Facette MAGAZINE

INTERNATIONAL ISSUE NO.19, JANUARY 2012

FANCY SAPPHIRES / JADE / IGC 2011 CONFERENCE
NEW RESEARCH / NEW SSEF REPORTS / CUT GRADE OF DIAMONDS
NEW WEBSITES / SSEF IN ASIA / FAMOUS PEARLS

SSEF
SCHWEIZERISCHES GEMMOLOGISCHES INSTITUT
SWISS GEMMOLOGICAL INSTITUTE
INSTITUT SUISSE DE GEMMOLOGIE

Dear Reader

The editing and writing of our annual Facette reminds us not only that a busy year has passed, but much more, of what we have achieved in terms of services provided and research carried out in the last few months. Going back to past issues of the SSEF Facette shows well that besides our certification services, our main goal is to pursue research on gemstones and pearls. This is already indicated in our name: Swiss Foundation for the Research of Gemstones (meaning of SSEF in German). I am very proud to present you this issue of our Facette – the 19th since we started in 1992 – especially as it comes fully redesigned for even more reading pleasure. The Facette is once again rich with gemmological information relating to our current activities. It truly reflects our mission – the science of gemstone testing – as we continue to invest in new technology (Raman, tomography) and in new staff members to be even more flexible, provide new services and meet the future needs of the gem trade.

The year 2011 was very successful for the SSEF. It has shown to me personally the importance of being present internationally to offer our clients our services on-site. The trade is increasingly globalised with strong emerging economies in Asia as driving forces, and this is also true for gemmological laboratories. We have expanded our global presence to cater to these developments by offering more frequent on-site testing services, which we also offer 2012 in Bangkok, Hong Kong, and Paris. Our strategy of expansion comes hand-in-hand with a better connection to important gem trade hubs through smooth shuttle services, which we now offer for Antwerp, Bangkok, Hong Kong, London, New York, Paris and more are to follow in the coming year. Although economic turbulences with strong currency fluctuations have marked the last few months, especially for a Swiss company, we see that the high standard of SSEF certification is not only an international reference requested by the market, but also gives a premium when prestigious gemstones and pearls are sold.

From the outstanding items we certified in 2011, we have to highlight two cases: The first is an outstanding unheated ruby from Mogok, Burma of 48 ct, reportedly from a historical collection, and last but not least, the "Peregrina" pearl together with its necklace, which was recently sold at the Christie's sale of Elizabeth Taylor's jewellery at a record price for a pearl sold at auction. This shows that SSEF is an authority for gemstones and pearls testing, especially when it comes to items of high importance and value.

For 2012, we have many projects which are focussing on coloured stones, diamonds and pearls, and I am sure we will be able to present you again plenty of news and findings in the upcoming issue.

Finally, I would like to wish you much pleasure in reading this SSEF Facette and also a very successful and prosperous year 2012.

Dr. Michael S. Krzemnicki
Director SSEF

COVER PHOTO ▷

A woman miner showing us a rough spinel sample in Yen Bai mining area, Vietnam.

Photo © Luc Phan, SSEF

TABLE OF CONTENTS

IMPRINT
Annual publication by **Swiss Gemmological Institute SSEF** Falknerstrasse 9 CH-4001 Basel SWITZERLAND
tel. **+41 61 262 06 40**, fax. **+41 61 262 06 41**, e-mail: **admin@ssef.ch**, website: **www.ssef.ch**

Layout: Archibald Studio | All images ©SSEF unless otherwise stated

FANCY-COLOURED SAPPHIRES

classical gemstones with a rich colour spectrum

By **Dr. M.S. Krzemnicki, SSEF**

Intense red rubies and velvety blue sapphires are well known and much sought after in the world of gemstones and jewellery. Fancy-coloured sapphires, also part of the corundum family, come in a wide variety of beautiful colours but are not well known.

The colour range of corundum covers practically the whole spectrum from colourless to yellow, orange, pink, violet all the way to greenish, brown and black. A number of famous ruby and sapphire mines have also produced impressive coloured sapphires in the past or still do so today in regions of Burma, Madagascar, Sri Lanka and Australia.

COLOUR DIVERSITY THROUGH TRACE ELEMENTS AND COLOUR CENTRES

Corundum, in an ideal state, consists exclusively of aluminium oxide (Al_2O_3) and is absolutely colourless. But colourless corundum is rather rare in nature. Rather, we can find corundum with chemical impurities that influence the colour depending on the trace elements present. The red colour of a ruby is the result of integration of a small amount of chromium in the crystal lattice. With sapphire, it is iron with titanium that is responsible for the blue colour of the crystal. The process that leads to this is called substitution: individually charged atoms (ions) of transition elements (such as Cr, Fe, Ti) replace aluminium atoms within the crystal lattice. These substituting ions result in selective absorption of incoming white light, which means that the eye sees a colour. The intensity of the colour depends on the mix and the amount of trace elements present in the crystal.

The specific colour seen by the human eye depends on a num-

ber of factors. The cocktail of trace elements, their valency state (i.e. especially with iron, which can exist with a deficit of two or three electron positions, termed Fe^{2+} or Fe^{3+}), the presence of colour-inducing colour centres in the crystal lattice, all play an important role. The pleochroic nature of corundum may further support these different colour nuances.

△ Fancy sapphires from Mogok, Burma.

THE ORIGIN OF COLOUR AND FINDING THE RIGHT NOMENCLATURE

The padparadscha variety of corundum is a good example that highlights how difficult it can be to define the right wording for the colour of a gemstone. Padparadscha sapphire, as defined by LMHC, is a variety of corundum from any geographical origin whose colour is a subtle mixture of pinkish to orangey pink with pastel tones and low to medium saturations. A number of corundum varieties, such as padparadscha, but also ruby and pink sapphire, can be represented in a three-dimensional space of colours. In this case, the question arises of how these colours can be separated from each other. For example, where is the colour limit between a padparadscha and a pink sapphire or between a ruby and a pink sapphire? In the absence of clear international nomenclature, the main gemmological laboratories of the world have agreed to join efforts and develop and standardise these definitions. With this in mind, the Laboratory Manual Harmonisation Committee (LMHC) has developed a classification of colours for the corundum varieties padparadscha (see also **www.lmhc-gemology.org**).

The nomenclature of corundum is closely linked to the history of these gemstones. Although the term 'sapphire' is reserved for the blue variety of corundum, it has become common practice in the trade to use sapphire as a prefix for practically all other colour varieties of corundum: such as yellow sapphire, pink sapphire, violet sapphire or just fancy-coloured sapphire. From the point of view of nomenclature, this is not concise, as usually different colour varieties should have different names, but we have to accept this as a historically justified and common trade practice for coloured sapphires.

FANCY SAPPHIRES IN THE LABORATORY AND TRADE

With the increased demand for colourful jewellery, especially in the Asian region, new and previously lesser-known colour varieties of corundum are more and more sought after. In the last few months, we have analysed and certified a whole range of exceptional untreated fancy-coloured sapphires up to 300 ct in weight.

Among the most sought-after colour varieties at present are certainly pink sapphires and yellow sapphires. The main reason for the trend in yellow lies in India, where the demand for these sapphires has grown strongly because of the transcendental connotation of this colour variety. Because fancy coloured sapphires often have subtle variations in colour, they are frequently not sorted based on their colour tone but are used in attractive and colourful multicolour pieces of jewellery. With their hardness, their high brilliance and frequently excellent clarity, we are optimistic that the trend of fancy-coloured sapphires is likely to continue to grow in future. ✶

△ Padparadscha sapphire.

▽ Green sapphire.

JADE, STONE OF "GODS"
Terms, Concepts & Certification

By **Dr. M.S. Krzemnicki, SSEF**

Jade, for thousands of years a mythical stone appreciated in the Far East and in the high cultures of Native Americans, is rising high at present as it is sought after at auctions in Hong Kong and elsewhere. However, the term "jade" is quite vaguely defined. Different concepts try to describe the term based on historical, geographical, mineralogical and gemmological references. In the following, we will focus on mineralogical and gemmological aspects. But we have to understand the etymology of the terms used in the context of jade in order to fully understand its ambiguous position and the discussions about its nomenclature in the trade nowadays.

THE HISTORY OF TERMS

Historically, the term jade derives from the Spanish "*piedra de ijada*" or stone of loins (deriving from the Latin word *ilia* for intestines and abdomen), based on the belief of native Indians in Mesoamerican cultures that ailments of the loins and kidneys (nephritis, an inflammation of the kidneys) could be cured with these stones (Nicolas Monardes 1565). But even in prehistoric European cultures, "jade" tools and ritual objects were highly sought after and traded throughout Europe. Well-known are jadeite-jade axes originating from small neolithic mining sites close to Monte Viso and Monte Beigua in Northern Italy (Pétrequin et al. 2006).

In China, the term "*Yù*" 玉 - literally "*the most beautiful stone*" – was used to describe jade, but also other hard material such as chalcedony and marble that was carved into tools and ceremonial objects since Neolithic times. Jade has always been a material to represent status and was considered the "imperial gem" from the earliest Chinese dynasties to the present. Due to its durability, the possibility to carve it in delicate designs and through its mere beauty, jade has become connoted with divine qualities such as protection, longevity, health and luck in Asian cultures up to the present day (Jones 2004).

CONCEPTS

Based on historic references, the Chinese understanding of the term jade is not equal to the Western understanding of the term, which has been defined (CIBJO) to consist either of jadeite (mineral of the pyroxene group) or nephrite, an intermediate member of the solid solution series between actinolite and tremolite (amphiboles). In the Chinese understanding, the term jade was historically separated into the terms Ying Yù (hard jade), mostly corresponding to pyroxenitic jade (also known as "*Fei Cui*" □□) and Ruan Yù (soft jade), which apart from nephrite also includes minerals of the serpentine group (Xiù Yù jade, Henan) (Krzemnicki 2008) and even marbles (Lantian jade, Yuchuan quarry in the Shaanxi Province). Despite all the differences, the common understanding is that jade is a polycristalline aggregate made of fine and very densely interwoven mineral grains or fibres, which give it its outstanding workable properties.

△ Jadeite jade necklace from Burma.

As we see from the above, the term jade is rather historically defined and does not have a concise mineralogical definition. Its meaning has changed over time and is still nowadays understood differently in different cultures.
The scientific approach to describing "jade"-like materials is based on mineralogical identification. In many cases this is quite straightforward, based on physical properties (e.g. SG, RI), chemical composition (e.g. ED-XRF), and structure (e.g. FTIR and Raman spectra). However, there are two aspects,

which have to be considered.

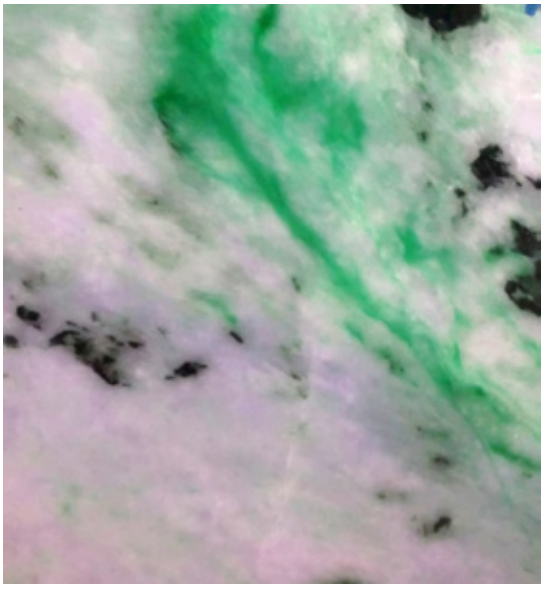
1. These stones are in fact metamorphic rocks, and in many cases are mineralogically not fully homogeneous. Therefore, the analysed properties in many cases reflect a summarised composition rather than a grain-by-grain representation of the material. This is still valid in most cases, as long as we consider jade testing as the identification of a rock and not of a mineral species of defined composition. We must thus be aware that the indicated name reflects the main constituent of a sometimes more complex rock composition.

