

GIA PEARL REPORT

GIA Report Number.....2546030896

Item Description: Four hundred thirty-nine (439) drilled pearls and sixty-seven (67) seed pearls (also tested) in a graduated five strand necklace with two yellow metal spacers and a clasp set numerous transparent pink and near-colorless variously shaped cuts: **Strand 1)** 47 pearls **Strand 2)** 51 pearls **Strand 3)** 127 pearls **Strand 4)** 136 pearls **Strand 5)** 145 pearls.

Weight..... 88.88 grams (gross)

Measurements..... Ranging from 1.78 mm to 8.00 mm

Shape.....Round, Near-round and Button

Bodycolor.....Cream

Overtone.....Orient and None

CONCLUSION

Identification.....Natural Pearls

Environment.....Saltwater

Mollusk.....*Pinctada* species

Treatment.....No indications of treatment

Comments: Pearls are identified and described insofar as stringing/
drilling permits analysis. Mollusk identification is an expert opinion based
on a collection of observations and analytical data.



The Gulabi Noor Natural Pearl Necklace

A natural pearl is considered a rare gem. “Heaven-born and cradled in the deep blue sea, it is the purest of gems and the most precious” (S.M. Zwemer) George Frederick Kunz eloquently begins his chapter on the origin of pearls. He continues, “The origin of pearls has been a fruitful subject of speculation and discussion among naturalists of all ages, and has provoked many curious explanations. Most of the early views—universally accepted during those centuries when tradition had more influence than observation or experiment—have no standing among naturalists of the present time. And although much information has been gained as the conditions accompanying their growth, and many theories are entertained, each with some basis in observed fact, science does not yet speak with conclusive and unquestioned authority as to the precise manner of their origin and development” (G.F. Kunz, 1908).

There can be little doubt that pearls formed naturally with sea-dwelling, nacre-producing mollusks still evoke the same passion and mystery today as they did when Kunz wrote his mammoth work *The Book of the Pearl* with co-author Charles Hugh Stevenson.

Natural pearls, no matter the producing mollusk, epitomize the very notion of that which is ultimate in both beauty and rarity. First, to dive time and time again into the eerie depths that hold too many hidden dangers to relate. Then, to discover a group of these wild but placid creatures, to bring them to the surface still unaware of what lies within and then lastly—on the very rare occasion—to discover one natural, near-perfect pearl.

Desire for natural pearls has historically always been strong among the elite. Members of the privileged classes in Asia, Europe, and various other locations treasured pearls, passing them from generation to generation. By the nineteenth century, western European royalty and ladies of nobility were wearing elaborate necklaces, earrings, and other adornments in what became known as the Pearl Age.

Historically, pearls sourced in the Persian (or Arabian) Gulf were known as Basra pearls. These natural pearls have been adorned by the regal and the refined—carrying whispers of history within their delicate sheen; they are amongst the rarest and most coveted gems in history. The distinctiveness of each pearl presents a significant challenge for those engaged with natural pearls: fashioning strands that harmonize in color, shape, and surface quality. Acquiring and meticulously arranging a collection of five well-blended strands of 506 natural saltwater pearls of fine surface condition and high luster is an impressive achievement.

The creation of the Gulabi Noor natural pearl necklace is said to have spanned nearly 25 years; a jewel made possible by decades of expertise and deep involvement in the pearling trade. The necklace, when adorning the neck of a fortunate wearer, symbolizes the transformation of even the most extravagant dreams into tangible reality. The luminous beauty of these five strands of natural pearls is a testament to human skill, showcasing not only the precious gems but also a story that will undoubtedly last a lifetime.



Natural Pearl Sources from Antiquity to the Present

Following the discovery of the New World, European royalty, particularly the Spanish and British, benefitted from the pearls discovered on both coasts of the Americas; indeed, recently-discovered sunken galleons in the hurricane-prone Caribbean, containing caches of natural pearls, attest to the trade in those times. Similarly, natural pearls fished from the waters in the vicinity of Sri Lanka (Ceylon), Java, and the Philippines, and later off the coast of Australia, provided the wealthy with magnificent adornments. This trade was likewise confirmed through the discovery of caches of natural pearls from thousand-year-old sunken vessels.

