SSEF FACETTE No. 17

SWISS GEMMOLOGICAL INSTITUTE
SCHWEIZERISCHES GEMMOLOGISCHES INSTITUT
INSTITUT SUISSE DE GEMMOLOGIE

International Issue No.17, January 2010

Dear Reader

The gem trade saw a difficult year in 2009, as did gemmological laboratories worldwide. It has been challenging both for the Swiss Gemmological Institute SSEF, and for me personally, having been appointed as the new director of the SSEF laboratory in June 2009. As a member of the SSEF team for more than 11 years, the last two years as Deputy Director, I have been well prepared by Prof. Henry A. Hänni, the former director of SSEF, for this duty. I am very glad to say, that with his support, the change over has been a very smooth one. I would like to thank him for his support and training, which have shaped not only my personal gemmological knowledge but also the excellence of the whole SSEF team over the past 20 years. It is my personal commitment to continue and further develop our SSEF services to highest scientific standards in the tradition established by George Bosshart and Prof. Henry A. Hänni in the past.

The last few months the whole SSEF team has been working very hard to strengthen our position in the market as the premium laboratory for gemstone certification. We are proud of our success, even in these difficult times, certifying some of the most important jewels sold recently at auction. We also achieved our best ever result at the last September Show in Hong Kong, especially in the field of valuable natural pearls, where SSEF reports have become the best guarantee available in the trade.

Apart from our daily certification and teaching activities, we have continued to invest a lot of effort in research on pearls (tomography and age dating), coloured stones (new ruby mines in Mozambique) and diamonds (treatment detection). For chemical analysis in the lab, a new state-of-the art unit Quant'X from ThermoFisher is replacing our old EDXRF instrument.

Our goal for 2010 is to make our testing service at SSEF as convenient as possible for our clients. To do so we will be more visible than ever with on-site testing services in major trade centres such as Bangkok, Hong Kong, and Paris, and our easy shuttle services to Switzerland will be developed further in cooperation with our partners worldwide.

Finally, I would like to thank you for your continued confidence in our services.

I wish you all the best for 2010 and a prosperous and exciting year for your business.

Dr. Michael S. Krzemnicki
Director SSEF

Cover photo:

Recutting and polishing of a green beryl by Christo Raptis at Piat SA in Paris, France.

Photo © M.S. Krzemnicki, SSEF Swiss Gemmological Institute

Smart: How you profit from reduced tariff on SSEF reports

The Swiss Gemmological Institute SSEF offers a 25% reduced tariff for their SSEF members (see also on our website www.ssef.ch/en/services/prices.html). Apply to become a member of SSEF (Swiss Foundation for the Research of Gemstones) and pay the annual membership fee of 550.- Swiss Francs and you are already taking full profit of our member tariff for one year.
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Annual publication by:
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What does it take to issue a certificate at SSEF

First class service for your prestigious gemstones and jewellery

Have you ever wondered why a first-class flight is more expensive than an economy class ticket?

In the field of gemstone testing, the Swiss Gemmological Institute SSEF offers a first-class service, relying on three pillars, the excellence of our staff, an up-to-date scientific approach to analysis, and time, extended time for testing. All of which result in uncompromised quality. We have certified some of the finest coloured stones, diamonds and pearls available on the market in the last few years. Our clients assure us that our reports have become an important selling tool for them, because of our reputation for quality. Gemstone testing and certification is our daily business, and as such, we take care, that our service fulfils the high standards our customers expect from us.

A service like this comes at a price. In times when the economic situation is tense everyone is trying to minimize his expenses. Therefore it is important that we can justify our tariff and to convince our clients of our scientifically sound and professional gemmological work.

To illustrate our approach, we would like to present to you the steps taken to analyse a **sapphire**, revealing all the relevant information, before a SSEF Gemstone Report is issued.

The first steps:
After arrival in the SSEF laboratory, the administration department gives the gemston a number, which can be seen as the SSEF report number on your certificate. The stone/jewellery is then immediately checked for any pre-existing damage.

Two gemmologists check the sapphire quickly, using classic gemmological instruments, to see if the stone has been obviously treated or even if it is synthetic. A negative result like this would be communicated to our client immediately, thus avoiding time-consuming and costly analyses. It is the philosophy of the SSEF that every observation and conclusion, even for this first quick test, has to be confirmed by at least two gemmologists.

If the stone has passed this first test a series of high-resolution photos are taken to illustrate the beauty of the stone on the certificate. The stone is then described in terms of shape, cutting style, proportions, measurements, weight, and colour saturation. Each of the observed/measured values is double checked by a second gemmologist.

Kashmir sapphire of 42 ct of exceptional beauty, certified recently at SSEF. © SSEF

Sophisticated testing:
The next steps include non-destructive testing with sophisticated instruments, such as ED-XRF for chemical analysis, UV-Vis spectrophotometer for absorption spectra, Raman analysis on inclusions and finally LIBS and FTIR analysis for treatment detection. The availability of these instruments is an advantage the SSEF has over many other labs. This technology goes had in hand with the experience of our technical and gemmological staff and their standardised analytical routines.

The sapphire is first analysed by X-ray fluorescence (ED-XRF) to register its chemical composition, especially focussing on its trace elements, such as titanium, vanadium, chromium, iron, and gallium. To measure these elements in a sapphire requires a series of XRF analyses, using different excitation energies and prolonged accumulation times. By using the appropriate filters the signal can be optimized so that even concentrations as low as a few parts per million can be measured. For each gemstone variety, the SSEF has established a specific ED-XRF routine to optimize its chemical analysis. For our sapphire, the concentration of trace elements is one factor contributing to the determination of origin. It may also show evidence of treatment, such as surface diffusion with titanium, cobalt coating on the surface, and fissure filling with a high-refractive glass (e.g. lead glass), or even provide proof that it is a synthetic sapphire.

In the next step, we take the absorption spectrum of the sapphire in the UV and visible range. As sapphire is pleochroic, showing two different shades of blue, we take the spectrum polarized along the ordinary vibration direction. To do so, we have to place the stone in the correct orientation in the sample holder, sometimes quite a difficult procedure, especially if the stone is mounted. Only by registering the spectrum accordingly can we compare the absorption curve with our large reference database and take full benefit from the information revealed (peak height, curve pattern, and absorption edge). By comparing the results with our large sapphire database, we move closer to identifying the origin of our sapphire.

The microscopic interlude:
Next the sapphire is meticulously observed under the microscope and all relevant inclusions and surface features are drawn on a sketch on a worksheet. This sketch is just like an ID-photo in a passport, enabling us to recognize the stone later, even after re-cutting. Special care is taken to register chips and fractures reaching the surface. This might become valuable information for the client, helping to avoid any bad chipping when the stone is set. For anisotropic stones, like sapphires, we also draw the orientation of the optic axis on the sketch, found using a conoscope. Then the first grading gemmologist will describe the reaction of the stone in long wave and short wave ultraviolet light.
Taking into account inclusions, the chemical data and the absorption spectrum, the first gemmologist will come to a conclusion on the presence or absence of treatment and give his opinion on the origin of the sapphire. He will also decide if additional testing is required.

Additional testing required:
This is needed when no clear conclusion can be drawn from the results documented so far. For example, a Raman spectrum on a needle-like pargasite in a sapphire would be clear evidence of Kashmir origin. Furthermore, Raman microspectrometry would give information on fissure filling substances or the cristallinity of zircon inclusions (see page 12, this Facette). With infrared (FTIR), we could add information about fissure fillings or the presence of boehmite/diaspore in unheated corundum. In cases, where beryllium diffusion is indicated, we have to use laser induced breakdown spectroscopy to analyse the presence/absence of beryllium in the stone.

A second, third, and even fourth expert:
After the first gemmologist has finished the full description of the stone, the sapphire is rechecked in detail by a second and senior expert. He will add any further observations/tests he thinks are necessary and helpful. If the initial gemmologists cannot agree on their conclusions, the stone will be checked by a third and possibly a fourth member of staff. All findings and opinions on a stone are discussed within the team to ensure as much agreement as possible on the results. In most cases, this procedure will allow us to give a statement about treatment and also the origin of the sapphire. However there are a number of stones that show features found in specimens from different origins. In a case like this we will not state an origin on the certificate but will explain the situation to the client.

The result is...
Now the sapphire is returned to the administration department, together with the worksheet with all the relevant information which will remain stored at the SSEF for ever. The secretary will then condense this information and issue the SSEF report with standardised wording. We affix the photo of the sapphire onto the certificate and sign it. The two signatures always show who tested the stone. Then the report is laminated, stamped, and a prooftag security label is applied. Finally there it is, a SSEF Gemstone report! It not only highlights the beauty of the stone, but also, following our full disclosure policy, unambiguously indicates the untreated or treated state.

As we have shown, the thorough analysis of a gemstone is a time-consuming process. It involves several SSEF experts in their fields, from photographer to gemmologist and scientific analyst. It is our commitment to quality and integrity that guarantees that each stone tested at the Swiss Gemmological Institute SSEF receives a first class service, taking the time necessary to understand its true nature. This sets us apart from other laboratories.
We have recently observed a price war developing, with labs offering gemstone reports for just a few dollars (and even less!). However we are sure that our clients are well aware of the differences between a quick test and the first class quality of service you get from our laboratory.

New rubies from Montepuez, Mozambique:

The first faceted rubies of this new origin (Fig. 1) were observed during off-premise testing in Hong Kong in March 2000. In July 2009, the first rough samples from a new source of ruby in NE Mozambique reached the laboratory. Werner Spaltenstein (Chantaburi), a rough gemstones buyer in East Africa, informed us that the deposit lies in weathered rock and in alluvial placers about 25km from Montepuez, south of Cabo Delgado. The colour of the stones covers pink to saturated red, and some purplish tones. The rough is often in tabular shape of usually broken pieces. The crystal shapes are mostly tabular and prismatic (Fig. 2). Transparency of the stones is good to translucent, usually due to twinning. Sizes are reported up to 50 g in rough. Clear faceted stones may reach 5 to 6 carats.

Fig. 2: Ruby crystals in tabular and prismatic habit from Montepuez, Mozambique. The largest crystal is 4 cm in width. Photo © H.A.Hänni, SSEF.