2. The second important aspect is that the minerals defined as belonging to jade (mostly jadeite and nephrite) are in fact members of large mineral groups (i.e. pyroxenes and amphiboles) with extensive chemical substitutions. As the definition of jade is not purely scientific and mineralogical, it is a matter of definition what compositional range is still accepted as jade or not. This is especially important if we talk about jadeite-jade and the acceptable amount of Fe and Mg concentration (e.g. omphacite compound), in order for it to still be considered jadeite-jade.

Based on the above, we can see that the identification of a stone as jade is not enough, as its composition remains too ambiguous. It is only by adding the mineralogical identity, i.e. nephrite-jade or jadeite-jade, that we can be specific enough to truly understand the nature of the material.

MINERALOGICAL DEFINITIONS

Nephrite is actually not a mineral, but describes the massive and microcrystalline form of intermediate members of the tremolite-actinolite series, with a general formula $Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$. Nephrite belongs to the amphibole group and is a very typical formation of regional metamorphism. Nephrite consisting mainly of Mg-rich tremolite is white. Such white nephrite from Xin Jiang (Hetian Prefecture) is highly adorned in China as so-called "mutton-fat" jade. The more iron (actinolite compound) substitutes for magnesium, the more green the colour of nephrite. Nephrite often contains further minerals in minor quantities such as chromite, magnetite, and talc. Fe-oxides and hydroxides along grain boundaries and microfractures lead to yellowish to brown nephrite.
Nephrite is found in many places worldwide, with important and classic deposits in China such as the Yurungkash river ("white jade" river) in the Hetian Prefecture of the Xinjiang-Uygur Autonomous Region, and the Yuku peak in the Quinghai Province (Qinghai Jade) for green nephrite. Other historically important sources of nephrite are found around the Taramakau and Arahura rivers in Westland, southern New Zealand. The material, called "Pounamu" was crafted and valued by native Maoris due to its strength and transcendental qualities. Even in Switzerland, near the village of Poschiavo, close to the Italian border, there is a quarry with patchy and slightly greenish nephrite. This material was worked into objects and tools for a certain time until the mid 20th century.



△ Detail of a polished jadeite jade sample.

Jadeite:

Jadeite is a member of the pyroxene group with the ideal formula $NaAlSi_2O_6$. Similar to the amphiboles, extensive chemical substitutions are possible, mostly involving chromium, iron, magnesium and calcium, and resulting in various pyroxene minerals. Pure jadeite is colourless, or mostly white when present as a microcrystalline aggregate. Minor amounts of chromium result in a vivid green colour of jadeite, also poetically described as "Imperial jade" in the Western trade. Interestingly, however, the colour becomes very dark green to even black when chromium dominates the composition (kosmochlor). Iron leads to a rather dull green colour becoming more greyish black with increasing concentration (omphacite to augite compound). Manganese traces result in a subtle to distinct violet colour, also known as "lavender jade". Similar to nephrite, jadeite rocks may additionally be coloured by small mineral inclusions or Fe-oxides and hydroxides accumulated along grain boundaries and (micro-) fractures. Jadeite is found only in a rather limited number of deposits in economically important quantities and qualities. The most important sources are found in Upper Burma (Myanmar) near Hpakan (Hughes 1999) and historically important sites near Montagua region in Guatemala (Taube et al. 2004).

△ Untreated jadeite jade ring.

Mineralogically speaking, jadeite $NaAlSi_2O_6$ forms a so-called solid solution series (at least partially) with other pyroxenes, mainly kosmochlor $NaCrSi_2O_6$, aegirine $NaFe^{3+}Si_2O_6$, diopside $CaMgSi_2O_6$, augite $(Ca,Na)(Mg,Fe^{2+},Al)Si_2O_6$, and omphacite, an intermediate variety between augite, aegirine, and jadeite. As in nature, pure end-members of the above minerals exist only rarely, the definition of the mineral species includes a certain (defined in mineralogical literature; see e.g. Deer Howie & Zussman 1992) amount of mixed chemical compositions. This is very similar to the garnet group and the tourmalines, just to name a few.

Although physical properties between the above-mentioned pyroxene minerals vary considerably, a definitive identification of whether the stone belongs to jadeite or to one of the other pyroxene solid solution members is only possible by quantitative chemical analysis. This may lead to the conclusion that even a stone with visual appearance quite similar to those of a jadeite-jade, is in fact not a jadeite.

GEMMOLOGICAL DENOMINATIONS

Nowadays, it is common practice in the trade to specify whether a jade is a nephrite-jade or a jadeite-jade. In Asia, the term "*Fei-cui* □□" is also used to describe jadeite-jade. Promoted by the creation of an ISO standard for Fei Cui testing (HOKLAS ISO 17025; August 2006), this historic term is gaining more importance in the Asian market. As a member of the Technical Board of the Fei Cui Testing Methods and Laboratory Management System Development Project (Hong Kong), the author is also involved in these issues. It is however important to understand that creating a "new" gemmological term is also challenging. For the Japanese, the term Fei Cui is synonymous to jadeite-jade; whereas in the Chinese market, omphacite and kosmochlor-rich members of the pyroxene group are often also included in the term Fei Cui.

The SSEF regularly certifies "jade" for the trade. Being a gemmological laboratory with a scientific approach, we strictly use mineralogical and chemical parameters to identify jade, either as nephrite-jade or jadeite-jade (Hänni 2007) and to disclose any treatments applied on these stones. Apart from classical gemmological methods, meticulous chemical (ED-XRF) and structural (FTIR, Raman) analyses are fundamental to our testing approach. Although quality grading is an issue in parts of the trade, there are many factors that contribute to the beauty and value of jade of finest quality, which make the application of any such "grading" system a very difficult task. That is why we do not grade the quality of jade, just as we do not grade rubies, sapphires or other coloured stones and natural pearls. However, it is our policy to add an appendix letter for exceptional items, describing in detail the features which contribute to the beauty and rarity of such a gem, thus adding a premium to an outstanding jade. ✶

▽ A selection of nephrite samples. Photo: H.A. Hänni.

REFERENCES

Deer W. A., Howie R.A., Zussman J. (1992) An introduction to the rock forming minerals. *Longman Scientific & Technical, 696 pages*

Jones M. (2004) An exploration of jade. *Senior Honor Theses, Paper 85* Eastern Michigan University. http://commons.emich.edu/honors/85

Hänni H.A. (2007) A European gemmologist's thoughts on jadeite-jade. *Journal of the Gemmol. Assoc. of Hong Kong. (with short summary in SSEF Facette 15, 2007)*

Hughes R. (1999) Burma's Jade mines: an annotated occidental history. *Journal of the Geoliterary Society*, Vol. 14, No. 1. http://www.ruby-sapphire.com/burma-jade-mines

Krzemnicki M.S. (2008) Serpentinite artifact resembling Libyan desert glass. *Gems & Gemology, Vol. 44, No. 2, 181-182*

Monardes N. (1565) Historia medicinal de las cosas que se traen de nuestras Indias Occidentales. *English translation by J. Frampton (1577), ISBN 9022102513*

Pétrequin P., Errera M., Pétrequin A-M., Allard P. (2006) The neolithic quarries of Mont Viso, Piedmont, Italy: Initial radiocarbon dates. *European Journal of Archaeology, Vol. 9, No. 1, 7-30*

Taube K.A., Sisson V.B., Seitz R., Harlow G.E. (2004) The sourcing of Mesoamerican jade. *In: Olmec art at Dumbarton Oaks, (ed.) Taube K.A., pp. 203-220*

△ Selection of rough and polished jadeite samples. Photo: H.A. Hänni.

COLOUR-CHANGING BASTNÄSITE FROM PAKISTAN

The following contribution on the relatively unknown mineral bastnäsite is a summary of research that was presented during the poster session of the 2011 International Gemmological Conference (IGC), held in July 2011 in Interlaken, Switzerland.

△ **Figure 1**: Colour-change from yellowish-green (daylight, left) to brownish-red (incandescent light, right) of a bastnäsite (8.82ct) from Zagi Mountain,Pakistan.

Bastnäsite crystallises in the hexagonal crystal system, the mineral is quite soft (Mohs hardness 4 – 4.5) and it tends to cleave perfectly along the rhombohedron faces. The two latter facts do not favour bastnäsite in considering it a gemstone – but it is beautiful with a high luster. Its RI is rather high (RI_o=1.721 and RI_e>1.79) and it shows prominent doubling if viewed perpendicularly to the c-axis.

Bastnäsite is a fluor-carbonate of rare earth elements (REE), with as REE mostly cerium (Ce) and lanthanum (La), but other light REE may be found in traces as well.

It is well known that rare earth elements, very much like the transition elements, can play the role of allochromatic and idiochromatic chromophores for minerals (Nassau, 2001). As we had access to a sample of bastnäsite that even showed a colour-change effect (see Fig. 1), we were motivated to do some research in order to gain more insight into the colouring mechanism caused by these elements. Colour-changing bastnäsite is not new and was already described by Massi (2007). REE as the reason for colour-change behaviour has been described even earlier by Schmetzer K. et al. (1980) and by Bernstein L.R. (1982). This present research project included the following work:

- Get some more samples of colour-changing bastnäsite: Prof. Dr. H. Hänni and G. Bosshart each provided a sample and we included a REE-doped glass showing the same colour-change as the minerals for comparison. Each bastnäsite showed a slightly different colour and colour-change behaviour.
- Characterise the four samples chemically as well as possible: LA-ICP-MS measurements were done at the University of Bern.
- Measure the UV-Vis spectra with a good resolution (1nm) and deduce from these spectra the CIELAB- colour coordinates to quantify the colour and the colour-change.
- Try to attribute the different peaks visible in the UV-spectrum to the atomic transition of the rare earth elements found in the chemical analysis.

It is clear that details of this work are beyond the scope of this article, so we present here just the main conclusions:

- The colour change behaviour of all the probes is due to a relatively high concentration of neodymium (average ~12wt% Nd_2O_3). The important absorption band in the UV-Vis spectrum at ~580 nm, responsible for the colour change effect, can be attributed to this element.
- The element praseodymium is present at a low concentration (average ~3wt% Pr_2O_3); its influence is in the region 400 – 500 nm, resulting in higher absorption in this

region. Neodymium has some absorption bands there as well and thus a clear distinction between these two is not easily possible.

- Lanthanum and cerium do not play a major role in the colouration of bastnäsites – the glass sample, containing La and Ce in concentrations 100-times lower than the minerals, shows a similar colour and colour-change effect. The behaviour of the glass and the bastnäsites can be compared, because matrix or coordination effects play a minor role for the well shielded trivalent REE-ions.
- The difference in colour-change behaviour of all the samples has been quantified by colorimetric methods, making use of the CIELab-colour-space. Its origin can be traced to minute differences in the absorption behaviour – a mirror of the slightly different chemical composition of the samples.

Acknowledgments and references can be found in the IGC poster than can be downloaded from our website, in the news section. ✶ **Dr. F. Herzog.**

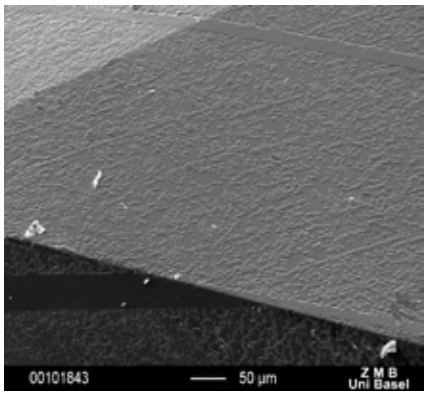
CORRODED RUBY

From time to time, the Swiss Gemmological Institute SSEF receives a gemstone with an apparent damage. Commonly, the question from the client is: "what happened to the stone and when did it happen?". As these queries are often linked to financial claims or even a possible court case, the damaged object has to be analysed with great care and with sophisticated instrumentation. To cope with this demand, the SSEF offers written damage analysis reports as a special service for our customers and has accumulated a great number of case studies in the last few years.