The Persian Gulf (or Arabian Gulf) is really where early pearling fame belongs; here, whole economies were based on natural pearl fishing prior to the last century. A thriving pearling trade sustained whole communities along the shores of the Gulf. Today much of the world's natural pearl trade still centers on the cities of Manama, Doha, and Dubai in the Middle East, and Mumbai (formerly Bombay) in India. These vibrant commercial centers handle natural pearls from all parts of the world, whether of historical provenance or more recent discovery.

The waters off the Australian coast also have a diverse and fascinating legacy owing to the recovery of natural pearls from the *Pinctada maxima* mollusk, the largest species of the *Pinctada* genus. "As regards area of distribution, the most extensive pearl-oyster grounds of the world are situated on the northern and western coasts of Australia" (G.F. Kunz, 1908).

PINCTADA SPECIES

Mollusks that belong to the *Pinctada* genus are the source of most commercially valuable pearls and the majority of them are found in the Caribbean-Pacific and Indo-Pacific Oceans. Pearl oysters under this genus produce some of the finest known natural pearls in all sizes and shapes. All *Pinctada* species are capable of forming breathtaking natural pearls, but the most commercially available are often associated with mollusks from the *Pinctada radiata*, *Pinctada imbricata*, *Pinctada mazatlanica*, and *Pinctada maculata* species.



Illustration of a Ceylon pearl fishery.



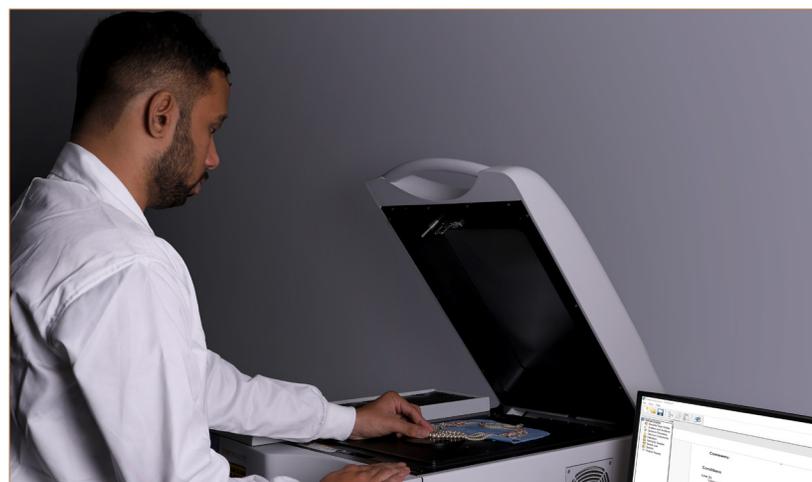
The pearls in the Gulabi Noor necklace belong to the Pinctada species.

Gemological Assessment of the Gulabi Noor Natural Pearl Necklace

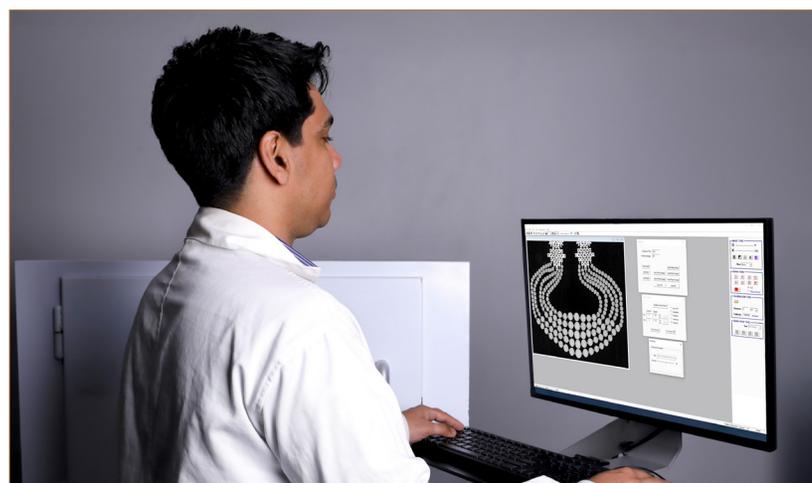
Characterization of a pearl at GIA involves a full range of analytical techniques. A variety of traditional approaches—examination with a loupe and gemological microscope, ultraviolet lighting, and advanced spectroscopic testing—builds a thorough understanding of a pearl’s identity and treatment history.