In order to characterise the new material and investigate the differences in comparison with rubies from other sources, six small samples were subjected to preliminary analysis. The results showed that the inclusions contained twin lamellae and intersection lines, and fissures were often filled with iron oxide. Mineral inclusions were frequent and usually consisted of corroded crystals, rhombohedrally shaped negative crystals with polyphase inclusions and subtle precipitations of white rutile

Fig. 1: Outstanding unheated ruby of 8 ct from the new deposit near Montepuez, Mozambique, which was certified in 2010 at the SSEF. © M.S. Krzemnicki, SSEF

in flakes (Fig. 3 left and centre). Silk in fine bands or hexagonal patterns were seen in some stones. The inclusions scenery is thus very similar to that of Burmese Mogok-type rubies. Roundish zircons and colourless to greenish amphibole grains were both identified with Raman spectroscopy (Fig. 3 right).

An absorption spectrum was recorded from a sample, and the trace of the curve is typical for ruby with some iron. The cut off in the UV end was at 305 nm. While our samples were natural and unheated, we expect the stones with more fissures and twinning features to be heated with borax or even with lead glass.

The latest research news is that the geological frame of the Montepuez deposit is very similar to that of Winza (Tanzania) from where we have seen

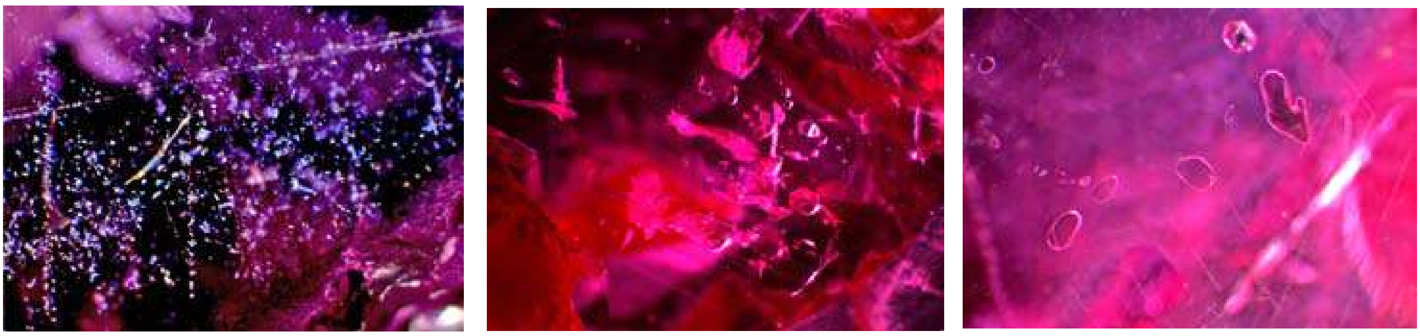


Fig. 3 Inclusions in ruby from Montepuez in Mozambique, showing rutile formation as flakes and needles (left); negative crystals, small crystals with tension fissures, fine rutile precipitations in hexagonal array, larger fissure with limonite (centre, mag. 30x); and corroded, lobular amphibole crystals, basal fluids and fine rutile formations (right, mag. 40x). Photos © H.A.Hänni, SSEF.

excellent large and pure rubies of 10 ct and up. The host-rock of the rubies is again an amphibolite with kyanite and siderite as a accessory minerals. The co-existence of these three minerals allows quite a good estimation of pressure and temperature during formation, which is about 9.5 kB / 650 °C (Hunstiger 1989).

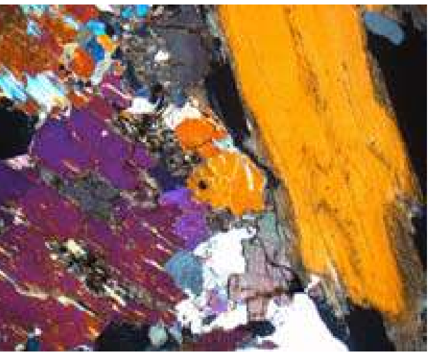


Fig. 4: Thin section of the parent rock of the Montepuez deposit under crossed polarizers: amphibol (multicoloured grains), kyanit (orange-yellow) and Fe-carbonate (pastel colours with distinct cleavage) in polarised light. Width of image approx. 6 mm. Photo © Leander Franz, Mineral.-Petrogr. Institute, University Basel.

In January 2010, we have seen several unheated rubies stones of excellent quality in Bangkok (Fig. 1), coming from that same deposit. Microscopically, they showed fine rutile needles (silk) similar to stones from Burma, but their saturated red colour and duller red LWUV fluorescence were indicating a higher iron concentration. The chemical analyses proved the close similarity to the rubies from Winza (Tanzania), showing similar concentrations of iron, and also no vanadium, and only minute traces of gallium. Apart from this, we have seen and purchased a large number of flat rough stones from the same locality, before any treatment and after heating with borax or after heating and fissure filling with a high refractive glass (Pb-glass). The deposit seems to be a major source for rubies and will have certainly an impact on the market, especially after treatment (Fig. 5). Untreated and clean stones are rather rare.

The investigations on this new ruby material is published by H.A. Hänni and M.S. Krzemnicki in Zeitschrift der Deutschen Gemmologischen Gesellschaft, last issue of 2009, vol. 58/3-4, 127-130.

Fig. 5: Ruby crystals from Montepuez in Mozambique: Unheated, heated with borax and heated with Pb-glass.© M.S. Krzemnicki, SSEF.

Damage to cut gemstones

The factors that limit a gem's stability and thus make it prone to damage include mechanical resistance, the various manifestations of 'hardness', toughness, brittleness, fracture, cleavage and parting, thermal stability, chemical resistance, and stability of colour.

Various examples can illustrate the relative durability expected from gemstones. Examples of damage to diamonds include, damage caused during the cutting and setting of diamonds, damage caused during use such as girdle chips, worn facet edges, abrasion due to rubbing against neighbouring diamonds and even diamond surfaces abraded during sandblasting in jewellery finishing operations. Even more marked were similar types of damage on other gems, such as the sapphires and garnets, especially when worn or set so that they came in contact with diamonds.
An interesting form of naturally occuring damage over time is the expansion of uranium-containing zircon inclusions and uraninite inclusions in sapphire. This type of expansion can lead to fractures or even chipping of the gemstone if the inclusions are close to surface.
The trend towards repairing jewellery with the gems in place also provides opportunities for damage. For example, diamonds in jewellery being torch-repaired are protected from burning by coating them with a borax compound. However, the same compound would attack rubies, sapphires and some other gems.
Significant corrosion to rubies in jewellery as a result of using a borax-compound is common during

Fig. 1: Corrosion on ruby surface during soldering repair when borax was put on the stones. © H.A. Hänni, SSEF.

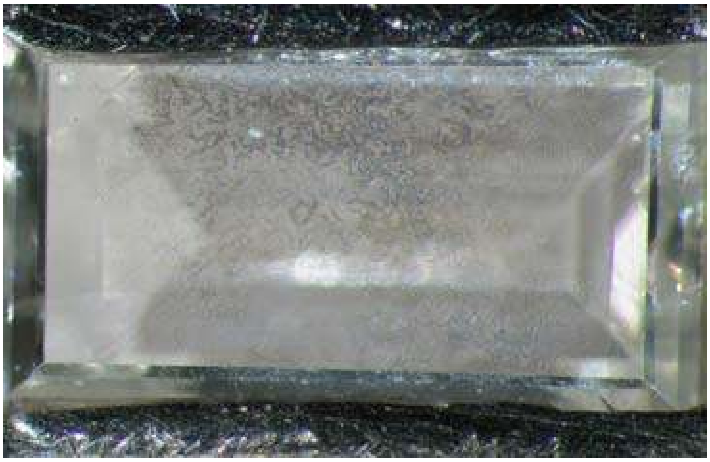


Fig. 2: Corrosion on a diamond surface during soldering repair when no borax was put on the stones. © H.A. Hänni, SSEF.

soldering. A burned diamond surface when borax has not been used has also often be observed. Soldering can cause heat stress and even fracture to some set stones. A particularly intriguing example was observed in the form of a crater-shaped chip from a large diamond. The damage was caused by the impact of a soldering laser shot during a repair to a prong.
Other examples of damage have included the removal of the polymer filler in B-Jade in an ultrasonic cleaner and serious etching to peridot from acid cleaning of jewellery in workshops, for example after soldering.
When the author witnessed how easy it is to chip smoky quartz during setting, he turned his attention to the limited durability of gemstones. In 1988 he co-authored an educational booklet for goldsmith apprentices that included possible damage in the workshop (Schaffner & Hänni, 1988). Since he has been working in the SSEF gemmological laboratory he has encountered numerous gemstones with old or recent damage, always with client's explanation of the possible reason, sometimes related to a case from an insurance company. The first systematic treatment of the subject of damage (Martin, 1987) was a timely contribution towards a better understanding of the different situations where damage can occur.
Coincidentally a paper was published on damage to cut diamonds when it became clear that a diamond might not be forever (Hänni & Bosshart, 1987). Trigger observations were important in calculating the amount of systematically generated damage by diamond cutting factories in the cutting process. Fractures in emeralds with emanation polishing marks indicated that the damage was older than the buyer of an emerald ring could expect.

A full report, including a discussion of some of the cases encountered over the last 29 years, has been published by Prof. Hänni, in English and in German. (see list of publications, page 24)

CVD synthetic diamonds:

Nomenclature, Production and Applications

Will synthetic diamonds challenge natural diamonds in the future in the jewellery and watch markets? Since there is an ongoing debate between synthetic diamond producers and the CIBJO - The World Jewellery Confederation and IDC – International Diamond Council, let's have a look at the current situation.

Nomenclature

Synthetic diamonds possess similar physical and chemical properties to natural diamonds. They show the same hardness, the same brilliancy, and the same thermal conductivity.
Today some people would like them to rival natural diamond's status. In doing so, they forget that in contrast to synthetic diamonds grown quickly in industrial apparatus, natural diamonds crystallised in the mantle of the earth at great depth – 120 km, and some of them are four billion years old. In relation to diamonds, the appearance of mankind on Earth happened almost yesterday, a mere 4 million years ago.
When CIBJO recommends that the trade to use the term 'synthetic' to describe a synthetic diamond, it is simply to remind us that a synthetic diamond is not a natural diamond (see CIBJO box). The International Mineralogical Association (IMA) classified synthetic minerals in the category of anthropogenetic materials (made by man).