△ **Figure 1**: Studied batch of rubies with corroded surfaces.

Beginning of this year, the SSEF received a batch of 48 small rubies (figure 1) with etched surfaces. The rubies, originally set into the mounting of a luxury watch, showed this damage only after galvanisation during the watch making process. To better understand the cause for this damage, two rubies from the batch were selected and analysed at high magnification with a scanning electron microscope (SEM) at the Centre for Microscopy, University of Basel, Switzerland.

Interestingly, we could observe that the etching of the surface during this chemical attack was not equal on all surface planes, but mostly controlled by crystallographic orientation. This became especially evident with twinning lamellae, which showed an etching degree opposite to the rest of the facet surface (see figure 2).



△ **Figure 2**: SEM micrograph showing the etching on facets and nearly unaffected twinning lamellae.

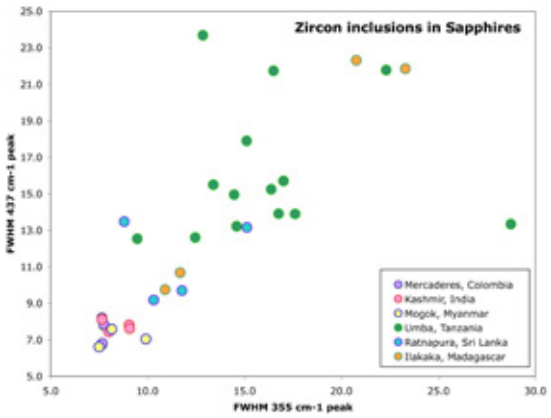
Based on the information of the client, the observed surface patterns, and literature about corrosion of corundum, we assume that a strong acid such as phosphoric acid was responsible for corroding the surface of the rubies. The acid was presumably used to clean the metal mounting prior to galvanisation (Van Ooij & Vijayan, US Patent 6'200'636 B1, March 2001).

A more detailed article about these corroded rubies is to be published in the upcoming issue of the Gemmological Journal of the Gemmological Association of Hong Kong in 2012. ✶ **Dr. M.S. Krzemnicki.**

ZIRCON IN CORUNDUM

Since many years, the SSEF has been collaborating with universities in Switzerland and abroad and supports research projects in gemmology and mineralogical science. In 2011, Ms Tina Block investigated zircon and apatite inclusions in sapphires from various gem deposits for her Master's Thesis at the University of Jena (Germany).

This project was carried out under supervision of Dr. Michael S. Krzemnicki (SSEF) and Prof. Dr. Juraj Majzlan (Mineralogical Department, Institute of Geosciences of the University Jena, Germany). During her stay at the SSEF she analysed a large number of specimens from our reference collections using Raman microspectrometry and established criteria to separate these inclusions from different geological settings on the basis of their Raman spectra. We congratulate Ms Block for having completed her Master's thesis succesfully. ✶



△ Raman data of zircons inclusions in sapphires from different gem deposits (data from T. Block).

LEAD-GLASS FILLED RUBIES AT SSEF

Recent press releases have shown that lead-glass filled rubies are still an issue in the trade, although the treatment was already described a few years ago and can, in fact, be quite easily detected by an experienced gemmologist.

In the beginning, mostly low-quality rubies from Andilamena (Madagascar) were used as starting material. The recent supply of larger quantities of fractured rubies from northern Mozambique that require treatment has expanded the quantity of lead-glass filled rubies on the market considerably.

Since the very start, the SSEF has taken measures to protect the trade against incorrect disclosure of these stones. Due to our position at the high end of the market, we only rarely see this material in the SSEF laboratory. However, we are very much aware that it may cause major damage to the confidence of gemstone consumers in general.

Any such stone tested at SSEF will be certified on a SSEF Test Report and never on a SSEF Gemstone report. Further, for a full disclosure of the treatment according to LMHC harmonized wording, we add a special comment, which is: "This treatment usually applies to low quality rubies".

So far, we have only encountered material that was cut from a fractured single-crystal ruby that was filled with lead glass. In such a case we identify these stones as treated rubies. In the case of artificially bonded materials that contain ruby fragments, we would call this a manufactured product, in accordance with LMHC nomenclature.

In having applied this wording and disclosure policy for many years now, we are certain that this is protecting consumers in such cases now and in future. ✶

▽ Ring with lead-glass filled ruby.

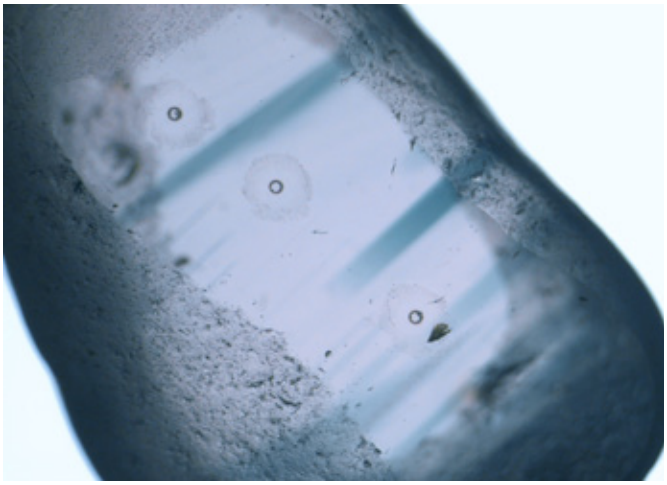
LA-ICP-MS RESEARCH ON SAPPHIRE

As part of an ongoing larger research project to chemically characterise gemstones, the SSEF set up a Master thesis project with the following title: *Chemical characterisation of gem-quality sapphires from metamorphic and basaltic host rocks: LA-ICP-MS study*.

The samples are from: Kashmir, Myanmar (former Burma), Sri Lanka, Madagascar, Thailand, Cambodia and Montana (USA). This project is in collaboration with the Department of Mineralogy of the University Basel and the Institute of Geological Sciences, University of Bern. Under the supervision of Dr. Thomas Pettke (University of Bern), our Master student Piotr Halicki has analysed a large number of sapphires using LA-ICP-MS. Preliminary results show that an easy separation between sapphires from different mining sites, based on their trace element composition, is possible only with major restrictions. Many factors, including instrumental parameters, have to be well understood and controlled to gain reliable data.

For 2012, we plan to publish the results when the Master thesis of Piotr Halicki will have been finalized and accepted. ✶

▽ Sapphire sample on which three LA-ICP-MS laser pits are visible.



ROSTELLITE, NEW ORNAMENTAL MATERIAL

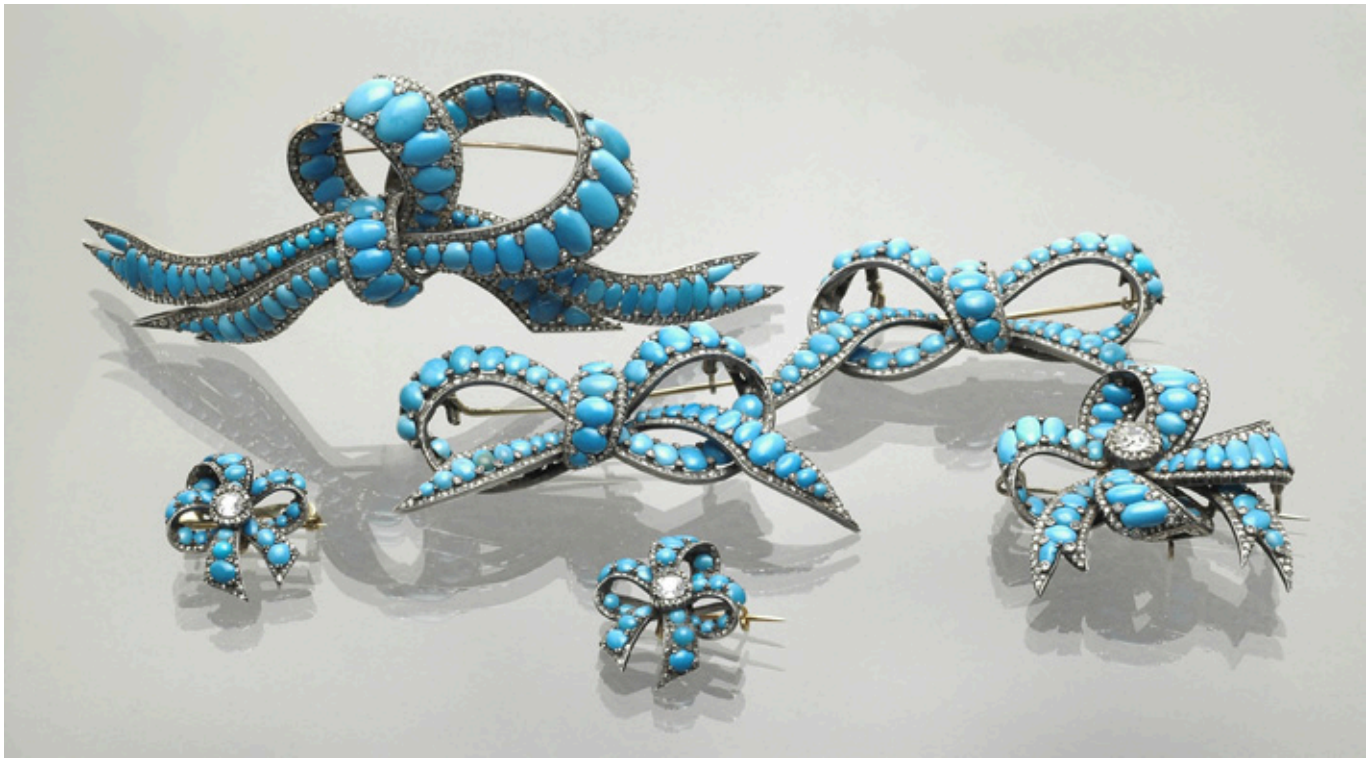
In July 2011, Stephen Webb from New Zealand donated a number of specimens of "rostellite" to the SSEF. He had presented this as a new gem material at the International Gemmological Conference IGC in Interlaken (Webb et al. 2011; IGC Conference proceedings; **www.igc2011.org**).

Rostellite is an ornamental material derived from the unusually dense fossilized upper jawbone of prehistoric beaked whales. The name derives from the Latin term rostellum being the diminutive of the Latin word rostrum beak, which is characteristic for this animal species. The material is cream-coloured and shows an attractive mottled texture with green and brown patches. It consists of phosphatised and glauconised bone (Bianucci et al. 2007) and is somehow similar to odontolite (fossilized dentine). As this material is chemically similar to odontolite (see below), we performed heat treatment experiments and observed a similar change into a bluish grey colour (figure 1).

We are convinced that rostellite could be an interesting new addition to the gem market, especially for small-scale initiatives to develop local communities, as this material has been recovered during commercial and research fishing operations from the North Sea, North Atlantic, the coasts of Florida, California, the Clarion-Clipperton fracture zone of the Pacific, Peruvian coast, south of Tasmania, Japan, South Africa (Bianucci et al. 2007, 2008) and New Zealand. It is also attractive because it makes a gem material available that comes from marine mammals but that poses no threat to living whales. ✶

△ **Figure 1**: Rostellite (fossilized jawbone of whales) from New Zealand, including two cabochons cut from the material. The greyish-blue sample was subjected to heat treatment (620°C for 6 hours).

ODONTOLITE & HEAT TREATMENT OF APATITE



△ **Figure 1**: Set of historic brooches (from Thomas Faerber collection), set with odontolite (fossilized dentine), mixed with a few turquoise and glass cabochons. Photo: Luc Phan, SSEF.