Routine treatment of all types of pearls is commonly performed to enhance their appearance or marketability. Some color and luster modifying treatments are often undetectable—and undisclosed—to the purchaser. Fortunately, GIA is equipped with state-of-the-art analytical instruments and advanced technology necessary to identify most treatments. Because pearls that are untreated have a huge premium placed upon them, GIA also screens each pearl and reports on any treatments detected.

The pearls in the necklace were studied with all available instrumentation by a team of experienced GIA gemologists. Their combined observations and data interpretation, which are detailed on the following pages, indicate that all pearls described in GIA Report 2546030896 are untreated natural saltwater pearls. Many are exemplars of the finest nacreous pearls derived from *Pinctada* species mollusks, particularly the *Pinctada radiata*—Gulf Pearl Oyster.



EDXRF spectrometry analysis.

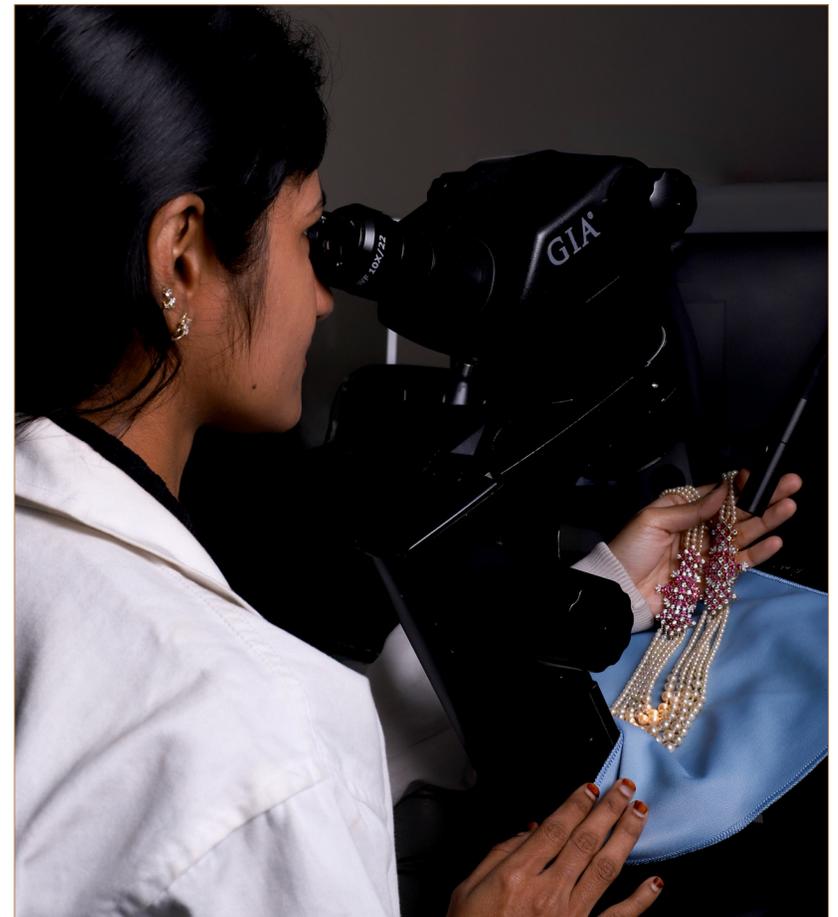


X-ray radiography (RTX) analysis.