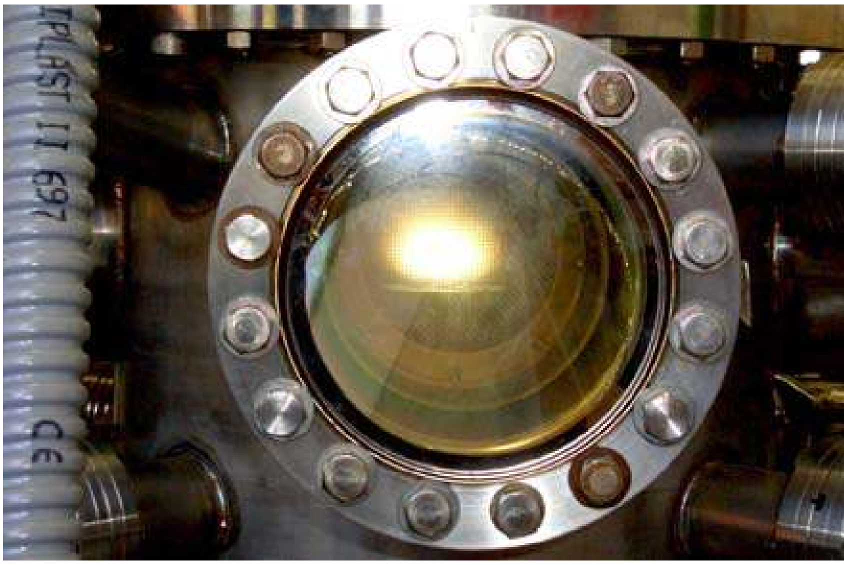


Fig. 1: Microwave reactor of the "Laboratoire d'Inginiérie des Matériaux à Haute Pression", Paris. The gas plasma appears white behind a thick quartz window. Photo © J.P. Chalain, SSEF

Chemical Vapour Deposition CVD

The first CVD synthetic diamonds produced in the 1950s consisted of polycrystalline layers on a metallic substrate. In the beginning, they were small and

not transparent and unlike modern synthetics did not meet the needs of the jewellery industry.
To produce CVD synthetic diamonds, a carbon rich gas is heated to a very high temperature in a microwave reactor (Fig. 1) and forms a plasma of about 10 cm diameter. While its centre may reach a temperature of 20'000 °C, its outside will remain at only 1000 °C.
A diamond seed is placed at the edge of the plasma cloud, and the ionised gas delivers carbon ions that are deposited on the diamond seed and crystallize layer by layer. The quality of the CVD synthetic diamond is closely related to the growth rate (the slower, the better). A few ten micrometers per hour is a typical growth rate for this method nowadays.

Industrial application
The production of CVD synthetic diamonds is being observed with much interest by the industry, including jewellery and watch producers. The famous Swiss watch manufacturer Ulysse Nardin has recently made use of CVDs instead of steel for the mechanical parts of one of its watches. Further applications include CVD synthetic nano-diamonds, which are widely used in molecular biology for various electronic applications, as this material is biocompatible in contrast to silicon. CVD synthetic diamond electrodes have also been used for the purification of wastewater. Furthermore, Bowers & Wilkins, manufacturer of luxury HiFi loudspeakers has launched a new product series that contain CVD synthetic diamond tweeters (Fig. 2).
In future CVD synthetic diamond components will become an integral part of mobile phones and many other technical gadgets in daily use. As a consequence, the more CVD synthetic diamond is used for industrial applications, the more affordable it will become for other sectors, including jewellery.

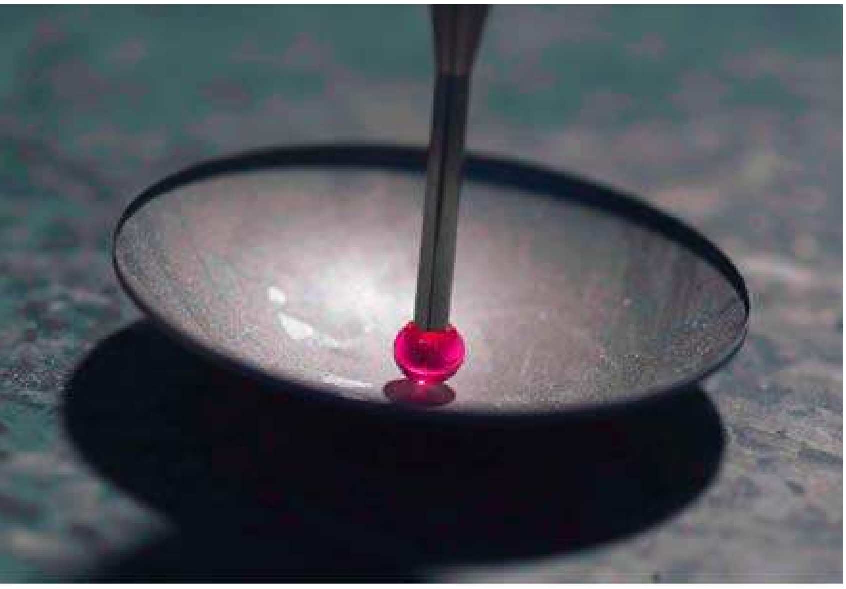


Fig. 2: This polycristalline CVD synthetic diamond dome (26.29 mm across) is a high-tech component of the 800 series HiFi loudspeaker produced by Bowers & Wilkins. The picture shows the control measurement of the thickness. Photo source : Bowers & Wilkins

In future CVD synthetic diamond components will become an integral part of mobile phones and many further technical gadgets we use everyday. As a consequence, the more CVD synthetic diamond will be used for industrial applications, the more affordable it will become for other sectors, including that of jewellery (Fig. 3).

author: J-P. Chalain

from: CIBJO Diamond Book, 2007 version.
downloadable on: www.cibjo.org

Terms and definitions

4.10 Diamond
A diamond is a natural mineral consisting essentially of carbon crystallised in the isometric (cubic) crystal system. Its hardness on the Moh's scale is 10; its specific gravity is approximately 3.52; it has a refractive index n of 2.42.

4.37 Synthetic diamond
Man-made reproduction of diamond (4.10) that has essentially the same chemical composition, crystal structure and physical properties as its natural counterpart.

CIBJO Normative Clause for synthetic diamond

3.2 Synthetic diamond
The fact that a stone is wholly or partially synthetic diamond (4.37) shall be disclosed (4.12)

3.2.1 Description
Only the term "synthetic" shall be used to describe synthetic diamonds (4.37) and this term shall be equally as conspicuous and immediately proceeding the word "diamond" (4.10).

Fig. 3: Small brilliant cut CVD synthetic diamonds (approx. weight 0.70 ct each), analysed in detail at the Swiss Gemmological Institute. © SSEF

Micro X-ray Tomography of Pearls: SSEF introduces a new service for pearl testing

Recently the SSEF Swiss Gemmological Institute has tested a large number of natural pearls as they are becoming more important to a specialized sector of the jewellery market.

However, separating natural pearls from cultured pearls has never been easy and has become even more difficult recently with the quantity of beadless saltwater cultured pearls sold nowadays using the term 'new Keshi'. The separation of natural pearls from cultured ones is commonly based on analyses of radiographs (and in rare cases X-ray diffractograms), X-ray luminescence, and meticulous microscopic observations. The radiographs (shadowgraphs) may show very fine and subtle internal structures, which then are interpreted. In some cases however, even a series of radiographs is not sufficient for safe identification. That's why the SSEF now offers a new, sophisticated option in our pearl testing routine by undertaking a thorough analysis with micro X-ray tomography.
Computerized tomography, also known as CT-scan, is not a new invention. Initially developed in the 70's (1979 Nobelprize for physicist Allan M. Cormack and electro engineer Godfrey Hounsfield) the method was quickly adapted for medical research and diagnostics, as it allows a non-invasive insight into the body and the processes within.
With further developments of this method, i.e. the strong increase in resolution (from ca. 5 mm to a few microns 0.001 mm), it has become useful for many other applications, especially in material science.

A tomographic analysis always consists of two phases. Firstly the sample is exposed to a focused X-ray beam and rotated. Step-by-step, the X-ray absorption is registered (similar to radiography) on a planar X-ray detector. And secondly, these projected images are used to calculate a three-dimensional reconstruction of the sample. Both X-ray scanning and reconstruction are quite time, and megabyte, consuming. The computerized tomographical reconstruction can then be scrolled through on three orthogonally oriented virtual slices.

Furthermore, distinct X-ray absorption contrasts within the sample can be calculated into a 3-dimensional model, which can be rotated in all directions. In summary, this method provides a very visual approach to the analysis of the internal structures of solids. It has been largely applied for quality analysis of industrial products (e.g. medicines, foams) and in-vivo medical research (e.g. bones). Only recently has X-ray micro tomography been applied

Fig. 1: Necklace of natural pearls of outstanding size and quality. This necklace has been tested and certified recently by the Swiss Gemmological Institute SSEF.

to pearls (see Strack 2001, Wehrmeister et al. 2008 and 2009) and gems (Hänni, Facette 16, 2009).

What does a pearl tomograph look like?
The micro X-ray computerized tomograph of a pearl is a reconstructed three-dimensional model, calculated from a large number of X-ray shadow images. The virtual cross sections of a pearl tomograph (Figure 2) are in greyscale (similar to the X-ray shadowgraphs); colours may be added on the screen if necessary.

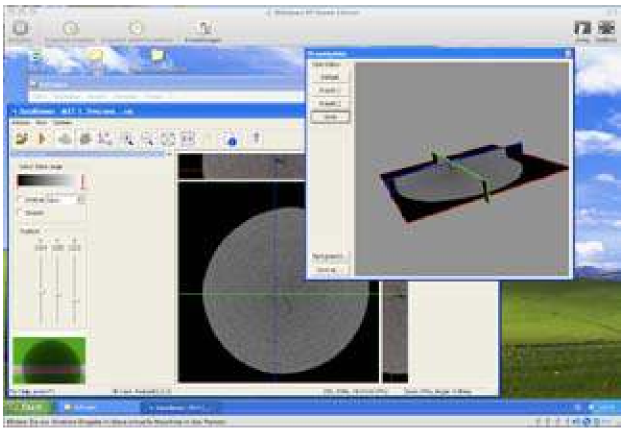


Fig. 2: With specific computer programs, the virtual cross sections of a pearl can be studied in detail. © M.S. Krzemnicki, SSEF

Similar to radiographies, the parts with a low X-ray absorption (e.g. fractures, central parts with a higher porosity and more organic matter) are darker than dense nacre layers. However, in contrast to the traditional X-ray shadow method (radiography) in which the three-dimensional pearl volume with its internal structures is condensed on the two-dimensional plane of the X-ray film, tomography allows us to observe spatial structures in detail in their three-dimensional view.

