk (Vienna) and Prof. H.A. Hänni (GemExpert; Basel) for natural and cultured pearls and shell samples
- Mr. Hussain Alfardan for the pearl book and logistic support in Qatar
- Raymond Naftule (Geneva) for lead glass filled rubies from Mozambique and black spinel from Thailand
- Alex Leuenberger (Aline GmbH) for a series of sapphires from Andranondambo in Madagascar
- Mikola Kukharuk (Nomad; Bangkok) for rough samples of tourmalines from Africa and Afghanistan, and rough samples of Imperial topaz from Ouro Preto in Brazil.
- Oliver Waldis (Gemstein.com) for rough samples of tourmaline showing the Usambara-effect
- Sigkham Xayaboun (Unix Goldschmiede; Chur) for a Verneuil synthetic star sapphire
- Mrs Freeland for three Verneuil synthetic rubies
- Hans Isler (Basel) for a synthetic orange spinel
- Roland Schlüssel (Pillar and Stone International LLC; USA) for a selection of jadeite jade
- Mrs Miemie Tin Thut (Silken-East; Bangkok) for a large sapphire crystal from Burma
- Joseph Belmont (KV Gems; Bangkok) for light blue spinels from Vietnam
- Jeremy Bergman (Bangkok) for Trapiche sapphires from Burma and a faceted Usambara-tourmaline from Tanzania.

The SSEF Team wishes all friends and customers a successful year 2011 and would like to thank you for your continued support of the SSEF laboratory.