Recently, the Swiss Gemmological Institute received a set of six historic brooches mounted with light blue cabochons, which seemed to be turquoise.

Visual examination quickly revealed that many of these cabochons were unlikely to be turquoise. Based on detailed microscopic observations and Raman analyses, we were able to identify the cabochons mostly as odontolite, a historical substitute of turquoise, also known as "ivory turquoise", "bone turquoise" or "French turquoise". The odontolite specimens all showed a microgranular surface with a dense pattern of micropores and weak banding. In some cases, we even observed a distinct pattern of curved intersection bands, which is characteristic for ivory. Furthermore, within these brooches, we found a few turquoise cabochons and a small number of glass imitations with included air bubbles.

Odontolite, nowadays only occasionally encountered in historic items, is fossilised dentine (mastodon ivory). It is found in sedimentary sequences of Miocene age (13-16 mio.) in the Gers district between the Aquitaine and the Languedoc region of southwestern France. Since medieval times, the local Cistercian monks knew how to transform the fossilised greyish dentine by a heating process, turning these into appealing light blue "stones" (De la Brosse 1626, Reamur 1715, Fischer 1819). It became quite popular in the beginning to mid 19th century, when this fossilised dentine was commercially "mined" in southwestern France and when these brooches were crafted.

Mineralogically, odontolite consists mainly of fluorapatite. Reiche et al. (2002) showed that the oxidation of manganese (Mn^{2+} into Mn^{5+}) traces within fluorapatite during a heating process results in a turquoise-blue colour.

Interestingly, the same Mn-oxidation process is also used for large quantities of apatite crystals, which after heating show attractive blue colours, similar to those of Paraiba tourmalines.

The detailed results of this study on these historic brooches was published in the last issue of *Gems&Gemology* Vol. 47, No. 4. ✶ **Dr. M.S. Krzemnicki.**

◁ **Figure 2**: Characteristic curved intersection bands on odontolite (20x mag.)
Photo: M.S. Krzemnicki, SSEF.

THE BLUE OF ODONTOLITES VS. THE BLUE OF APATITES

The blue apatites of "Paraiba"-like colour have been investigated even before the true Paraiba-tourmalines were found in the 1990s. The first hint is already given in 1963 by Johnson et. al [1963] with the following abstract:

"The optical absorption and emission spectra of natural blue apatite are similar enough to spectra of synthetic compounds containing MnO_4^{3-} to conclude that the blue color of natural apatite results from the presence of this ion."

More detailed work on the coloration of apatites of the form $A_{10}[(B_{1-x}Mn_x)O_4]_6F_2$, where A={Ca, Sr, Ba} and B= {P,V}, were done by Dardenne et. al [1999]. They showed that for a given A-cation the colour changes from blue to green with an increase of Mn(V). These authors used synthetic apatites in their study, which were obviously subject to heat during their formation.

Further work in this field was done by Hughes et. al. [2004] where Mn-bearing fluorapatite from Austria was analysed. Again it was found that the Mn(V) may replace the P(V) in the phosphate radical with a spectrum dominating strong absorption band at ~640nm, thus leaving the mineral to appear blue. From this article it seems that the apatite was naturally blue (pale) and that no heating was involved to turn it blue.

Therefore, the coloration of the odontolite and the blue apatite both rely on the same phenomenon. Mn(V) is found in tetrahedral position, replacing the P-ion in the PO_4^{3-}radical within the structure of the apatite, the main constituent of odontolite.

From a gemmological point of view it is clear that more research is needed to investigate the role of heating in the colouration of "Paraiba"-blue apatites. ✶ **Dr. F. Herzog.**

△ Two faceted blue apatites. Photo: Franz Herzog, SSEF.

REFERENCES

Johnson P.D., Prener J.S., Kingsley J.D. (1963):
"Apatite: Origin of Blue Color",
Science, 20 September 1963, Vol. 141, no. 3586, 1179-1180

Dardenne K., Vivien D., Huguenin D. (1999): "Color of Mn(V)-Substituted Apatites $A_{10}[(B,Mn)O_4]_6F_2$, A=Ba, Sr, Ca; B=P,V",
Journal of Solid State Chemistry 146, 464-472

Hughes J.M., Ertl A., Bernhard H.-J., Rossman G., Rakovan J. (2004):
"Mn-rich fluorapatite from Austria: Crystal structure, chemical analysis, and spectroscopic investigations",
American Mineralogist, Volume 89, 629-632

NEW GEMEXPLORER WEBSITE

SSEF expands its interactive guide of the world's gemstone mining areas.

Following the launch of GemExplorer as an iPhone application in early 2011, we have now made this content and more available on a new website. The website **www.gemexplorer.org** lets users navigate the world's major sources of coloured gemstones, diamonds and pearls. You can view different mining regions with the help of satellite imagery, pictures of gemstones and read further information about these gemstones and their origins.

The aim of this website is to share knowledge about the location of different gem producing areas around the world. Following the success of the GemExplorer iPhone application we chose to expand this resource by now being able to view mining areas from the sky. This website can be accessed by anyone and we welcome any form of contribution and collaboration in enlarging the database, information and pictures on these gemstones and mining areas. ✶

Visit us at
www.gemexplorer.org.

TOKKI CULTURED PEARLS: SSEF SOLVES PROBLEM OF PEARL TESTING!

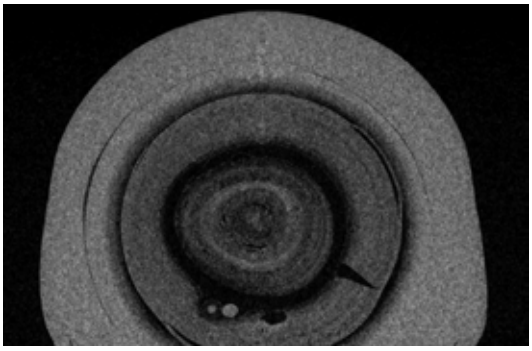
Beaded cultured pearls (e.g. from Pinctada maxima or Pinctada margaritifera) quite often show imperfections in shape and surface condition. The presence or absence of imperfections is likely coupled, at least partially, with the grafting procedures (Hänni 2007).

The nature of these imperfections varies in a wide range. Quite common are roundish bumps and bulges, which are in fact small blisters or small additional pearls formed as a by-product on a beaded cultured pearl (Figure 1). Traditionally, these additional cultured pearls are called "tokki" pearls (Japanese). These additional cultured pearls may be still attached to the beaded cultured pearl, sitting as an extension on the main pearl. They may also, however, fall apart when the cultured pearls are harvested, or even develop without ever being attached to the beaded cultured pearl (Krzemnicki et al. 2010).

Tokki cultured pearls are quite commonly found during the pearl harvest. They are often found in sizes of 1 – 5 mm, with

△ **Figure 1**: Tokki cultured pearls from Pinctada maxima (silver-lipped pearl oyster) from Australia and Pinctada margaritifera (black-lipped pearl oyster) from Tahiti.

△ **Figure 2**: Cross-section through a beaded cultured pearl with two additional cultured pearls ("tokki"). Photo © H.A. Hänni, SSEF



△ **Figure 3**: X-ray microtomographical section (CT scan) of a Tokki cultured pearl, showing characteristic organic rich and "loose" internal growth structures with additional white calcium carbonate spots.

larger sizes being less frequent. They often show a button-shape, commonly with a more or less flat non-nacreous base, showing a circular structure of nacreous layers where the "tokki" was attached to the larger cultured pearl before breaking off.

Radiography pictures show various structures within these tokki pearls. Some show irregular to roundish central cavity structures, similar to those commonly found in non-beaded cultured pearls (Scarratt et al., 2000, Hänni, 2006, Sturman, 2009). However, most are characterised by a dark centre with distinct circular structures. Thus, their internal structure may resemble those of a natural pearl. Figure 2 shows a cross section of a pair of such additional cultured pearls (tokki). These tokki pearls show one (left) or two (right) small white central spots of calcium carbonate (Krzemnicki et al. 2010, Krzemnicki 2011), surrounded by a rather loose structure of organic rich dark grey growth rings dominated by conchyn. Finally, they get covered by a nacreous layer. The reason for the presence of these white spots (see also Figure 3) is currently not completely understood. As the perfectly accumulated circular growth structures suggest, these additional cultured pearls formed in a first stage, quite undisturbed by the nacre deposition on the neighbouring large bead. They were "attached" to the larger beaded cultured pearl only at a late stage of nacre deposition, when the two pearl sacs merged.

Based on the observed structures we assume that small additional pearl sacs may develop +/- simultaneously and close-by the main pearl sac. The reason for such additional pearl sacs may be spontaneous tissue transformation (injuries or pearl sac bulging) or due to tiny tissue fragments resulting from an imperfect cutting of the epithelium tissue (Japanese "saibo") prior to implementation. Usually at a late stage of pearl cultivation, the large pearl sac entraps the small pearl sac(s), thus attaching the "tokki" pearl(s) on the large cultured pearl.

Understanding the nature of these Tokki pearls has proven very important for our pearl testing routine, as such pearls may be mistaken for natural pearls and thus threaten the natural pearl trade, if they are not correctly identified. This pearl project, which was presented at the International Gemmological Conference in July 2011, shows our commitment to protecting the trade of natural pearls from any new threat, and to further establish SSEF as the leading pearl testing laboratory worldwide.

✶ **Dr. M.S. Krzemnicki.**

REFERENCES

Hänni H.A. (2006) A short review of the use of 'keshi' as a term to describe pearls. *Journal of Gemmology, Vol. 30, No. 1–2, pp. 52–58*

Hänni H.A. (2007) A description of pearl farming with Pinctada maxima in South East Asia. *Journal of Gemmology, Vol. 30, No. 7–8, pp. 357–365*

Scarratt K., Moses T.M., Akamatsu S. (2000) Characteristics of nuclei in Chinese freshwater cultured pearls. *Gems & Gemology, Vol. 36, No. 2, pp. 98–109*

Sturman N. (2009) The microradiographic structures of nonbead cultured pearls. *GIA Thailand, Bangkok, August 20, www.giathai.net/pdf/The_Microradiographic_structures_in_NBCP.pdf*

Krzemnicki M.S., 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, Vol. 46, No. 2, pp. 128-134*

Krzemnicki M.S. (2011) 'Keshi' cultured pearls are entering the natural pearl trade. *SSEF Facette, No. 18, pp. 8–9 and electronic SSEF Trade Alert May 2010, see www.ssef.ch*

PEARL TREASURES: LA PEREGRINA & MELOS

Being a leading authority for natural pearl certification, the SSEF has recently received some of the most outstanding and famous pearls for testing. Such pearls are often accompanied with historical documents, which describe the source and dynasties from which these "royal" gems come from. This historical background is also fascinating for us gemmologists and adds "value" to the pearls we analyse.

In summer 2011 we tested and certified the famous collection of Melo pearls, which were described in 1999 by Derek J. Content (editor) in the book "*The Pearl and the Dragon*". This collection consists of twenty-three Melo pearls of impressive size reaching up to 201.9 ct, combined with an attractive colour subtly ranging from light yellow to orange. All the pearls show attractive patchy to flame-type structures, resulting from interwoven tiny calcium-carbonate fibres which form the Melo pearls, but also the shell of the Melo Melo gastropod. The habitat of the Melo Melo gastropod is mostly along the coasts of Southeast Asia. The animal is specifically known from the shallow waters along the Vietnamese coast. Based on historical documents and references, this collection has been connected with the royal treasure of Bao Dai, the last Emperor of Vietnam.

Another famous pearl, La Peregrina, which we certified recently, has become the star at auction and in the international media. The pearl, part of the impressive jewel collection of the late Elizabeth Taylor, was set together in a necklace with further pearls, some rubies and diamonds. It was sold in December at the Christie's auction in New York for an incredible 11.84 mio US$, the most expensive pearl item ever sold at auction. The SSEF scientifically analysed the La Peregrina pearl and took radiographs, X-ray luminescence, X-ray fluorescence, UV-Vis reflectometry, and Raman microspectrometry data on the pearl. All these data confirm the authenticity of this outstanding saltwater natural pearl, which has a documented history since the early 16th century, and which was in the possession of royal dynasties in Spain, Great Britain and France. ✶

▽ **Figure 1**: The colour of the "Peregrina" pearl is compared with reference pearls at SSEF.