Figure 3 shows virtual cross sections through the centre of three different pearls: a natural pearl on the left, a beadless cultured pearl in the centre and a beaded cultured pearl on the right.
The natural pearl (left) shows fine circular structures, similar to an onion, with a small dark spot in the centre. In the figure a minute dot, this centre of the pearl, becomes more evident when scrolling virtually through the tomographical reconstruction of the pearl. Towards the outer rim of the pearl we can distinguish dark circles, which indicate that the final nacre layers grew loosely on the underlying layers.
The beadless cultured pearl (middle) shows a curved dark void in the centre that represents the small cavity created by the crumbling transplanted mantel tissue that later became the pearl sac for the growing beadless cultured pearl. This fine structure was hardly visible on radiographies taken on the same pearl, but is now easily observed on the tomograph. Previously, this structure could not have been seen without cutting the pearl in half (see small inset in fig. 3). Thanks to tomography, we are able to see these fine structures without touching the pearl at all. An advantage much appreciated by pearl dealers.
The beaded cultured pearl (right) shows a bead, which has split along the drill hole in two due to the pearl drilling. Although damaged in the interior, this should not have any influence on the stability and lustre quality of this cultured pearl.

Fig 3: Micro X-ray computerized tomography cross sections of a natural pearl (left), a beadless cultured pearl with characteristic curved „moustache“ structure in the centre, and a beaded cultured pearl (right) with a split bead. © M.S. Krzemnicki & P. Chalus, SSEF and Roche (Basel).

The modelling of internal pearl structures:
Although the virtual scrolling through a pearl already reveals plenty of information about its inner structures, we can even create a three dimensional model of the defined features, similar to CAD programs, and then rotate them and observe them from all directions.
To do so, the outline of a structure observed on the tomography cross sections has to be defined according to a specific contrast in grey scale. Then the cross sections are recalculated and reduced in a simple binary black/white mode. Based on this, the modelling program then calculates the three-dimensional surface of the specified structure.
On the screen, we can then rotate the model in all directions. To show this, we have modelled the small curved ‘moustache’ structure of the beadless cultured pearl above (see figure 4).

Fig. 4: Three different cross sections through the beadless cultured pearl (see above). The white structure shows the curved „moustache“ structure of this pearl. The figure at the bottom show a a three dimensional model of the characteristic structure for this beadless cultured pearl. . © M.S. Krzemnicki & P. Chalus, SSEF and Roche (Basel).

Pearl tomography as a client service at the SSEF:
Since August 2009, the SSEF has offered pearl tomography as an additional service to our clients. We are the first gemmological laboratory to have implemented a routine procedure for this highly sophisticated method of pearl testing.

The procedure is time, and gigabyte, consuming and quite expensive. As natural pearls can usually be distinguished from cultured ones by traditional radiography, we will only use the tomography for specific cases on important pearls. As the value of an important a pearl depends entirely on whether it is natural or cultured, we are sure that this new scientific method will be well received by the market. Since August, we have used tomography to analyse a number of client’s pearls.

We are sure, that micro X-ray tomography will become an important tool for pearl testing in the future. For more information about pearl tomography, we offer a downloadable presentation on the topic on our website, see the News-Archive section on our website www.ssef.ch.

author: M.S. Krzemnicki

Age dating of pearls

In 2008, the SSEF introduced radiocarbon age dating to gemmology. The item analysed was a non-nacreous bead, sold at the Macau Fair and said to have originated from a prehistoric conch fossil. The test showed that the bead was either formed in 1997 or 1957, but was certainly not prehistoric (see Facette 16, page 9, and Gems&Gemology 2009).

Last year, we continued our collaborative research with Prof. Bonani and Dr. Hajdas of the Laboratory of Ion Beam Physics / Radiocarbon Dating of the Swiss Federal Institute of Technology (SFIT Zurich) on a series of pearls and shells.

Fig.1: Three historic freshwater shells from Switzerland, kindly donated by the Natural History Museum Basel, and a series of freshwater and saltwater pearls were analysed for this study. © M.S. Krzemnicki, SSEF

The method of radiocarbon age dating is well established, especially in archaeology, as it is a perfect tool for tracing back artefacts and bones of historic and prehistoric origin (up to 50'000 years). The method is based on the principle that a living organism (animal or plant) is constantly equalizing its carbon isotope ratio (ca. 99% ^{12}C, ca. 1% ^{13}C, and ca. 1,2 x 10^{-12} radioactive^{14}C) by metabolism with the surrounding (atmosphere). After its death, this process stops and, due to the radioactive decay of ^{14}C, the carbon isotope ratio changes and thus the age of the organism can be calculated.
The first ^{14}C ages produced 60 years ago on archaeological and geological samples of "known age" illustrated the potential offered by the new method for these research fields (Arnold & Libby, 1949). Usually, the method is used for age determination in the range of 300 – 50'000 years. However, the so-called „bomb peak", i.e. the excess of ^{14}C produced artificially during the 1950s/60s atmospheric nuclear tests and the subsequently monitored flattening out of this ^{14}C peak, also enables us to date very recent samples.

For this study, we were interested in the feasibility of radiocarbon age dating of pearls; in particular if

Fig. 2: Keshi-type beadless cultured pearl. (sample PC-14_2).

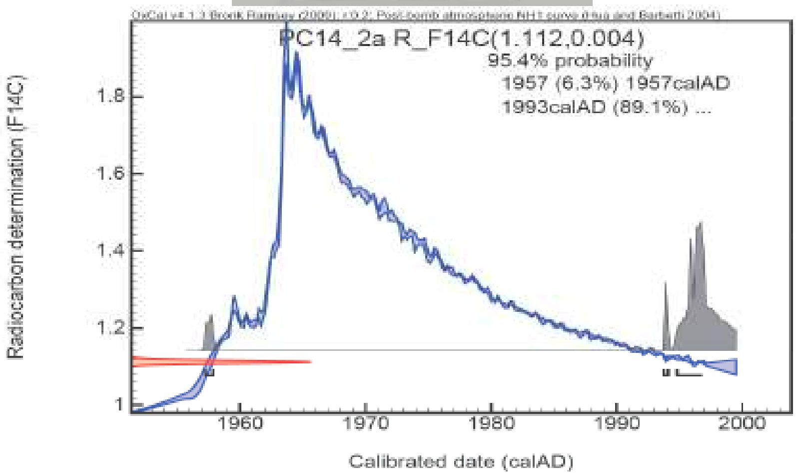


Fig. 2: Atmospheric radiocarbon curve showing the "bomb peak" due to nuclear testing in the 50s and 60s. The measured ^{14}C ratio of the Keshi-type beadless cultured pearl (sample PC-14_2) shows two intersections at 1957 (6.3%) or > 1993 (89.1 %). The pearl originates from a harvest end of the 90ies from a pearl farm in Australia.

recent pearls can be separated from historical ones. For our study, we selected a number of pearls of very recent ages, from 2001 to approximately 1950 (SSEF collection), and freshwater shells from the historical period from the beginning of 20th century to the mid 17th century, kindly donated and documented by the Natural History Museum of Basel (Switzerland). Using the accelerated mass spectrometer (AMS) at the Ion Beam Laboratory of the ETH Zurich, it was possible to carry out radiometric age dating on just a few milligrams of sample material. Thus, our pearl samples were partially drilled and slightly polished and the resulting carbonate dust was collected for analysis.

The preliminary results show that it is possible to separate saltwater pearls younger than the "bomb peak" (late 1950s) from older pearls. For the historic freshwater shells from Switzerland, however, the ages calculated were much too old for the samples. This "age-shift" is due to the contribution of very "old" sedimentary carbon, originating mainly from Mesozoic metasediments in the Swiss Alps, in which the sources of the mussel-bearing rivers are located. Further measurements are planned for 2010 in order to get more insight into this new gemmological method.

author: M.S. Krzemnicki

How to get the "Blues" out of the Pink: Detection of low-temperature heating of pink sapphires

Pink sapphires are in fashion and have entered the gemstone market in large quantities and large sizes. This is particularly due with the rise of the gemstone deposits in Madagascar and East-Africa. Vivid pink sapphires are highly valued in comparison to stones with a slight violet hue. By heating slightly off-coloured stones to about 800-1000 °C, their colour may be distinctly improved. In fact, this so-called "low-temperature" heating reduces/removes the blue component of the colour, just leaving behind the pink, due to small amounts of chromium in the crystal structure.

Generally, heat-treated corundum is identified by meticulous microscopic observation. In particular, when heated to above 1000 °C, as happens in most cases for sapphires and rubies, we can see numerous features in the stones which are a direct result of heating. Atoll-like structures of inclusions, which have melted and exploded during heating, are definitely the most prominent features of this treatment. (Fig. 2) However, when it comes to so-called low-temperature heating of pink sapphires, these features become scarce and are sometimes simply absent.

Fig. 1: A series of pink sapphires from Madagascar before (above) and after (below) heating at 1000 °C. The heating has had an obvious effect on the colour of these stones, removing the blue component and making them more attractive for the trade. © M.S. Krzemnicki,

To be able to clearly identify low-temperature heated pink sapphires, we have treated a large number of samples to different temperatures (400, 600, 800, and 1000 °C) and analysed them before and after heating. Our research shows that we can clearly identify heated pink sapphires from Madagascar and East-Africa even after a low temperature heat treatment based on the Raman-spectra of their zircon inclusions, which usually are found in great quantity within the stones.

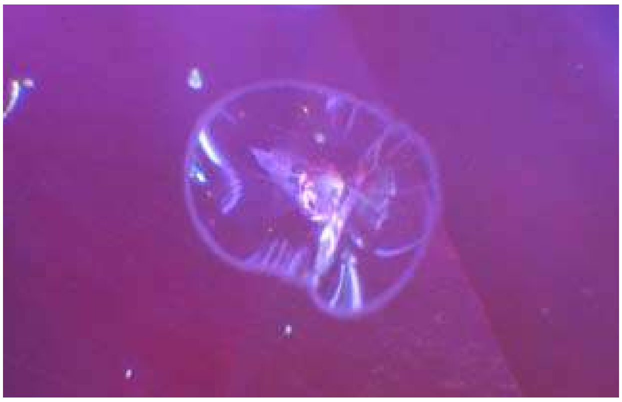


Fig. 2: Atoll-like structure of a molten inclusion due to heating. These features are only seen in pink sapphires heated at about 1000 °C. Below that temperature, clear microscopic evidence of heating is often missing. © M.S. Krzemnicki, SSEF

Before heating, the zircon inclusions are metamict (locally damaged lattice) due to the radioactive decay of the uranium traces within the zircon. As our experiments have shown, these zircon inclusions regain their cristallinity relative to the applied temperature, giving rise to more and more distinct Raman-spectra with narrow peaks and reduced peak diameter (Full With Half Maximum FWHM, see also article on page 14 in this Facette). Furthermore, at temperatures at and above 800 °C, we see a number of photoluminescence peaks developing.