Analytical Methods

The following types of analyses were undertaken during examination of the pearls:

- ◆ Microscopic observations were made using various GIA Gemolite microscopes at 10× to 50× magnification.
- ◆ X-ray fluorescence reaction was analyzed using a PXI GenX-100PF X-ray unit.
- ◆ 2D microradiographs were obtained using a PXI GenX-90P real-time X-ray unit.
- ◆ Photomicrographs of external features were captured at up to 135× magnification with a Nikon SMZ18 system using oblique illumination with a fiber-optic light.
- ◆ Chemistry was analyzed using a Thermo Quant'x EDXRF spectrometer.
- ◆ Ultraviolet (UV) fluorescence was observed using a GIA UV lamp with both 365 nm (long-wave) and 254 nm (short-wave) radiation.
- ◆ Raman spectra were collected using an inVia Renishaw microscope equipped with a 514 nanometer (nm) argon-ion laser.



Microscopic observation of pearls.

Surface & Internal Observations

MICROSCOPY

Microscopy is beneficial for the accurate evaluation of a pearl's surface, as it provides evidence to assist in determining whether it is untreated or has undergone treatment processes. Pearls are often improved in a variety of ways, whether the more acceptable method of polishing, to the not so acceptable methods of working, coating, dyeing, or filling.

Proper microscopy requires a binocular gemological microscope with a moderate range of magnification (e.g., 10×-50×) equipped with flexible lighting options, such as fiber-optic attachments, to assist in viewing a pearl's surface at a range of lighting intensities. Under magnification, overlapping aragonite platelets, characteristic of nacreous pearls, were observed on the surfaces of the pearls strung in the Gulabi Noor natural pearl necklace.