△ **Figure 2**: The famous Melo pearl collection, certified at SSEF.

TREATMENT OF FRESHWATER CULTURED PEARLS

In a collaborative research project with Elisabeth Strack from the Gemmological Institute Hamburg, we investigated a number of drilled beadless freshwater cultured pearls, which were treated by dying with simple dyestuff and heating in order to observe possible visual and spectral changes.

In the beginning, the samples were white (probably bleached), and turned brownish to greyish-brown after being treated with hair toner, hair colorant and heating (also in combination with dyeing). The treated samples showed some microscopically obvious features such as colour concentrations around the drill hole, surface cracks, surface peeling, and iridescent Newton rings. Apart from this, the Raman spectra of these treated pearls revealed Raman-bands not present in the freshwater cultured pearls before treatment, which could be associated to dyeing pigments and heating.

The results of this study were presented by the first author, Mrs. Elisabeth Strack at the Gem Research Conference in Carlsbad in June 2011 and can be studied in the conference proceedings published in *Gems&Gemology*. ✶

CULTURED PEARLS WITH NATURAL PEARLS INSIDE

The use of natural pearls of lower quality and value as beads for cultured pearls is a logical – but in our opinion not acceptable – development. This is mainly linked to the recent trend in natural pearls, which have experienced important price increases. This has resulted in efforts to farm cultured pearls that resemble the internal structures of natural pearls. We do not see any other realistic reason to produce such a product than to defraud the buyer at some point. SSEF already communicated in June 2010 in a trade alert (Krzemnicki 2010; see SSEF website, press releases) and in our SSEF Facette 18 (2011) about these cultured pearls with natural pearls as a bead. This topic has also been an issue in the last few months, with many discussions with pearl dealers and cultured pearls producers.

Recently, a trade member generously donated a parcel of such cultured pearls from Pinctada maxima and margaritifera for our research. These cultured pearls were produced in Indonesia. For the SSEF, it is crucial to have as much as possible first-hand information and specimens to be finally able to understand and establish criteria to identify such materials and to be able to protect the trade from any fraud.

Investigations by radiography, tomography and scanning electron microscopy revealed classical structures of natural pearls in the centre, with an additional growth of a "new" and mostly thin nacre layer at the surface. Based on the preliminary data, the separation of such cultured pearls from natural pearls is possible, but has to be backed-up with sophisticated analyses. Due to the preliminary nature of this research project, more details will be revealed in 2012 to the trade and gemmological community, as soon as our study has been concluded.

It is evident that this cultivation process has been undertaken by certain individuals with a clear purpose in mind. It is also evident that this product presents a threat to the natural pearl market. We are, however, convinced that the described cultured pearls with a natural pearl as bead will not be the main danger to the markets, as the quantities of such tricky pearls will remain rather limited. This is mainly due to their often rather low quality when compared to traditional beaded pearl cultivation production, and thus economically only of limited interest for producers so far. It is also due to ethical problems (see above) in selling such products. Thus most international pearl producers will abstain from producing and selling such products also in future. ✶ **Dr. M.S. Krzemnicki.**

▽ A selection of cultured pearl samples that contain natural pearl beads.

32ND INTERNATIONAL GEMMOLOGICAL CONFERENCE (IGC)

The 32nd IGC conference was successfully held in Interlaken, Switzerland 13-17 July 2011. Over 70 participants from 31 countries attended. Since 1952, this conference has a great tradition in bringing together leading gemmologists to discuss newest developments in the field of gemmology. The organizing committee was led by Dr. Michael Krzemnicki of SSEF together with Walter Balmer, George and Anne Bosshart, Laurent Cartier, Michael Hügi and Prof. Henry A. Hänni. The SSEF played an important role in organizing this conference.

The conference featured twelve thematic sessions with presentations ranging from coloured gemstones to pearls and diamonds, analytical methods and treatments of gemstones, and special sessions on Canadian gemstones, rare gemstones and organic materials. Two interactive poster sessions also took place. Participants' 48 talks and 14 poster presentations covered a wide range of topics and regions.

△ **Figure 1**: The 32nd IGC took place at the historical Casino Kursaal in Interlaken, Switzerland. Photo: Laurent Cartier.

The SSEF presented four papers. Dr. Michael S. Krzemnicki gave a talk about formation models for Tokki cultured pearls, which form as additional cultured pearls attached to a larger beaded cultured pearls. Prof. Henry Hänni, research associate of SSEF, reviewed 30 years of Beryl research. Laurent Cartier gave a presentation that reviewed diamond production in Sierra Leone since 1930. Dr. Franz Herzog presented a poster on rare-earth coloration in bastnäsite.

Talks and posters featured current research on new sources, treatments and methods that the gemmological community is pursuing. In order to share this research more widely, extended conference abstracts have been made available on www.igc2011.org.

The conference was preceded by an excursion to the Natural History Museum in Bern, and the Ticino Alps. A trip to Campo Lungo, where ruby mineral specimens are found in marble deposits, could unfortunately not be carried out due to bad weather. A three-day excursion followed the conference (18-20 July). This included a visit to the Binn valley, which is world famous for its rare and exotic mineral specimens. Accompanying guests toured different areas of Switzerland in what was a rich three-day social programme.

Following Dr. Nguyen Ngoc Khoi's proposal, it was unanimously decided that the next IGC conference in 2013 would take place in Vietnam. SSEF gemmologists will continue to be involved and will also travel to this conference.

An online version of the conference's proceedings, photos and the excursion guides are available on the website www.igc2011.org. ✶

△ **Figure 2**: Group photo of IGC 2011 conference participants at Giessbach Falls, Switzerland. Photo: Christian von Faber-Castell.

SSEF BUYS A NEW RENISHAW RAMAN SYSTEM

For many years, the SSEF has been working with a Renishaw microprobe, with which we have achieved some milestones in gem testing. These include the detection of HPHT treated diamonds, the identification of fissure fillings in emeralds and other gemstones, and the characterization of annealed zircons in corundum, to name but a few. Based on the long-standing collaboration with Renishaw, the SSEF has decided to upgrade its analytical department with their new InVia Raman system. The new instrument will be equipped not only with the indispensable argon laser (514 nm), but also with a 785 nm diode laser.

For those not familiar with the method, we would like to give a short insight into the use of such a system and about the Raman effect in general.

Raman spectroscopy is based on the Raman scattering effect, as discovered by C.V. Raman in 1928, where monochromatic light (light of only one wavelength) hits onto a crystallized material and is inelastically scattered by quanta of lattice vibrations inherently present in that target. The change in the light's energy, expressed in terms of the so-called Raman shift, can be used to gain insight into the vibrational modes of almost any substance.

As every mineral has its very own Raman spectrum (like fingerprints of humans), minerals can be identified with Raman spectroscopy as soon as there is a Raman reference database of the most common minerals. This is true for macro-crystals as well as for tiny mineral inclusions in gems: some inclusions may be specific to the geographic origin of their host mineral – e.g. pargasite (an amphibole) in Kashmir sapphires. Thus, Raman spectroscopy can be of foremost importance for origin determination of gemstones.

Raman spectroscopy can help us to identify not only minerals, but also organic compounds, regardless of whether they are natural or synthetic. The detection of organic fissure filling substances in emeralds and other gemstones is one well-known example for this category.
Another important application in this class is the detection of colour authenticity of pearls or corals. It is well known which natural organic substances are responsible for the specific colour of pearls or corals, and their Raman spectra are well documented. Any deviation from these reference spectra has to be considered as highly suspicious and it is very likely that a gemmological surface examination may confirm human intervention for the "improvement" of the gem's colour.

Apart from Raman spectroscopy, our Renishaw instrument can also be used for studies in the field of photo-luminescence (PL). Here the laser is only used to excite atomic and/or molecular levels in such a way as to force a decay of these excitations via emission of light. This light-emission is caught by the Raman detector. Applications are:

- HPHT treatment of type IIa diamonds: PL-spectra, recorded at low temperatures (~ -196°C), for natural type IIa are markedly different to those of HPHT-treated natural diamonds of the same type (or HPHT synthetic diamonds): PL peaks clearly visible in natural type IIa diamonds tend to disappear or get drastically reduced for HPHT treated/created diamonds.

- Photo-luminescence of spinels: The PL behaviour of spinel is due to traces of chromium (Cr^{3+}): The width of the PL-peaks is linked to the environment in which the Cr-ions are embedded. Any change, e.g. through heating, may change this environment and thus the width of the peaks. PL-spectra, recorded with our Renishaw system, can thus give further evidence about a certain treatment.

We are convinced that many new and exciting phenomena will be uncovered with our new system – to be reported in the next Facette, hopefully.

References to the methods and techniques mentioned above can be found on our website and in well-known gemmological journals. ✶ **Dr. F. Herzog.**

▽ Pictures taken in Halong Bay and Yen Bai areas of Vietnam. Photos: Luc Phan, SSEF.

VISITING VIETNAM

In May 2011, Dr. Nguyen Ngoc Khoi invited SSEF members to visit several ruby and spinel mining places in the Yen Bai province in northern Vietnam and a pearl farm in the Ha Long Bay in northeastern Vietnam.

Prof. Hänni, research associate of SSEF and Luc Phan, staff-gemmologist at SSEF arrived in Hanoi beginning of May. A first visit to the "Ruby Plaza", a commercial building of the DOJI Gold and Gems Group gave an insight of the skills and capacities in gemstone cutting and jewellery making in Vietnam.

At Hanoi University, Prof. Hänni gave a lecture on scientific gemmology and familiarised the audience with how a scientific approach to gemstone testing has been developed and is practised at the SSEF.

A field trip to Luc Yen and nearby ruby and spinel mines showed us the difficult life of miners in that country, but also a classical marble deposit in karstic terrain. On the market of Luc Yen samples for the SSEF collection were available, including cobalt blue spinel, rubies and red spinel. First samples of Vietnamese ruby and sapphires reached the SSEF laboratory about 20 years ago, and the recent samples complete our reference collection. Later in the week the SSEF delegation started a picturesque sea trip to a pearl farm in the world-famous Halong Bay. The farm uses the Japanese method (Akoya) and produces cultured pearls for the local market. We thank Dr. Nguyen Ngoc Khoi for his kind invitation and for managing our field trips so perfectly.

✶ **Prof. H.A. Hänni & L. Phan.**

SSEF COURSES
in 2012

2011 was a busy year for the SSEF Education Department. Our courses have a high international reputation and we see more and more gemmologists, jewellers and gemstone professionals from very different countries attending our courses. It's interesting to have participants from so many different gemmological and international backgrounds.

The course calendar for 2012 is now set. The SSEF Basic Training Course (25 June - 10 July) and the SSEF Basic Diamond Course (22 - 26 October) offer good introductions, and participants can graduate with a diploma after taking theoretical and practical examinations. For more in-depth courses we offer Advanced Training Courses on coloured gemstones (15 - 19 October), pearls (2 - 4 May and 26 - 28 November), diamonds (29 October) and small diamonds (30 October - 1 November). SSEF remains the only institution that offers training for laboratory gemmologists with its Scientific Gemmology Course (13 - 17 August and 21 - 25 January 2013) and Scientific Diamond Course (6 - 10 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.

ADVANCED PEARL COURSE

This three day pearl course takes place twice a year (2 - 4 May and 26 - 28 November). It 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 offer a good opportunity for practising and expanding your skills and knowledge of pearls. The course also offers an introduction into the use of UV-visible spectrometry, EDXRF, X-ray radiography and luminescence for pearl testing in a scientific laboratory.