To our knowledge, the SSEF is the only laboratory applying this FWHM-criterion to zircon inclusions to accurately identify low-temperature heated pink sapphires.

author: M.S. Krzemnicki

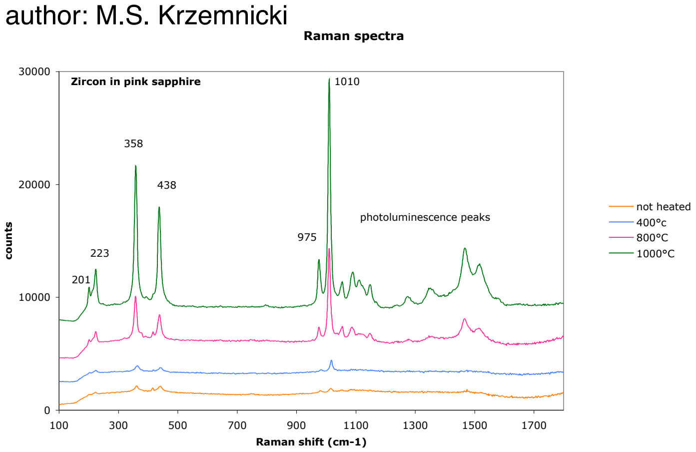


Fig. 3: Raman-spectra of zircon inclusions in pink sapphires before heating (orange curve) and at different heating temperatures (blue, red, green). The relationship between heating temperature and peak shape is evident. © M.S. Krzemnicki, SSEF

Diamonds with a "star": Asteriated diamonds

During the last September Show in Hong Kong, we were able to buy eight asteriated diamonds (see figure 1) selected from a lot of similar polished slabs. We were astonished to see such a quantity of these peculiar diamonds (several tens of carats) available on the market. Most of them were of fine quality. The characteristic features of these asteriated diamonds are grey to brownish grey distinct growth sectors, similar to flower petals, starting from the centre of the more or less transparent diamond (figure 2). The samples selected have an average weight of 0.33 ct and the largest specimen shown on the photo is about 8.4 mm in diameter with a thickness of 0.45 mm. The base of each slab is plane polished and the top is a flat modified brilliant. Our interest in these asteriated diamonds started in 1998 when collectors brought some of these diamonds to the SSEF to be tested. Based on infrared absorption analysis, we could demonstrate immediately that these greyish-brown sectors showed a distinctly higher concentration hydrogen than the transparent sectors in between. This preliminary study was later followed up by a thorough study, with which we collaborated, on similar asteriated diamonds, published in 2004 (Rondeau et al., Diamond & Related Materials 13, (2004) 1658-1673). In the last few years we have only rarely encountered diamonds like these. Therefore we were delighted to be offered such a large choice of good quality asteriated diamonds and to add a number of them to our SSEF research collection.

Asteriated diamonds may become fashionable in the future because they are quite affordable when one compares their price per carat to brilliants and, to the connoisseur, really attractive. We are looking forward to seeing how jewellers will use these stones in their creative designs in the near future.

author: J-P. Chalain

Fig. 1: These eight asteriated diamonds were bought in September 2009 at the Hong Kong Jewellery Show. The largest specimen on the photo is 8.4 mm in diameter. © SSEF

Fig. 2: Microphotography (mag. 15x) showing details of the hydrogen-rich sectors. © SSEF

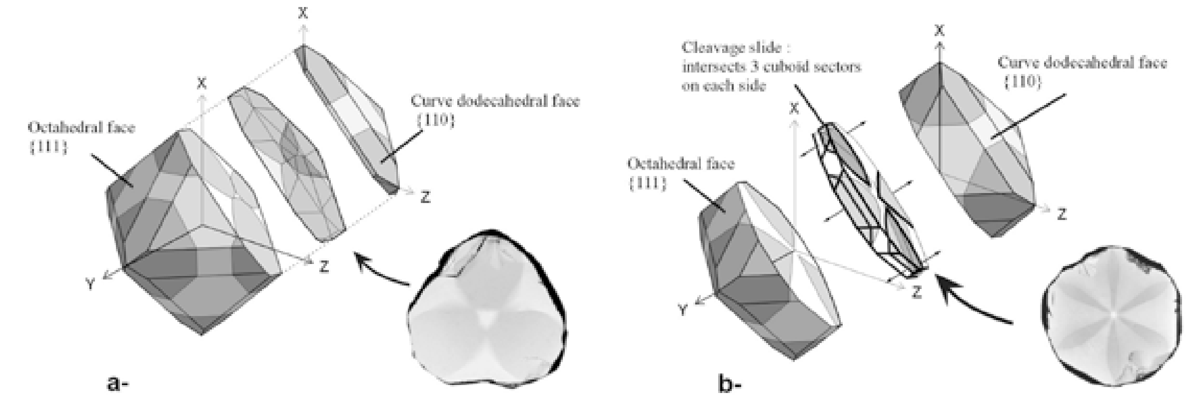


Fig. 3: This scheme illustrates the peculiar hydrogen affinity for specific crystallographic sectors in diamond and explains how several slabs sawn out of one single crystal may look quite different. © Rondeau et al. 2004

Peak analysis:

The Full Width Half Maximum criterion

The Full Width at Half Maximum (FWHM) is a criterion for analysing the shape of a peak in a spectrum. It has become an important measure used by gemmological research laboratories for gemstone analysis.

Below, we would like to give a brief description of the FWHM and review its main gemmological applications with particular reference to diamonds. Our readers may also refer to a specific application for spinels (SSEF Facette n° 16) and for corundum with zircon inclusions (see this Facette).
The Full Width at Half Maximum (FWHM) is the measurement of the width of a given peak in a spectrum at the half of its total height (see Figure 1). The unit of the FWHM depends on the unit that is used for the given spectrum, but may be transformed into any convenient unit (meV, cm-1, nm etc.) by simple mathematical transformation.

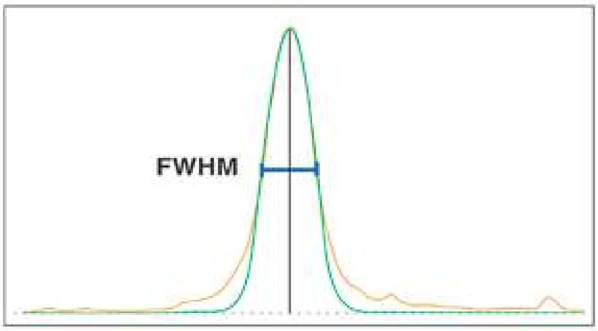


Fig. 1: The FWHM is calculated from a idealized peak curve (green), projected onto the real peak (orange).

Gemmological applications
Calibration of a Raman spectrometer
Using a Raman spectrometer photoluminescence spectra of major gemmological significance, for example diamond, may be recorded. Given the extremely high sensitivity of this instrument, its calibration is a priority and therefore should be checked prior to use, especially for photoluminescence spectra. Since 1999, SSEF has used a pure type IaA and D colour master diamond for the calibration, because of its homogeneity. We consider our Raman spectrometer to be correctly calibrated only when the FWHM of the diamond Raman peak at 1332 cm^{-1} Raman-shift is equal to 4.0 ± 0.1 cm^{-1}.

HPHT treatment detection
In 2000, SSEF showed that the FWHM of the NV-optical centre peak (637 nm) is a perfect tool for the distinction between type II natural colourless diamonds and HPHT treated colourless diamonds (Hänni, Chalain & Fritsch, Gems & Gemology, 2000, Vol. 36, pp.96-97). Since then, further authors have confirmed this criterion.
Today, the measurement of the stress of a diamond is also an indication of whether a colourless type II diamond was originally brown. It is measurable through the FWHM of its neutral vacancy PL peak.
In 2007, SSEF concluded that diamonds of natural colouration showing a 648.0 nm PL peak may have a FWHM photoluminescence vacancy related line well above 1.20 meV even though they are of a D colour (Chalain, Lefèvre, Hänni, 2007, Proceedings of the Diamond Conference).
In 2009, thanks data collaboration with the DTC Research Centre – DeBeers Group, the SSEF established that the FWHM of the B' peak (platelets peak) is a new criterion for separating type I greenish yellow diamonds of natural colour from HPHT treated ones (Chalain & Fisher, 2009, Proceedings of the Diamond Conference).

Green diamonds
Although this criterion is still subject to ongoing research, we have known for more than a decade that the FWHM of the GR1 peak found in absorption spectra (recorded at low temperature) allows, under certain circumstances, the identification of artificially neutron-irradiated diamonds.

author: J-P. Chalain

Prof. Hänni,

Research Associate of SSEF

After the retirement of Prof. Hänni, former director of SSEF, quite a number of companies and associations have taken advantage. In Hong Kong he gave an update seminar to members of the gemmological association, in return, he recieved the honorary membership of that association. A lecture at Göttingen University on scientific gemmology was followed by a week on practical gemmology at Lausanne University, where he teaches gemmology regularly. In Köln he worked with different experts from the insurance industry, giving six lectures on current topics.
In addition goldsmith groups and jewellers have asked Prof. Hänni to guest at their annual meetings and have benefitted from his knowledge on various subjects
GemExpert (www.gemexpert.ch) is the new private company of Prof. Hänni and his partner, Prof. Hunziker, looking after clients with specific needs. Gemstone and pearl research is still his passionate interest and as a research associate, he is still linked to the SSEF Institute. The results of his work are published in trade magazines and gemmological journals world-wide. At present he is assembling a number of pearl boxes, a business where he can also use his practical skills when sawing and polishing the delicate pearls to show their true nature.

SSEF Courses in 2009

2009 was a successful year once again with many students participating in our courses. The Swiss Gemmological Institute SSEF provides participants with basic, advanced and scientific gemmological education, so that gemmologists at the beginning of their career and more experienced students could learn about coloured stones and diamonds. A course specifically for pearls was offered this year for the first time. Our courses focus on practical skills starting with the correct use of a refractometetrer and continue through to the mysteries of UV-VIS-NIR spectroscopy at liquid nitrogen temperature on coloured diamonds.

In 2010, the SSEF continues to offer plenty of opportunities to enhance your knowledge of gemmology. For students, who would like to get a diploma in gemmology, we offer the SSEF Basic Training Course (21 June - 6 July 2010) or the SSEF Basic Diamond Course (18 - 22 September). The SSEF diploma is only issued after the student has successfully passed a theoretical and practical exam (see section 'congratulations...'). In the SSEF Advanced Training courses the topics are covered in greater depth.