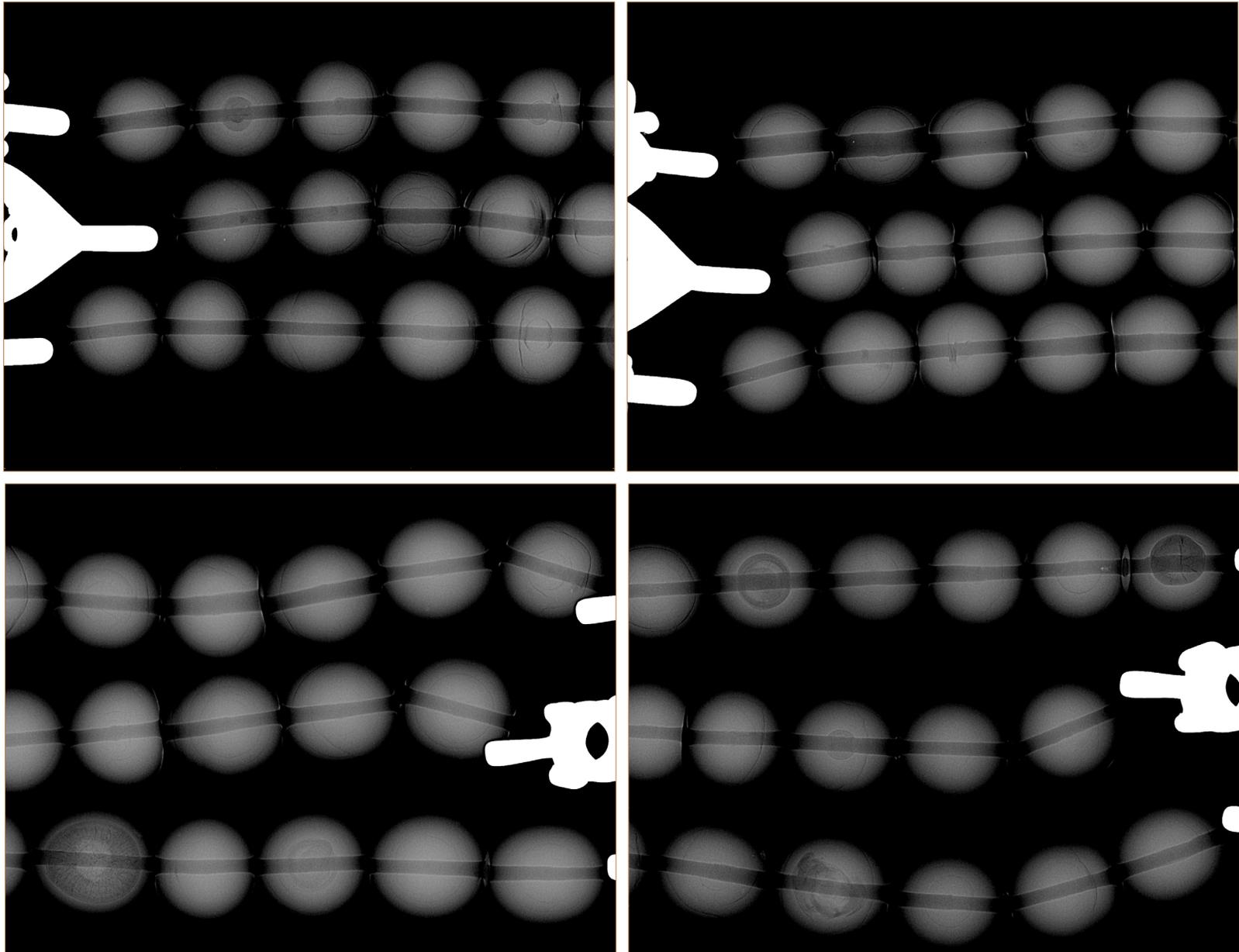


Nacreous platelet structures are visible on the pearls' surfaces.

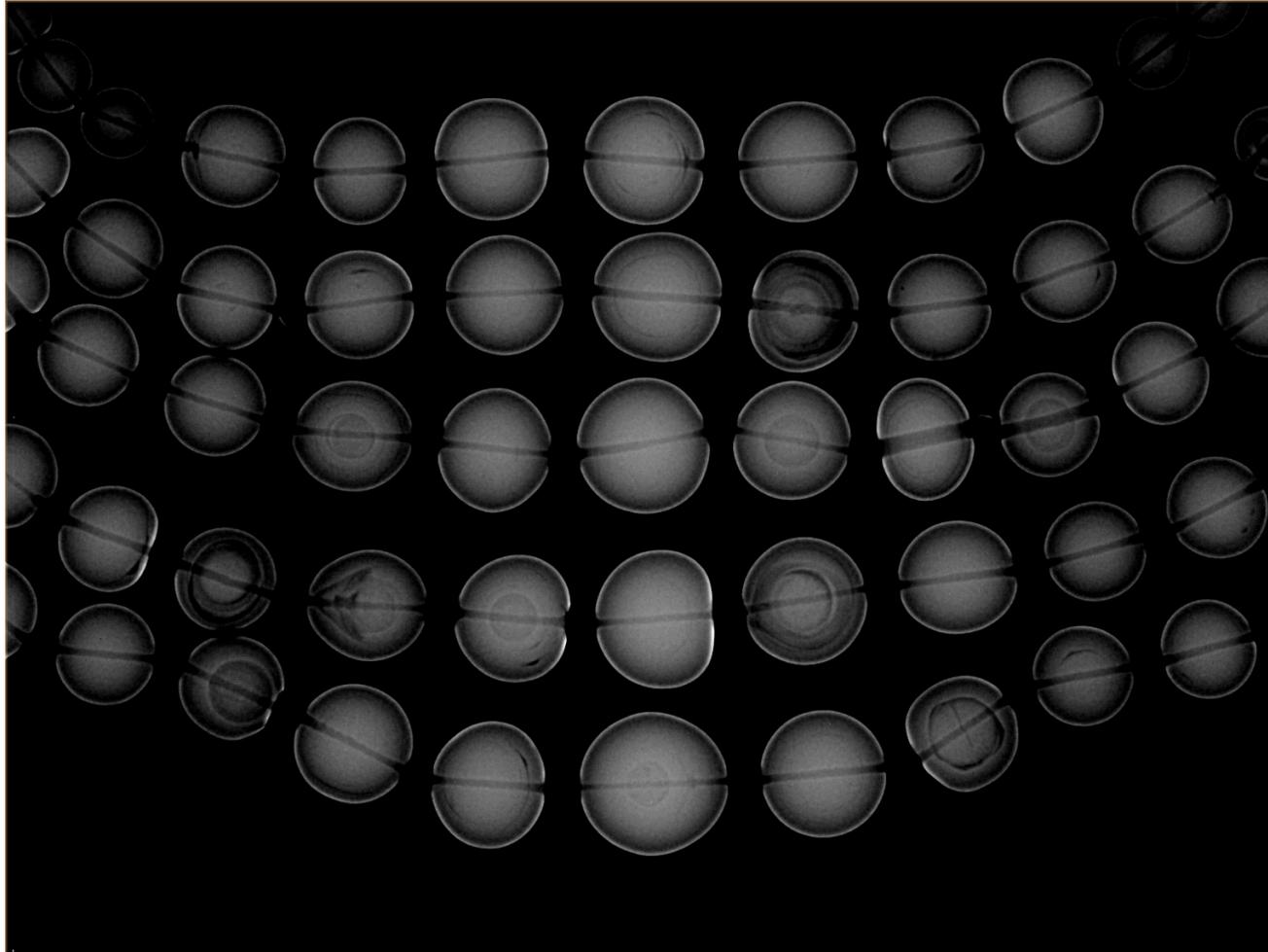
MICRORADIOGRAPHY (RTX) AND COMPUTED MICROTOMOGRAPHY (μ-CT)