SMALL DIAMOND COURSES

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

SCIENTIFIC GEMMOLOGY COURSE

In 2012, the one-week Scientific Gemmological course will take place 13 - 17 August and early 2013 from 21 - 25 January. During this course, participants learn about techniques and applications of instruments like X-Ray fluorescence spectrometry, UV-Visible-NIR spectroscopy, LIBS (Laser Induced Breakdown Spectroscopy), Raman and FTIR spectrometry in the field of gemmology, as performed at the SSEF Swiss Gemmological Institute. Advanced gemmological education is a requirement.

SCIENTIFIC DIAMOND COURSE

The one-week SSEF Scientific Diamond Course (SDC) 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 (UV-Vis) at low temperature (-120°C), and photoluminescence spectroscopy (PL) at low temperature. In 2012, this expert course will take place from 6 - 10 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.

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 and authorities, such as Caran d'Ache, Christie's, the Geological Survey of Greenland have benefited from such courses that 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 us to discuss how a gemmological course can be tailored to your needs. ✶

CONGRATULATIONS

SSEF Swiss Gemmological Institute wants to express its congratulations to the following persons for graduating from the following courses:

SSEF Basic Gemmologist Certificate:

- Mohamed Al Suwaidi, Ras Al Khaimah, UAE
- Svetlana Gujahr Wirth, Zürich
- Enver Kahraman, Liestal
- Marc Lacher, Steinhausen
- Marina Meyer, Lörrach
- Dijana Mitrova, St. Gallen
- Carlo Mutschler, Zürich
- Dominik Obrist, Wettingen
- Sara Peppino, Thun
- Phornthip Saksirisamphan Rimml, Zürich
- Susanne Scheer, München
- Yves Scheidegger, St-Blaise
- Traudi Schönegger, Sirnach
- Sandrine Totah, Geneva

SSEF Basic Diamond Certificate:

- Veronica Abrahamsson, Beyer Chronometrie AG, Switzerland
- Sandro Baldi, Switzerland
- Pascal Cartier, Rolex SA, Switzerland
- Daniel Cau, Rolex SA, Switzerland
- Anne Crouzet, Dress Your Body SA, Switzerland
- Sébastien Laurent, Rolex SA, Switzerland
- Sergio Valceschini, Switzerland

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

- Mikaël Abecassis, Paris, France
- Marta Alcolea, Barcelona
- Yungmin Chin, Hong Kong
- Nirav Damania, Mumbai
- Marco Giovanardi, London
- Ilya Klyev, Moscow
- Tim Leuenberger, Geneva
- Karim Maricar, London, UK
- Mohamed Salih Maricar, London, UK
- Roland Noser, Luzern
- Bernat Rubi Pages, Spain
- Nancy Staehlin, Riehen, Switzerland
- Chudawala Sucheta, Mumbai, India
- Sara Thomeier, New York, USA
- Wei Zhou, Basel

COURSES ON TREATMENT
AND ORIGIN OF COLOURED STONES

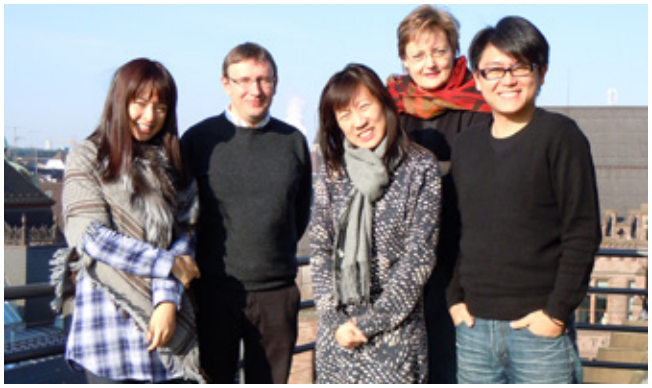
- Mickaël Abecassis, Eve Cazes & Mikaël Dan, Paris
- Marta Alcolea, Barcelona, Spain
- Maria Cristina Barioglio, Italy
- Laurent Cartier, Basel, Switzerland
- Marc Chevalier, Dress Your Body SA, Switzerland
- Anette Clausen, Greenland
- Annalisa Furini, Italy
- Franz Herzog, Basel, Switzerland
- Per Kalvig, Greeland
- Brenda Kang, Christie's, Geneva
- Nynke Keulen, Greenland
- Felice Lieftinck, Christie's, Geneva
- Regine Ngan, Christie's, Hong Kong
- Anshul Rakyan, Global Gems, Idar-Oberstein
- Davide Siffredi, Italy
- Chiang Sin Fung, Christie's, Hong Kong
- Henrik Stendal, Greenland
- Laerke Louise Thomsen, Greenland

SSEF Scientific Diamond Course

- Yann Caloz, Dress Your Body SA, Switzerland
- Sokkalingam Visvanathan, Singapore

SSEF Scientific Gemmological Course

- Mahesh Pandurang Gaonkar, GII, Mumbai
- Kamlesh Rajesh Jain, GII, Mumbai
- Anil Gangaram Punjabi, GII, Mumbai
- Medury Dattatreya Sastry, GII, Mumbai
- Upesh Bhagwatilal Patel, GII, Mumbai
- Sandesh Narayan Mane, GII, Mumbai
- Karumanthattu Thambi Ramachandran, GII, Mumbai



△ **Top**: ATC Pearl Course participants, April 2011. **Bottom**: Christie's ATC Coloured Gemstone Course participants, January 2011.

SSEF COURSES 2012

9 - 10 Jan	Practical Training
2 - 4 May	Advanced Pearl Course
11 - 12 June	Practical Training
25 June - 10 July	Basic Gemmology
6 - 10 July	Scientific Diamond
13 - 17 Aug	Scientific Gemmology
15 - 19 Oct	Advanced Coloured Stones
22 - 26 Oct	Basic Diamond
29 Oct	Advanced Diamond
30 Oct - 1 Nov	Small Diamonds Quality Control
26 - 28 Nov	Advanced Pearls

2013

7 - 8 Jan	Practical Training
21 - 25 Jan	Scientific Gemmology
28 Jan - 1 Feb	Scientific Diamond

SSEF EDUCATION FOR THE SWISS TRADE

The Swiss Gemmological Institute, part of the Swiss Foundation for the Research of Gemstones (SSEF: Schweizerische Stiftung für Edelstein-Forschung) was founded by trade organisations in 1974 and works independently on a scientific basis. Being the official institution for the Swiss jewellery trade, the SSEF is strongly involved in gemmological education on different levels in Switzerland. Apart from our normal course program (see sections above or **www. ssef.ch/education**), we also have a strong commitment to education which is much less visible to clients, but which we would like to present in the following.

Since many years, Dr. M.S. Krzemnicki is lecturing at the School of Design in Zurich. During a number of practical workshops and theory modules, goldsmith apprentices learn the basics of gemstone identification. To gain the officially recognized Swiss Goldsmith Master Diploma requires an intense gemmological course, again provided by the SSEF.
Apart from this, the SSEF is strongly involved in the Swiss Gemmological Society (**www.gemmologie.ch**) providing talks and seminars for their members about new findings in gemstone research. Beginning of 2012, Dr. M.S. Krzemnicki will be also part of the Scientific Commission of the Swiss Gemmological Society.
At a scientific level, members of the SSEF are lecturing at the University of Basel (Dr. M.S. Krzemnicki) and Lausanne (Prof. Dr. H.A. Hänni, research associate of SSEF). These courses form part of the curriculum in Mineralogical Sciences and are held annually with a small but eager number of students, who might at some point become future scientific staff members at SSEF. ✶

SPECIAL RUBY COURSE

In November, a group of geoscientists from the Geological Survey of Denmark and Greenland (GEUS) and the Bureau of Minerals and Petroleum (Geology Department) of Greenland were participating with other trade members at a SSEF Special Course about corundum. Main topics included microscopic assessment of rubies and sapphires including treatment detection and origin determination. Apart from a gemmological education, the course participants had the opportunity to discuss their experiences about sustainable mining practices and market trends. ✶

NEW SSEF REPORTS

In October 2011 we revamped all SSEF reports (Diamond Grading Report, Gemstone Report, Test Report) giving them a new and refreshed design.

The major change in this new layout is the incorporation of the SSEF logo, which was successfully introduced in 2010, but was so far not present on our reports. The logo with the Swiss flag highlights the Swiss quality of our certificates. It perfectly fits with our professional approach in gem testing and reflects our philosophy of offering you a gem testing service of highest standards and integrity.

Apart from the newly incorporated SSEF logo and a subtle redesign of the layout, there is no change concerning our standards, neither in the format nor in the wording. The only exception is the new SSEF Diamond Grading Report.

DIAMOND GRADING REPORT

For round brilliant diamonds, we have introduced the SSEF cut grade and the word "excellent" as a descriptive term for the cut grade, the symmetry and the polish. Each new SSEF Diamond Grading Report also mentions the type of diamond as an additional comment. For more information also read the article on page 32.

GEMSTONE REPORT

A SSEF Gemstone Report is issued for a single loose gemstone, including coloured diamonds. Gemstone Reports are issued only for natural stones (no synthetic or imitation material). The only change to the gemstone report is that the photo of the gemstone is now located in the upper-right corner of the report unlike before when it was located at the bottom left corner.

TEST REPORT

A SSEF Test Report is the most versatile identification document and is issued for mounted gemstones, pearls, jewellery, lots of gemstones, synthetic or imitation material. The Test Report has only undergone minor changes to improve the layout and structure of the report.

SECURITY OF SSEF REPORTS

For over two years now, all reports issued by the Swiss Gemmological Institute SSEF carry a label of authentication. This SSEF/Prooftag label contains a fraud resistant bubble tag that can only be used once and is impossible to reproduce. The owner of a SSEF report with a tag can check its authenticity online. This innovation adds another layer to the security already provided using signature, seal and lamination.

We are certain that the revamped design of our reports will meet your needs and those of your clients. Should you have any queries regarding the wording of our reports or have any doubt about the authenticity of a report please do not hesitate to contact us. ✶

SSEF APPENDIX LETTERS

Since a few years now, the SSEF issues so-called "appendix letters" for outstanding pearls, gemstones and jewellery items. These letters come together with a SSEF report and explain in short but concise text, the characteristics which make the described item outstanding in beauty and rarity.

It is our policy to decide ourselves on an independent basis, for which item we issue such an appendix. Having seen such a large number of gemstones and pearls, we have set rigid criteria that needs to be fulfilled before we can consider a gem outstanding enough to be worthy of such an appendix.

The reaction of the trade has shown that these letters are very much appreciated, as they bring together the scientific findings we present on the SSEF report together with a more vivid and representative description of the item. ✶

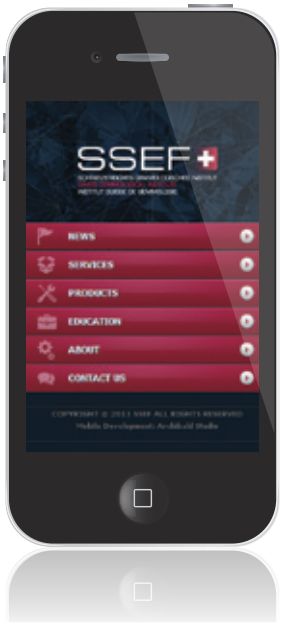
NEW WEBSITE

At the beginning of 2011 we launched our new website www.ssef.ch. This website has been a great success. It is a very useful tool to communicate with our clients. Calendars of the SSEF gemmological course programme and on-site testing dates are regularly updated on our website.

Also, if you need more information about the different types of SSEF reports and the prices of these, services section of our website has all the information you need. The "Price Calculator" is a simple tool that enables you to calculate the price of our testing services.