We will continue to offer practical days in 2010 on 12th January, 3rd May, 8th June, 5th July and 12th November. These days are aimed at anyone interested in freshening up their skills and practicing under guidance with gemstones from our large collection. You may even bring your own gemstones.

As in previous years SSEF offers its unique high-end Scientific Gemmology Course (9 -13 August 2010) and Scientific Diamond Course (16 - 20 August 2010), in which laboratory staff and experienced gemmologists from all over the world are trained in how to use sophisticated methods of gemstone testing. Each of these courses takes one week. The participants (not more than 4) learn the application of spectrometry (FTIR, UV-Vis-NIR, Raman, EDXRF, LIBS) and methods such as SEM, X-ray luminescence, and X-ray radiography for gemstone identification and diamond treatments respectively.

For the complete course programme or more information please contact SSEF: admin@ssef.ch (tel. +41-(0)61 262 06 40) or see our website www.ssef.ch (download our course programme as a pdf file!).

Advanced Pearl Course

Due to the growth of the natural pearl market and the increasing presence of the so-called "keshi" beadless cultured pearls, the SSEF has developed an Advanced Pearl course.
The success of this course last year means we are offering two sessions in 2010 (19 – 21 April and 22 – 24 November). Over these three days participants will receive a thorough introduction to pearl formation, work with single pearls and strands of pearls and evaluate pearl cross sections and radilgraphs.

Students will follow a pearl from the moment it arrives through all the stages of its journey through the SSEF lab, doing all the analyses by themselves: taking x-rays of pearls, doing chemical analyses, examining x-ray luminescence pictures and Raman luminescence spectra...

SSEF laboratory analyses many prestigious pearls and our pearl reports have the confidence of the international natural pearl trade, therefore we are ideally suited to offer this kind of training. For further information and application contact us by phone (+41 (0)61 262 06 40) or email (admin@ssef.ch).

Pearl boxes available at SSEF

During SSEF pearl courses students are able to look at pearl cross sections in display boxes. With the naked eye, but more accurately, with magnification one can observe and better understand different kinds of pearls. A typical pearl box, which is now offered for sale by SSEF contains samples of beadless mantle grown freshwater (China), beaded gonad grown saltwater (Japan, Tahiti, South Sea), beadless gonad grown ("Keshi"), and two natural pearls. A clear description is printed on the underside of each box. A collection of pearls like this illustrates the type of pearls encountered in the trade today and not only provides information for your staff, but can also display different products to jewellery consumers. Boxes can be ordered from the SSEF office for CHF 600 plus VAT and shipping.

SSEF Basic and Small Diamond Courses

The SSEF is offering two diamond courses in 2010. The Basic Diamond Course will be held from 18 - 22 September 2010. This course is aimed at students who want to know more about the basics of diamonds and diamond grading. During this course, the participants learn how to grade a diamond step-by-step. The course ends with an exam. Successful students will receive the prestigious SSEF Basic Diamond Certificate, recognized by the Swiss Gemmological Society (SGG).
Diamonds may also be cut as very small stones, often used by the watch industry, with a weight equal or less than 1 point. In response we created the SSEF small diamond course that has been running for a few years. This is an advanced course in which students learn to measure the quality of these small diamonds. One session has been organised for October (26 – 28 October 2010) and is especially designed for people working in the jewellery and watch industry. Previous experience is welcome but not a requirement. For information, or to apply, please contact us by phone (+41 (0)61 262 06 40) or email (admin@ssef.ch).

SSEF Company courses
In order to train a larger number of members of staff, we are pleased to offer SSEF Company Courses, which can be specially designed to meet your requirements. Please contact SSEF with any questions about these courses. (admin@ssef.ch, or tel. +41 61 262 06 40).

The participants of the Scientific Gemmology Course in January 2009 (from left to right): Dr. Thierry Salva, Ms. Yu-Chieh Tu, Julius Cogswell, Ms. Cheung Yuk King, Dr. Franz Herzog, Dr. Francesco Natale, together with the course teachers Prof. Hänni and Dr. Krzemnicki from SSEF.

Congratulations...

We would like to congratulate the following students for getting:

SSEF Basic Gemmologist Certificate:
With the highest distinction:
- Birgit Elett, Ebmatingen

and the following successful participants:
- Rajas Gupta, India
- Gertrud Immoos, Zürich
- Tanja Lecher, Erlenbach
- Rolf Krieg, Bern
- Oliver Waldis, Germany
- Regula Blumer, Seltisberg
- Silvia Gonzalez Huggler, Luzern
- Charles Handschin, Biberist
- Désirée Huber, Binningen
- Sanja Todorovic, Tanzania

SSEF Basic Diamond Certificate:
- Cynthia Bracher, La Chaux-de-Fonds
- Edinalva Edermann, Geneva
- Stéphanie Lambert, Geneva
- Luca Dotti, Geneva
- Thorsten Weber, Zürich
- Nadège Barthelemy, Tramelan
- Anne-Marie Ardito, Geneva
- Isabelle Brahier, Tramelan
- Ambroise Simon-Vermont, Geneva
- Jean-Luc Cornu, Tramelan
- Sébastien Gautier, Geneva

Only participants who 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
- Vanessa Paterson, United Kingdom
- Alberto Corticelli, Geneva
- Yvonne Julier, Lausanne
- Anna Hügli, Basel
- Laurent Cartier, Basel
- Anne-Marie Vaubourg, France
- Patrick Flückiger, Geneva
- Franz Herzog, Oltingen
- Anu Manchanda, United Kingdom
- Avnish Shah, India
- Jose Casares, Geneva
- Dominik Steiner, Winterthur
- Ronny Totah, Geneva
- Ugo Trimarchi, Italy

Participants of the advanced pearl course discuss an X-ray luminescence picture during the course. © SSEF

Courses on treatment and origin of coloured stones
- Nazanine Sabbag, Geneva
- Marc Boghossian, Geneva
- Roberto Boghossian, Geneva
- Jessica Silli, Geneva
- Christian Hemmerle, Germany
- Thomas Hübner, Germany
- Jaroslav Jiranek, Ostrava
- Maitraya K. Sanghvi, India
- Monique Nersessian, France

Courses on quality control of small diamonds
- Krystina Samek, Czech Republic
- Didier Gilles, Le Brassus
- Isabelle Ray, Geneva
- Frederica Roh, Geneva
- Loic Iampieri, Geneva
- Sébastien Loffel, Geneva
- Leonardo Prudente, Geneva
- Eliane Denicourt, Geneva

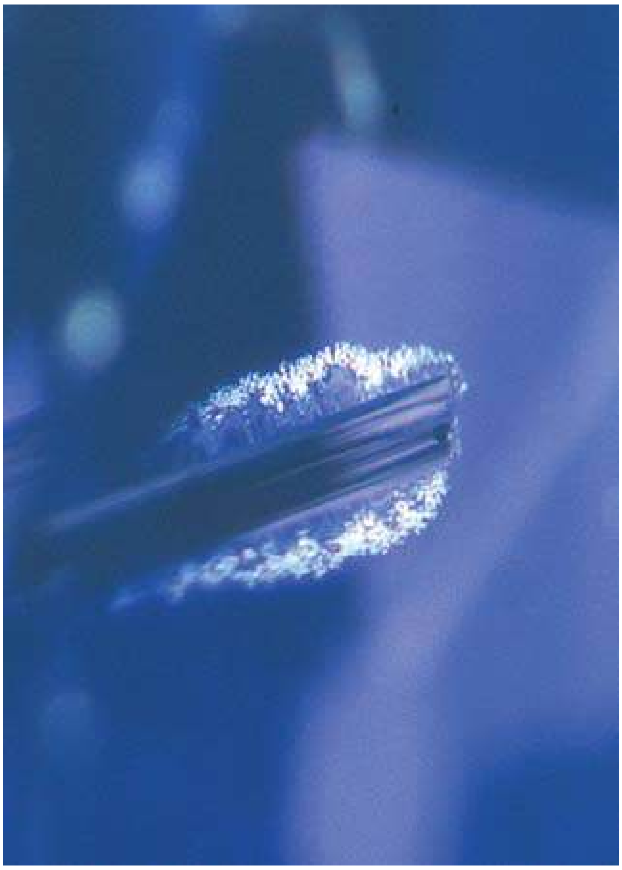
SSEF Scientific Diamond Course
- Chiara Parenzan, Basel
- Cheung Yuk King, Hong Kong
- Violeta Kisieliené, Lithuania
- Bharat Kakadia, India
- Pierre Lefèvre, France
- Miraj Patel, United Kingdom

SSEF Scientific Gemmological Course
- Francesco Natale, Italy
- Franz Herzog, Oltingen
- Yu-Chieh Tu, Taiwan
- Thierry Salva, France
- Cheung Yuk King, Hong Kong
- Julius Cogswell, USA

We wish all successful participants a bright gemmological future!

SSEF Courses 2010:

25 - 29 Jan	Scientific Gemmology
1 - 5 Feb	Scientific Diamond
19 - 21 April	Advanced Pearl Course
3 May	Practical Training
7 June	Practical Training
21 June - 6 July	Basic Gemmology
9 - 13 Aug	Scientific Gemmology
16 - 20 Aug	Scientific Diamond
27 Sept - 1 Oct	Advanced Coloured Stones
18 - 22 Oct	Basic Diamond
25 Oct	Advanced Diamond
26 - 28 Oct	Small Diamonds Quality Grading
22 - 24 Nov	Advanced Pearls
2011	
10 Jan	Practical Training
24 - 28 Jan	Scientific Gemmology
31 Jan - 4 Feb	Scientific Diamond



Pargasite in Kashmir sapphire.
Learn about characteristic inclusions in sapphires and rubies for origin determination during our SSEF Advanced Training in October 2010. © H.A. Hänni, SSEF

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. Now, we are offering you our expertise with an exciting new service: the **SSEF Photocard**. We are convinced that this will be a very attractive promotional tool for your SSEF certified coloured stones, diamonds or pearls, displaying their beauty in high quality photographs.

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. It is also possible to customize your card with your own company logo.

For any further question, please contact SSEF at: tel. +41 61 262 06 40, or send an email to: admin@ssef.ch

New SSEF tariff and tariff calculator online

Since 18th August, the SSEF has had a new and optimised price list for our services. It is not only easier to navigate through the list, but you also benefit directly from price reductions. In particular we have completely waived the extra fee of 350 Swiss Francs for testing colourless type IIa diamonds (whether they are HPHT treated or not) and the extra fee for identifying fissure fillings in emeralds (150.- Swiss Francs).
Furthermore, we now offer the SSEF tariff calculator (a small Microsoft Excel spreadsheet) as a download on our website. This clever file makes it easy to calculate the tariff for any SSEF certificate with a few taps on your keyboard.