The primary analytical method used by gemological laboratories in the identification of pearls is microradiography. This reveals the internal structures of pearls in a non-destructive manner, thus enabling gemologists to separate natural pearls from their cultured and imitation counterparts. In cases where the identification proves more challenging X-ray computed microtomography (μ-CT) is usually applied to assist in further determining the structures, yet this method is only applied to loose pearls or mounted pieces where the pearls are unobstructed by metal settings or metal within the drill-hole.

GIA used the RTX technique to examine all the pearls strung in the necklace. The following images show representative structures of samples from the 506 examined natural pearls. The majority of the pearls revealed natural fine growth arcs and small faint central cores, while some also possessed organic rich and acicular cores that are typical to those observed in natural pearls from the *Pinctada* species (particularly *Pinctada radiata* based on GIA's research sample database).



Real-time microradiograph (RTX) images of selected pearls from the Gulabi Noor natural pearl necklace.



Real-time microradiograph (RTX) image of the center pearls from the necklace.

Advanced Analytical Data

CHEMISTRY (EDXRF)

EDXRF spectroscopy is a non-destructive analytical technique that provides bulk (as opposed to spot) qualitative and semi-quantitative chemical data. This method uses X-rays to excite electronic transitions in atoms, and then measures the energy released when the electrons return to their stable states. Since the particular energies are specific to each element, EDXRF can provide qualitative analyses of the elements present in a sample. The technique can also provide quantitative information if the data are compared with a set of standards with known elemental concentrations. Using EDXRF spectroscopy, certain color modifying techniques and treatments such as coatings can be detected. The EDXRF results obtained for the key trace elements of the center pearls strung in this necklace are recorded in the table below in parts-per-million by weight. This chemistry is consistent with pearls originating in a saltwater environment.

Sample	Manganese	Strontium
Strand 1	0	904
Strand 2	0	964
Strand 3	0	990
Strand 4	BDL*	1031
Strand 5	44	802

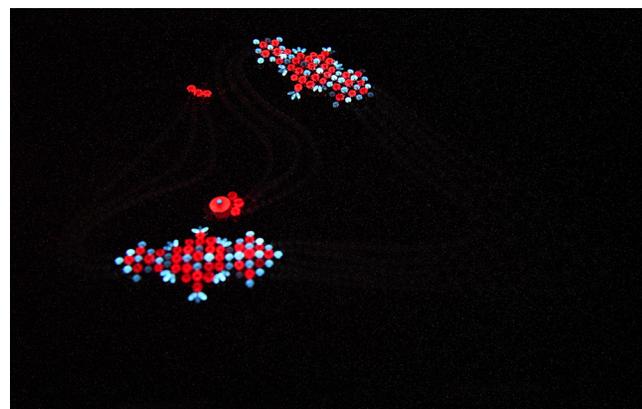
*Below Detection Limit

Trace element chemistry of the center pearls in the Gulabi Noor natural pearl necklace.