Finally, to stay informed by email do subscribe to our newsletter, which will inform you about updates, news or gemmological research. If you are not already subscribed to our newsletters, you can sign up on www.ssef.ch. ✶

NEW MOBILE WEBSITE



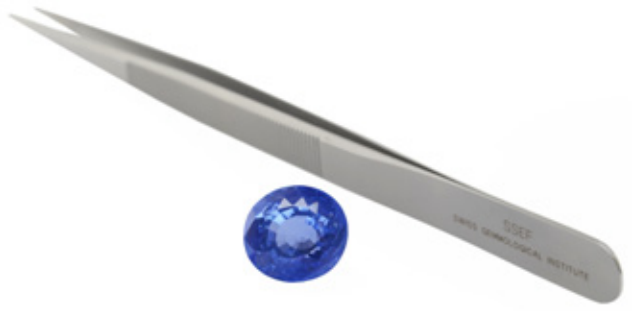
We are also happy to announce the recent release of a mobile version of our English language website. This website is optimized for users of smart phones. Unlike other mobile websites, it has been developed as an application, which improves navigation. Since many of our clients have told us they would like to have access and remain informed about SSEF's services and gemmological news while they are on the road they can now do so at www.ssef.ch/mobile. ✶

SSEF
瑞士珠寶學院 瑞士珠宝学院
SWISS GEMMOLOGICAL INSTITUTE

SSEF WEBSITE NOW IN CHINESE

In our endeavour to make the SSEF website more accessible to the target communities we serve, and in particular in response to strong demand for SSEF's gem testing services, both in Hong Kong and greater China, we have introduced a Chinese-language version of our website - www.hk.ssef.ch. The site is available both in traditional and simplified Chinese. It offers an overview of history, the services we offer, and latest news in the world of gemmology. ✶

LIBRARY OF SSEF PUBLICATIONS



We strive to link any research findings we may have produced onto the website and will in coming weeks have a complete library of all SSEF publications since 1974 available online. This goes hand in hand with our mission to share our gemmological knowledge and findings with the public and the trade. Stay tuned to our website and news to enjoy these publications when they go online! ✶

NEW DIAMOND GRADING REPORTS AND INTRODUCTION OF CUT GRADE

From October 2011 onwards, all issued SSEF diamond grading reports come with a new design. A clearer presentation style has been adopted enhanced by the new SSEF logo while the ProofTag authentication bubble-tags also remain present on each report.

CIBJO CONCERNS

The Diamond Grading Reports of the Swiss Gemmological Institute SSEF were printed on pre-numbered CIBJO certificates since 1978. Recently, CIBJO asked all laboratories to cease making reference to CIBJO on their reports.

Nevertheless, we continue to grade diamonds with exclusive reference to the CIBJO Diamond Grading system as described in the PAS 1048 document, a Publicly Available Specification.

Thus, SSEF continues to refer exclusively to the CIBJO master diamonds for grading the colour of diamonds and the Swiss Gemmological Institute SSEF remains the only authorised laboratory that can deliver direct copies of the CIBJO C1 Diamond Master series upon request. SSEF has been the custodian of this internationally recognized master diamond series since 1976. This fact is part of the guarantee that since this date, the CIBJO diamond colour grading system did not change. At SSEF, the purity of diamonds is also graded with reference to the PAS 1048 document.

Therefore, although the CIBJO acronym no longer appears on our Diamond Grading Reports, references to the CIBJO diamond grading system remains of major importance at SSEF.

THE TERM EXCELLENT

Since 1976, the best qualifier for symmetry and polish was *Very Good* and from October 2011 on, it becomes *Excellent*. Further terms available are *Very Good*, *Good*, *Medium* and *Poor*. At present, these five terms are more in line with the needs of the diamond trade and also reflect more harmonised practises amongst diamond grading laboratories.

CUT GRADE

Since 2007, the Swiss Gemmological Institute SSEF has developed and evaluated an internal cut grading system for round brilliant cut diamonds. Several other laboratories are already proposing their own so-called fourth C: Cut grading. There is no evidence that the cut grading system of one laboratory is better than that of another laboratory.

The cut grade of a diamond is the result of a specific combination of the following criteria: proportions, symmetry, polish and girdle.

SSEF developed its own cut grading system by following four main goals. The first one is the creation of a reproducible system, which means that when the same data is entered into the system years later it shall give exactly the same final results.

The second goal is to use, as often as possible, references published in recognized gemmological books and/or articles.

The third goal is to keep the existing diamond grading protocol unmodified. Several measurements that are now taken into account in the SSEF cut grading system were measured for a very long time although they did not appear on SSEF Diamond Grading Reports. Thus, the introduction of the SSEF cut grade is totally in line with the earliest Diamond Grading Reports, especially in regards to the reporting of table and depth proportions.

The fourth goal is to provide our clients with cut grade results that are in line with the results given by other major gemmological laboratories. A recent internal study has shown that for all diamonds graded at SSEF for a twelve months period, 75% of the calculated cut grades were identical to those released by other laboratories.

Bringing these four goals together, the new SSEF Diamond Grading Reports for round brilliant cut diamonds now describe cut grades with the terms *Excellent, Very Good, Good, Medium or Poor*.

TYPE IIA, TYPE IIB OR TYPE IA

The type of a diamond now also appears on the new SSEF Diamond Grading Reports, and is an important piece of information that needs some clarification.

A diamond is mainly made of carbon atoms. The type of a diamond indicates whether its crystal lattice contains some nitrogen (type I) or not (type II). In type Ia diamonds the

nitrogen atoms are aggregated. Whereas in a type IIa diamond no atoms are substituted for carbon atoms, in a type IIb diamond a few boron atoms replace carbon atoms, giving the diamond a blue to greyish blue colour.
Any diamond graded at SSEF is checked by infrared spectrometry in order to determinate its type. The infrared spectrum of a colourless to near colourless diamond proves both its nature (diamond versus imitation), its authenticity (natural versus synthetic) and with the exception of type II diamonds, the authenticity of its colour. The colour authenticity of this last type of diamond is systematically checked using low temperature (-196°C) photoluminescence spectrometry.
Together with the updated design of its new Diamond Grading Reports, the Swiss Gemmological Institute SSEF has recently introduced important additional information. The cut grade, the type of the diamond, qualifiers such as the term *Excellent* will help the trade and final consumers face the next decades of the diamond market. Previous strong key points of the SSEF diamond grading system, such as its reference to the CIBJO standard are preserved. And finally, all reports are available in English, German and French. ✶ **J.P. Chalain.**

SSEF MOURNS THE LOSS OF FORMER DIRECTOR GEORGE BOSSHART

It is with sadness that we announce the news that George Bosshart, former director of the Swiss Gemmological Institute SSEF, passed away at the age of 69 on Saturday 14th January after fighting for years against cancer.

George, as the first director of SSEF from 1974 to 1990, contributed much to where SSEF stands now, having set up testing procedures and standards that we still use nowadays in SSEF in our daily work. Apart from this, he was very active in research over all these years – and even more after his retirement – and published numerous articles in gemmological journals on a wide range of topics. Green diamonds and the origin of their colour has been for sure the issue to which he devoted most of his energy and scientific research, and where he has made major contributions for a better understanding of this complex matter. Apart from this, he was also very much interested in all kinds of unusual stones or collector stones, which are only rarely encountered in the gem market, but which by their rarity and sheer beauty attracted his scientific interest.

I remember many inspiring discussions in his beautiful house overlooking the lake of Zurich when working together on joint research projects. But even more so I remember his excitement and joy when he was talking about the adventurous journeys he and his wife Anne had undertaken to visit remote mining sites all over the world. I remember well when we were together in Pailin, Cambodia, where we enjoyed not only the local sapphires, but also great food and especially fine and old French wine, which we never thought we would find in this corner of the world.

In the last few months, George and Anne were very active as they were strongly supporting the organisation of the 32nd International Gemmological Conference IGC in Interlaken. I am very glad that we had the chance to work on this so closely and I am very thankful for his valuable contribution, which made this event so successful for all.

The whole SSEF team would like to express its sincere condolences to George's wife Anne and we will always keep in memory George and his passion for the beauty and science of gemstones.

✶ **M.S. Krzemnicki**
and the whole SSEF team.

CIBJO

In 2011, SSEF was present at the CIBJO congress that was organized in Porto, Portugal.

On the 14th of March, Dr Cavalieri opened the CIBJO annual congress. Already two days earlier, several CIBJO commissions and steering committees met in order to prepare the upcoming congress.

Apart from the General Assembly, 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 the CIBJO website (**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".

Conforming to the decision taken at the 2010 CIBJO Congress, held in Munich, where the GPTLB laboratory (Bahrain) expressed its concern about the differentiation between natural pearls and saltwater beadless cultured pearls, a LMHC Technical Pearl Commission met in May 2010 in Bahrain. The committee achieved fruitful work and as a consequence, the related Information Sheet will soon become available on the LMHC website (**www.lmhc-gemology.org**). ✶

LMHC

Laboratory Manual Harmonisation Committee

This year, the Laboratory Manual Harmonization Committee (LMHC) met only once. The committee which was originally formed with the representatives of seven different gemmological laboratories now only counts five members. This is due to the closing of two major laboratories: AGTA, NYC and GAAJ, Tokyo.

The current members of LMHC are: CISGEM (Italy), GIA (USA), GIT (Thailand), Gübelin Gem Lab (Switzerland) and SSEF Swiss Gemmological Institute (Switzerland). The meeting was organised by SSEF in Basel, 14 to 16 December 2011. For the first time, the meeting welcomed two observers who may become members of LMHC in future: CGL – the Central Gem Laboratory of Japan and DSEF – the German Gem Lab. These two observers were closely involved in the discussions and contributed valuable insights to the discussions.

During the meeting, the nine already published LMHC Information Sheets (IS) were amended and four other IS were finalised: IS10 (Amber- Copal), IS11 (Jade and related material), IS12 (organic fillers in gemstones), General Information Sheet (undetermined colour authenticity of gemstones). Additionally, it was agreed to put the Pearl Information Sheet drafted by the LMHC Pearl Commission onto the LMHC website. Also for the first time, it was agreed that LMHC would release a press release through a communication agency to inform widely about its last achievements. This was released on 20/12/2011. ✶

CIBJO EMERALD DAY 2011

In March 2011, the CIBJO gemmological commission planned a special "emerald day" conference. As usual, Dr. M. Superchi and Mr. K. Scarratt organised a very informative meeting that was also attended by many Spanish and Portuguese gemmologists. J-P. Chalain presented the content of the LMHC Information Sheet No. 5 to the audience. This IS deals with the harmonised wording used by LMHC laboratories for emeralds. Many interesting and detailed presentations informed the audience about the latest knowledge available on emerald's origins, imitations and history. A wonderful presentation was also given by our Portuguese host Rui Galopim de Carvalho. ✶

SSEF IN INDIA

In 2011, we strengthened our ties with India. Apart from having many clients from India, we also had two groups of gemmologists of the Gemmological Institute of India (GII), visiting the SSEF for a scientific gemmology course in February 2011. Based on very positive scientific exchange during the courses, the Board of Trustees of the GII officially invited Dr. Krzemnicki, as director of the SSEF, to visit their laboratory in Mumbai, India.

Just after the Hong Kong Show in September, he travelled to Mumbai, where he was heartily welcomed by the GII staff and board. Dr. Krzemnicki took the opportunity to give a guest lecture at the occasion of the Convocation Ceremony of the GII with the title "*Certification of coloured stones and pearls, and the quality control of small diamonds for the watch industry*". After the lecture, Dr. Krzemnicki visited the GII laboratory, where he was shown the scientific approach that this institution uses to analyse gemstones for the benefit of the Indian trade. We are certain that the Indian market will become even stronger than it already is, and SSEF will be actively strengthening its ties with India and its high-end jewellery trade in the near future. ✶

CLOSE UP
DR. WEI ZHOU

Dr. Wei Zhou has joined our multicultural team in April 2011 as a gemmologist. She is our first Chinese staff member and has already integrated herself perfectly into the SSEF team.