See: www.ssef.ch/en/services/
or contact SSEF: tel. +41 61 262 06 40,
admin@ssef.ch

Prooftag label successfully launched

In summer 2009, we launched the SSEF Prooftag labels. This unique authentication solution assures clients that the SSEF report they hold is not counterfeit or false.

The best way to make sure that a product cannot be copied or falsified is to make it unique and easily checked by the user. Therefore a unique bubble tag label is affixed by SSEF to the surface of a laminated SSEF certificate. The probability of being able to successfully create two identical bubble tags is less than $1:10^{24}$. Each bubble tag is identified by its serial number and this can be checked online from a computer or a mobile phone. Of course, any certificate from which a label tag has been partially or totally removed would show evidence of tampering.

Since this new service was launched each SSEF report has included a letter explaining the SSEF Prooftag verification label. Over the last six months several hundred SSEF certificates have been released with this unique Prooftag label.

SSEF expands shuttle services with Ferrari SA

Since August, we have been offering new SSEF shuttle services from Paris, London, Hong Kong and New York with Ferrari SA.

You now have the choice between using either Ferrari or Malca Amit to ship your most prestigious gemstones and jewellery items smoothly to the SSEF at a very attractive fee.
Please visit our website and download the information about our shuttle services. You may also call your nearest Ferrari or Malca Amit office and ask for the SSEF shuttle. For further information, please contact our administration on tel. +41 61 262 06 40 or send an email to: admin@ssef.ch

SSEF and Gem-A (London) announce Testing Link-Up

SSEF and Gem-A have signed a memorandum of understanding allowing Gem-A to outsource gemstone and pearl testing to the Swiss Gemmological Institute SSEF. Although the SSEF has operated internationally for many years, the new agreement will allow Gem-A's UK Members the advantages of convenience and the cost benefits of consolidated shipping. The final administrative and insurance details are still being finalised, but the arrangement will start on 15 March 2010, with, it is hoped, a pilot scheme in operation within a few weeks.

Dr Michael S. Krzemnicki, Director of SSEF, said: "We have worked closely with Gem-A for many years and this laboratory initiative will hopefully contribute to ever closer cooperation and growth. Our testing for the gem and jewellery industry are vital for our ambitious research programmes which are of benefit to the entire gemmological community and, ultimately, to consumers."

Dr Jack Ogden, Gem-A CEO said: "I am delighted to announce that gemstone and pearl testing will soon be available again to our UK Members. SSEF is a famous gem lab of acknowledged world-class standard and at the forefront of gemmological research. This agreement builds on the long and close cooperation we have had with SSEF."

For additional information on this release, contact Petra Niggli at SSEF (admin@ssef.ch) or Arianna Maccaferri at Gem-A London (arianna@gem-a.com)

On-site services 2010: Bangkok, Hong Kong, Paris

In 2010 we will continue our on-site service in Bangkok and Hong Kong and as a new location also in Paris. Equipped with our mobile instruments and spectrometers, every gemstone is meticulously analysed before certification.

If you wish to profit from this service, please contact SSEF at gemlab@ssef.ch to receive our newsletter or check our website www.ssef.ch, on which our on-site services are announced.

Important client 2009: Meister Juwelier AG, Bahnhofstrasse Zurich

Strongly committed to the SSEF for many years - with Adrian Meister as part of the SSEF foundation board since 1993 - the company decided, in 2009, to have the most important of their coloured stones certified by the Swiss Gemmological Institute SSEF. Thus, Meister Jeweller (Meister Juwelier AG) has become one of our important clients last year.

"By having our gemstones certified by the SSEF, we are able to offer our clients not only the beauty of, but also all the relevant information on the gemstones set in our jewellery, and we can see that our customers appreciate this very much" Adrian Meister, CEO of Meister Jeweller confirmed.

Meister Jeweller (www.meister-zurich.ch) is a family owned company with a tradition, going back to 1881, in prestigious jewellery, watches and silverware. Their main store is found on Zurich's famous Bahnhofstrasse.

CIBJO, LMHC

In 2009, SSEF was present at the CIBJO – The World Jewellery Confederation congress organized by the Turkish Jewellery Association in Istanbul and at the LMHC – Laboratory Manual Harmonization Committee meeting organized by the Gübelin Gem Laboratory in Lucerne.

CIBJO, May 3-5: The Turkish Prime Minister, Recep Tayyip Erdoğan opened the annual congress and presented his country as the historical link between Asia and Europe. The General Assembly adopted new statues and bylaws to modernise and simplify procedures.
Commissions launched their updated books (e.g. the precious metal book, the diamond book, the coloured stone book and the pearl book). The CIBJO Retailer's Guide to Trust and The CIBJO Retailer's Guide to Marketing complete the major trade documents that were launched and can be downloaded on the CIBJO website (www.cibjo.org).
Copies of presentations delivered during these sessions, as well as photographs of the congress, are available online on the congress website at http://congress2009.cibjo.org.

LMHC, April 23-25: The Laboratory Manual Harmonization Committee consisting of representatives from CISGEM (Italy), GAAJ (Japan), GIA (USA), GIT (Thailand), Gübelin Gem Lab (Switzerland) and SSEF Swiss Gemmological Institute (Switzerland) met last April in Lucerne, Switzerland. Due to the economic crisis, the members decided to meet only once in 2009. Work ongoing includes, but is not limited to, the qualification of a Padparadscha master set, the qualification of a ruby to pink sapphire master set, emerald filler quantification, andesine/labradorite; amber, jadeite nomenclature and so on. The definitions agreed are uploaded on LMHC members website in the form of information sheets. The very last venue of the LMHC meeting was in Vincenza, Italy in January 2010.

Eickhorst donation

For many years, the Swiss Gemmological Institute SSEF has closely collaborated with Eickhorts systems (www.eickhorst.com). Not only our lab but also our classrooms are equipped with their gemmological instruments and lighting systems.

The SSEF would like to thank Manfred Eickhorst, who has been so kind as to donate a Gemmolite Microscope for our Far East activities. We have been working with this microscope in Hong Kong and have been delighted with the functionality and quality of this gemmological tool.

We now have a full set of classic gemmological instruments stored in Hong Kong, which makes travelling and working on-site in the Far East much more convenient for us.

We would also like to take this opportunity to thank Joanne Chan from the HK Jade lab and Henry Cheng (Premier Jewellery in Kowloon) for the continuous support they provide during our on-site work in Hong Kong each year.

Bill Larson and Gabriel Mattice during the trip to the Elizabeth R mine in the Pala San Diego County.

Pala International donates a collection of rare gemstones to SSEF

In July 2009 one of our SSEF staff members visited Palagems International in Fallbrook, California. At one of many interesting discussions with the highly motivated team, including Bill Larson, Gabriel Mattice and Jason Stephenson, Palagem International's director, Bill Larson, came up with the idea of sponsoring the SSEF with a donation of some very rare gemstones, including rarities such as Painite, Johachidolite, Boleite, Herderite.

With this generous donation, Palagems International is strongly supporting the research and educational activities that are an integral part of our attempt to provide the highest standard of service to the Gem Trade.
SSEF is delighted with this donation and wishes to thank Bill Larson and his crew, especially Gabriel Mattice, for their generocity.

The change over:

1st of June 2009, Dr. Michael S. Krzemnicki took over as head of SSEF – the Swiss Gemmological Institute. He succeeded Prof. Dr. Henry A. Hänni, renowned worldwide as an eminent gemmologist and mineralogist, who retired from this position at the end of May 2009. Dr. Michael Krzemnicki, the former deputy director, is an internationally well-known expert in gemmology and mineralogy with many years of experience in SSEF where he has collaborated closely with Prof. Hänni.

EGS

3rd European Gemmological Symposium in Switzerland

The 3rd EGS conference was held 4-7 June 2009 in Berne, Switzerland, and was hosted by the Swiss Gemmological Society, the SSEF Swiss Gemmological Institute (Basel), and the Gübelin Gem Lab (Lucerne). Many interesting presentations were made to the 130 participants attending. The symposium opened with two keynote speakers: **Martin Rapaport** offered insights into the troubled diamond market, while **Gabi Tolkowsky** discussed diamonds from a different perspective, emphasizing their beauty.
In addition to the keynote speeches, several hot gemmological topics were presented by well-known European gemmologists. These included three talks by the Swiss Gemmological Institute SSEF. **Dr. Michael S. Krzemnicki** demonstrated the opportunities and limitations of LA-ICP-MS in gem testing. **Jean-Pierre Chalain** updated the audience on the detection of treated diamonds, discussing a new diagram illustrating the characteristic width (full width at half maximum) and position of the platelet peak of type Ia HPHT-treated diamonds. And **Prof. Dr. Henry Hänni** (SSEF) summarized the current status of cultured pearls, explaining the three basic distinctions: beaded or beadless, mantle-grown or gonad-grown, and saltwater or freshwater. As well as the talks there was a poster session organised, with five (!) posters by SSEF, dealing with the perspectives of LIBS in gemstone testing, the opportunities opened up by our new UV-Vis spectrometer, natural diffusion effects in Winza rubies and sapphires, colour-changing garnets from a new source in Kenya, and last but not least, the procedures for testing of lots of small diamonds at the SSEF (see publications section).

After the symposium, many participants joined an excursion to Switzerland's Grimsel region, where a visit to a protected crystal fissure, the walls of which are covered with well-formed colorless quartz crystals and pink fluorite, topped off the outing.

The third European Gemological Symposium was a great success and we hope that this initiative will be carried on in the same spirit at the next European symposium. Details will be communicated as soon as the venue and dates are fixed.

For more information about the European Gemmological Symposium 2009 and pictures, please see the website: http://www.gemmologie.ch

Sir Gabi Tolkowsky and Dr. Michael S. Krzemnicki at the EGS in Berne, June 2009. © SSEF

GIT Conference 2009

From 9 - 12 March 2009, the GIT (Gemmological Institute of Thailand) organised its second international conference in Bangkok. Again we were spoiled by their hospitality and enjoyed a splendid event, with many presentations by gemmologists from all over the world. The SSEF was present giving two lectures. One on cultured pearls (Prof. H.A. Hänni) and the other on advanced gemstone testing in the future (Dr. M.S. Krzemnicki).

The new IGC Executive Board; Hanco Zwaan, Jayshree Panjikar, George Bosshart, Emmanuel Fritsch, Tay Thye Sun, Gamini Zoysa, Michael S. Krzemnicki, John Saul, together with Mark Saul (standing).