Dr Zhou has a very impressive scientific background, starting with a bachelor at the China University of Geosciences (Beijing), entitled "*The gemmological characteristics and cultural connotations of tridacna in China*", a Master of Science on pyroxenes and amphiboles in marine sediments, and a PhD from the Institute of Mineralogy and Geochemistry, University of Freiburg (Germany), on surface water-rock interactions in the Zermatt-Saas area (Swiss Alps). At the SSEF, she is trained to become a gemmological expert on treatment detection, origin determination, and pearl identification. Apart from this, she already has developed the Chinese version of the SSEF website in both traditional Chinese and simplified Chinese.

We are glad to have with Dr. Wei Zhou such an interested and active new team member. The background of each SSEF team member adds value to our team. Based on this experience, we also look forward to learning more about Chinese culture, and not to forget the spicy cooking. ✶

TEAM ACHIEVEMENTS

Apart from our daily work of analysing gemstones and pearls supplied by our clients, some SSEF staff members are involved in advanced educational programs to further increase their knowledge in gemmology. We have for many years been collaborating with the Gemmological Association of Great Britain (Gem-A), and are pleased to announce that Dr. Franz Herzog, Head of the Analytical Department at SSEF has successfully passed the FGA exams and received the prestigious FGA Diploma in summer 2011. This diploma blends in perfectly with his sound understanding of physics, and by this, he will further strengthen our research activities. We would like to congratulate Dr. Herzog on his FGA diploma. ✶

PARIS OFFICE CALENDAR

In 2011, SSEF was present seven times in Paris for gemstone testing. Our Parisian clientele is now familiar with our office located between rue Lafayette and place Vendôme. They provide both comfort and discretion.

As for other on-site testing (e.g. Bangkok, Hong Kong) locations, in Paris, we do not grade diamonds and we cannot test pearls. For all other gemstones, any testing is by appointment only.

For 2012, our calendar of presence in Paris is the following:

January: 23 - 27
Feb. - March: 27 - 2
April: 16 - 20
June: 4 - 8
September: 3 - 7
October: 8 - 12
December: 3 - 7

ON-SITE SSEF REPORTS

In 2012 we will be exhibiting and/or offering our testing services at the following events:

Bangkok	16 - 21 January
Paris	23 - 27 January
Hong Kong	13 - 20 February
Paris	27 Feb. - 2 March
Basel World	8 - 15 March
Paris	16 - 20 April
Geneva	14 - 15 May
Bangkok	21 - 26 May
Paris	4 - 8 June
Hong Kong	18 - 24 June
Bangkok	20 - 25 August
Paris	3 - 7 September
Hong Kong	14 - 25 September
Paris	8 - 12 October
Geneva	19 - 20 October
Paris	3 - 7 December

Further on-site services will be communicated through our website and in newsletters. Please subscribe on our website **www.ssef.ch** to be updated regularly about our on-site schedules, other services and news. ✶

BASELWORLD 2012 EXPRESS SERVICE

During BaselWorld 2012 (8 - 15 March), the SSEF will be once again offering its much appreciated Express Service: get a SSEF 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 and pearls (48h for testing) during the Basel Show. If you would like to have a number of items analysed, we suggest you call us in advance at the SSEF office (tel. +41 61 262 06 40) to fix an appointment. This is also strongly suggested if you would like to have your items tested shortly before the Show. ✶

SSEF PRESENCE IN ASIA

Our presence in Asia has been very successful in 2011, as our services have gained importance for clients in Far East and South East Asia, who ask for highly accurate and internationally renowned reports.

In 2012, the Swiss Gemmological Institute will again offer its services at two locations in Asia:

In Bangkok, we will be testing your prestigious gemstones in our Bangkok office at the Silom road on 16 - 21 January, 21 - 26 May, 20 - 25 August. Please check our website regularly or subscribe to receive our electronic newsletter to be updated regularly about our on-site schedules (http://ssef.ch/newsletter-signup).

Bangkok dates to remember!

The last year has again shown how important Hong Kong has become as a major hub for the gemstone and jewellery trade. Since many years the SSEF is offering its services in Hong Kong for the local and international trade of prestigious gemstones and jewellery. In 2012, we will again be very active in Hong Kong, offering services at the three main Jewellery Shows in February, June and September (at AsiaWorld and at Convention Centre), but also at our location in Central during several pre-show periods. This pre-show service is only by appointment, so please contact us (phone +41 61 262 06 40, admin@ssef.ch) if you need further information about our Hong Kong services or to confirm an appointment.

Hong Kong dates to remember!

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

SSEF AROUND THE GLOBE

In 2011, the SSEF was again busily travelling around the globe, and even more so than in recent years. Apart from the total of 13 on-site services in Paris, Bangkok, and Hong Kong, we also visited gemstone mines and pearl farms, research conferences, and further trade shows and trading places.

In February, Dr. Krzemnicki visited the Inhorgenta Show in Munich before leaving for Hong Kong for the March Show where he was invited by the organisers to give a lecture about fancy-coloured sapphires. Also end of February, Jean-Pierre Chalain participated at the LMHC meeting, kindly organised by the Gem & Jewellery Institute of Thailand (GIT) in Bangkok. He then joined the Hong Kong Show and finally to Porto (Portugal) where he participated at the CIBJO Congress which ended a few days before the Basel show.

At the annual meeting of the Swiss Gemmological Society beginning of May, the SSEF was present with Dr. Michael S. Krzemnicki, Jean-Pierre Chalain, Laurent Cartier and Prof. Henry A. Hänni, giving talks on news from the lab, emerald treatments & nomenclature, Tahiti pearl farms, and the beryl group. In mid May, the SSEF was present at the jewellery auctions in Geneva, just before leaving to Bangkok for the next on-site service. In June, Luc Phan and Prof. Hänni visited gem deposits and a pearl farm in Vietnam. Also in June, Dr. Krzemnicki gave a talk at the annual meeting of the Swiss Association of Gemstone Dealers in Geneva, to update trade members of new developments in the market. In July, part of the SSEF team was strongly involved with organising and moderating the IGC conference in Interlaken, Switzerland.

In September, after the Hong Kong Jewellery Show, Dr. Krzemnicki visited Mumbai (India) by invitation of the GII. He gave a guest lecture at the annual Convocation Ceremony of the GII.
Afterwards, he was on a short visit in Bangkok, where he was invited to the PhD lecture of Walter Balmer, a close friend since many years.

In November, the SSEF was again in Geneva for the November jewellery auctions. In late November, Mr. Chalain participated at a CEN meeting in Milan (Italy), just before leaving to Paris for the last on-site service of a busy 2011. ✶

The SSEF Team wishes all friends and customers a succesful year 2012
and would like to thank you for your continued support of the SSEF laboratory.

PUBLICATIONS

Krzemnicki M.S., Herzog F., Zhou W. (2011) A historic turquoise jewelry set containing fossilized dentine (odontolite) and glass. *Gems & Gemology, 47, 4, 296-301*

Krzemnicki M.S. (2011) An analysis of rubies with corroded surfaces. *Journal of the Gemm. Assoc. of Hong Kong, Vol. 32, 36-41*

Krzemnicki M.S., Mueller A., Hänni H.A., Gut H-P., Düggelin M. (2011) Tokki pearls: additional cultured pearls formed during pearl cultivation: external and internal structures. *Abstract volume of the 32nd IGC 2011, p. 56-58, www.igc2011.org*

Herzog F., Krzemnicki M.S. (2011) Colour by rare earth elements (REE), as exemplified by colour-changing bastnäsite from Pakistan. *Abstract volume of the 32nd IGC 2011, p. 169-171*

Pettke T., Krzemnicki M.S. (2011) Laser ablation ICP-MS: technical aspects and capabilities of a versatile trace element microprobe. *Abstract volume of the 32nd IGC 2011, p. 135-136*

Bosshart G., Tay T. S., Hainschwang T., Krzemnicki M.S., Dressler R. (2011) Colorimetric investigation of unstable and stable spodumene colours. *Abstract volume of the 32nd IGC 2011, p. 26-30*

Strack E., Krzemnicki M.S. (2011) Experimental treatments involving dye and heat for Chinese freshwater cultured pearls and their detection by Raman spectrometry. *Gems & Gemology, Gem-Research Conference abstract*

Krzemnicki M.S. (2011) Fantasiefarbene Saphire: attraktive Farbenvielfalt eines klassischen Edelsteins. *Goldor, August Ausgabe. (German & French)*

Krzemnicki M.S. (2011) Ein-"Blicke" in die Schmuckgeschichte: Historische Objekte untersucht am SSEF Labor. *Goldor, März Ausgabe. (German & French)*

Krzemnicki M.S. (2010) Interesting muscovite specimens from Pakistan: Epitaxial incrustation and pseudomorphism after beryl. *Journal of the Gemm. Assoc. Hong Kong, Vol. 31, 60-65*

Krzemnicki M.S. (2010) Eine Reise zu den Spinellen Tansanias. *Goldor, Ausgabe Dezember (German & French)*

Chalain J-P. (2011) Les nouveaux Certificats Diamants SSEF Plus proche du marché actuel (German & French). *Goldor, November 2011*

Hänni H.A. (2011) Ming pearls: a new type of cultured pearl from China. *Journal of the Gemm. Assoc. of Hong Kong, Vol. 32, 23-26*

Hänni H.A. (2011) Neues aus China: Ming Pearls. Z. Dt. Gemmol. *Ges. 60, 3-4, in press*

DONATIONS

In 2011, the SSEF received again a great number of donations from many pearl and gemstone dealers around the world. We are highly thankful for these donations, as they often enable us to proceed with our research. They also add to our collection of specimens to be used in our courses, with the aim to educate the participants and to give them the opportunity to learn gemstone & pearl testing on a wide variety of untreated and treated materials.

WE WOULD LIKE TO THANK ESPECIALLY THE FOLLOWING PERSONS AND COMPANIES:

FOR PEARL DONATIONS:
Thomas Faerber (Geneva), Jeremy Norris (Oasis Pearl, USA), José Casares (Shanghai Gems, Geneva), Umit Koruturk (Australian Pure Pearl, UAE), Rak Pearls LLC (Ras Al-Kaimah), Andy Muller (Hinata Trading Co., Japan), Sam Buchanan (Nacar Co., Australia), Sucheta Chudawala (GII, India), Ronny Totah (Geneva), H.A. Hänni (GemExpert, Basel).

FOR GEMSTONE DONATIONS:
Veerasak Gems (Thailand), Joseph Belmont (KV Gems, Bangkok), Mrs. ThinThut (Silkeneast, Bangkok), Vladislav Yavorskyy (Bangkok), Jonathan Sjuman (Unique Brilliant Ltd., Hong Kong), Joseph W. Tenhangen (Tenhagen Gemological Laboratory, USA), Max Zubler (Zurich), Lisa Lesunja (Zurich), Mr Weber (Switzerland), Steve Webb (New Zealand), Werner Spaltenstein (Multicolor Ltd., Thailand), Henry A. Hänni (GemExpert, Basel), Alexander Leuenberger (Aline GmbH, Switzerland), Katharina Stierlin (Switzerland), Didier Rodelli (Ametista Mineralien, Switzerland), Michael S. Krzemnicki (Basel), Eugen Mürner (Valplan AG, Sugiez), J. Hyrsl (Prague, Czech Republic), Q.&W. Wight (Ottawa, Canada), N.N. Khoi (Hanoi University, Hanoi, Vietnam), S. Petitmermet (John Wullschleger, Zurich, Switzerland), Ms. Melcher (Zurich, Switzerland). ✶

Swiss Gemmological Institute SSEF

THE SCIENCE OF GEMSTONE TESTING®

Falknerstrasse 9
CH-4001 Basel
Switzerland

Tel.: +41 61 262 06 40
Fax: +41 61 262 06 41
admin@ssef.ch

www.ssef.ch