IGC Conference, Arusha Dr. Krzemnicki appointed to IGC Executive Board

The International Gemmological Conference was held in Arusha, northern Tanzania, from 10-11 October, organised by John Saul and his family. Due to the economic crisis, only a small number of delegates and observers were able to attend the meeting and join the excursions. The event was therefore quite intimate, and we were warmly welcomed at the New Arusha Hotel by the organisers. Apart from scientific gemmological presentations, including one about pearl tomography and the age dating of pearls by Dr. M.S. Krzemnicki, there were a number of meetings to discuss the future of the IGC. It was a great honour for Dr. Michael S. Krzemnicki to be appointed IGC Executive Board member, together with new members Jayshree Panjikar (India) and Hanco Zwaan (Netherlands).

After a short discussion, Dr. M.S. Krzemnicki agreed to organise the next IGC Conference 2011 in Switzerland. The preliminary planning with a small organising committee has already started and we will inform the delegates and guest observers as soon as the schedule is fixed.

Sri Lanka field trip

At the end of May 2009, Dr. Michael S. Krzemnicki travelled to Sri Lanka to give a scientific gemmological course to a gemmological laboratory in Colombo. While he was in the country, he took the opportunity to visit a number of mining areas, kindly organised by Dr. Gamini Zoysa and the Sri Lankan Gem Authority.

They left Colombo very early the morning, and headed to Kandy, beautifully situated in the Central Highlands. Although the roads were busy, their driver was happy to amaze them with his skills through the traffic-packed roads. Finally they reached the Elahera region, where some small-scale mining operations are still going on. However local miners told them that only a small number of sapphires have been found recently.
The next day, they headed up to Ratnapura to visit the mining operations around this small town and its famous gemstone market. Business has been rather slow at the market recently with the economic crisis hitting this trade very hard, and Dr Krzemnicki and his group were warmly welcomed and within a few moments they were surrounded by gemstone dealers trying to sell all kinds of stones.
With a nice selection of rough and cut stones, they continued to Pelmadulla, to visit a highly artistic artisanal mining operation in the aluvial grounds (illam) below a rice field.
Delighted with many souvenirs and nice stones, they returned to the capital.

Buying gemstones in Ratnapura, Sri Lanka. © Krzemnicki, SSEF

Tanzania field trip

Just after the Hong Kong Show in September, Dr. Krzemnicki took the opportunity to visit ruby and spinel deposits in the bush in Tanzania. He was travelling with Walter Balmer, who is completing his PhD on ruby the deposits of East-Africa. They travelled from Dar-Es-Salaam to Morogoro and Matombo and then south to Mahenge. There, in particular, they were able to find and buy a large number of fine spinel and ruby specimens for their scientific research. Having started as Earth Scientists, they both found it extremely interesting to study the mineralisation areas in situ and to map small-and large scale structural features (folding, faulting and boudinage), linked to these ruby and spinel mineralisations.

Buying spinel and garnets in Kibuko, near Matombo (Morogoro district), Tanzania.© W. Balmer, 2009

After this they went north into the Umba area, where they were able to collect a large number of the fancy coloured sapphiresfor which this area is famous. They also collected some nice Umba garnets and Cr-tourmalines, some showing the Usambara colour effect (dark green in reflected light, red in transmitted light). After two weeks of adventurous travelling through the bush, aquiring many mosquito bites and covered with layers of lateritic dust, they finally arrived safely in Arusha just before the IGC Conference started. During the conference they then had another opportunity to visit the Tanzanite One mine and the Longido zoisite/ruby mine and to actually study the mineralisation within the shafts.

Close up: Ms. Chi Hun Yang.

Since 2008, Chi Hun Yang has been working in the administration department of the SSEF. After a bachelor in economics at the university of Basel (Switzerland), she joined the SSEF team and has, since then, largely been in charge of client contact and the preparation and writing of certificates.

Ms. Yang, originally from South Korea, has expanded our international team spirit. Her language skills have helped us to understand the complexity of Chinese and Korean wording.

With her interest in art and photography, which blends in very well with her daily work of receiving and managing the often outstanding and historic pieces of jewellery that come into the SSEF, she has become an important part of our administration team.

Visit us in 2010 for On-Site SSEF reports

In 2010 we will be exhibiting or/and offering our testing services at the following events:

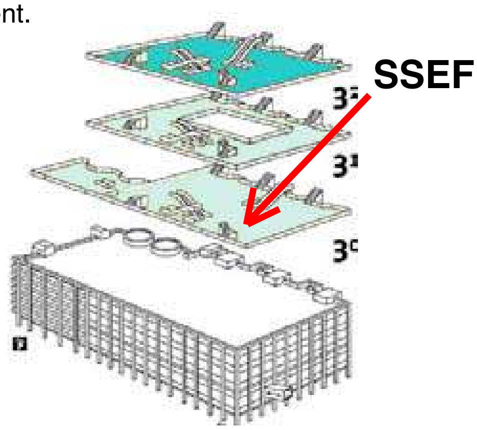
Bangkok	18 - 23 January
Paris	8 - 10 February
Munich (Inhorgenta)	19 - 21 Feb (no reports)
Hong Kong Fair	5 - 8 March
Basel World	18 - 25 March
Paris	26 - 30 April
Geneva Sales	9 - 12 May
Bangkok	24 - 29 May
Bangkok	23 - 28 August
Hong Kong Fair	14 - 20 September
Geneva Sales	14 - 16 November

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

Basel World 2010: 24h Express Service

During the BaselWorld (18 - 25 March 2010), the SSEF is once again offering our much appreciated Express Service: get a test report within **24 hours!**

Located in almost the same place as last year on the first floor in Hall 3 (Hall of Elements), you will find us without difficulty, as our booth is the first and most easily spotted in the corner with the other labs. The **booth 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 to call us in advance at the SSEF office (tel. +41 61 262 06 40) to fix an appointment.



Publications 2009

In 2009 we again published numerous articles in gemmological journals and trade magazines. For reprints, please contact SSEF (gemlab@ssef.ch)

Krzemnicki M.S., Friess S., Chalus P., Hajdas I., Hänni H.A. (2009) New developments in pearl analysis: X-ray micro tomography and radiocarbon age dating. *Journal of the Gemmological Association Hong Kong (in press)*

Krzemnicki M.S. (2009) SSEF first laboratory using X-ray micro tomography for pearl testing. *Jewellery News Asia, Dezember*

Krzemnicki M.S., Pettke T. (2009) LA-ICP - mass spectrometry in gemmology. *EGS Abstract Volume, Switzerland*

Krzemnicki M.S., Steinacher M., Herzog F. (2009) Portable UV-Vis spectrometer. *EGS Abstract Volume, Switzerland*

Krzemnicki M.S. (2009) Rote synthetische Spinelle wieder im Handel. *Gold'or (in German and French)*

Krzemnicki M.S. (2009) Abalone, Conch, und Melo: Exquisite Perlen von Meeresschnecken. *Gold'or (in German and French)*

Krzemnicki M.S. (2009) Mikro-Computertomographie an Perlen: Der Perlenstruktur auf der Spur. *Gold'or (in German and French)*

Krzemnicki M.S. (2009) Advanced Gemstone Testing: an Outlook into the Future. *Abstracts Volume of the GIT Conference, Bangkok.*

Chalain J.P. & Fisher D. (2009) The width of the platelets peak of greenish yellow diamonds of type Ia. *EGS Abstract Volume, Switzerland*

Chalain J.P. (2009) Diamant synthétique CVD: Nomenclature en bijouterie, fabrication et applications. *Gold d'Or (in French and German)*

Lefèvre P., Krzemnicki M., Herzog F. (2009) Colour zoning surrounding inclusions in a pair of bicolour Winza sapphires. *EGS Abstract Volume, Switzerland*

Parenzan C. & Krzemnicki, M.S. (2009) Artificial glass showing colour-change when exposed to light. *Gems & Gemology, 45, 1, 72-74.*

Parenzan C. & Krzemnicki, M.S. (2009) Colour change garnets from Chawia district in southern Kenya. *EGS Abstract Volume, Switzerland*

Phan L., ... (2009) small diamond testing. *EGS Abstract Volume, Switzerland*

Hänni H.A. & Krzemnicki M.S. (2009) Das neue Rubinvorkommen von Montepuez, Mosambik. *Z. Dt. Gemmol. Ges. 58/3-4, 127 - 130*

Hänni, H.A. (2009) New rubies from Montepuez, Mozambique. *Jewellery News Asia, September, 134*

Hänni, H.A. (2009) Beschädigungen an geschliffenen Edelsteinen. *Z.Dt.Gemmol.Ges. 58/ 3-4, 127-130.*

Hänni, H.A. (2009) Durability, damage and distress. *Gems & Jewellery, 18, 2, 3-8.*

Hänni, H.A. (2009) Damage to cut gemstones. *Jewelry World, November, Vol. 32, 100-102, and China Gems, Nr.4, 214.- 217, (in Chinese)*

Hänni, H.A. (2009) Damage to cut gemstones. *The NCJV Valuer, Vol. 27, Nr. 4, p 2-10.*

Hänni, H.A. (2009) Zur Flammenstruktur bei einigen porzellanartigen Perlen. *Z.Dt.Gemmol.Ges. 58/ 1-2, 47-52.*

Donations 2009

With the generous support of our donors the SSEF collection is growing every year. 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:

- Manfred Eickhorst, for a gemmolite microscope
- Mark H. Smith, for light green orthoclase (Pb containing)
- Paul Blöchliger, for Pb-filled ruby
- Stefan Hemmerle, for a rare flux-melt synthetic ruby and an opal doublet
- Charles Abouchar (Diastar SA), for a brown diamond (0,95 ct) and two bicolour sapphires slabs from Winza, Tanzania
- Ahmadjan Abduriyim (GAAJ), for rough red andesines from Tibet and rough light yellow andesines from inner Mongolia.
- Karim Guerchouche, for a number of quartz crytals from Mali
- Joseph Belmont (KV Gems, Bangkok), for a number of bright blue spinels from Vietnam
- Henry A. Hänni, for several stones, including a dark blue aquamarine from Binntal (Switzerland)
- Ronny Totah, for a number of natural pearls for tomography studies
- Wolf Bialoncyk, for a large number of andradites
- Andreas Puschnig from the Natural History Museum Basel, for three historic freshwater shells from Switzerland.

The SSEF Team wishes all friends and customers a successful year 2010 and would like to thank you for your continued support of the SSEF laboratory.