X-RAY FLUORESCENCE OBSERVATION

Various types of pearls can give different fluorescence reactions under X-ray excitation. This is mainly due to the manganese concentrations found inside of the pearls. Pearls formed in freshwater environments tend to contain higher amounts of manganese, thus often produce noticeable x-ray fluorescence, while saltwater environments generally have very little manganese and the pearls from marine environment are normally inert under the X-ray excitation. However, freshwater shell bead nuclei are commonly used in saltwater pearl culturing, causing the final products to fluoresce in different strengths based on their nacre thickness.

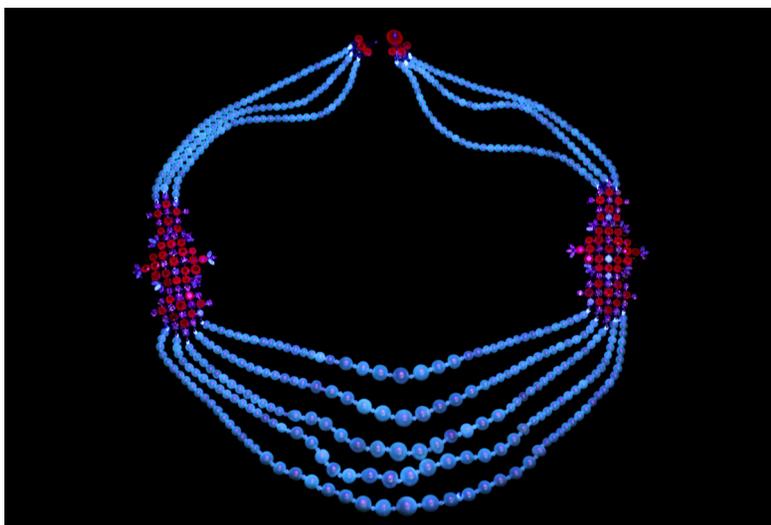
All the pearls in the Gulabi Noor natural pearl necklace exhibited an inert reaction when exposed to X-ray, indicating that these pearls originated from a saltwater environment.



Advanced Analytical Data

LONG-WAVE ULTRAVIOLET LAMP REACTION

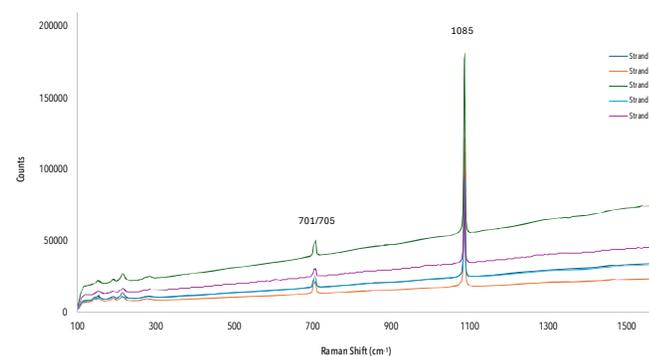
Ultraviolet (UV) light is a type of light energy making up one part of the electromagnetic spectrum. While UV light itself is invisible, it causes many elements to glow or fluoresce, in a variety of colors visible to the human eye as a result of its ability to absorb photons and release energy. Under long-wave ultraviolet light (LWUV), light-colored pearls from the *Pinctada* species typically exhibit reactions varying from yellowish green to bluish fluorescence, while darker-colored pearls generally emit an inert reaction. The pearls strung in the Gulabi Noor natural pearl necklace exhibited an inert to a moderate bluish reaction.



*LWUV reaction typically seen in saltwater pearls from the *Pinctada* species.*

RAMAN SPECTROSCOPY

Raman is a technique in which a photon of light interacts with a material to produce scattered light of different wavelengths. Measuring the unique set of wavelengths produced by each material thus allows for its identification. In Raman spectroscopy, a laser beam (or other light source) is used to illuminate a sample such as a gem or an inclusion. Light emitted by the sample is collected and analyzed by the spectrophotometer to produce a spectrum. The spectrum is compared to an extensive database— assembled over decades by GIA—in order to identify a gemstone, an inclusion within a gemstone, or in this case, the composition of the center pearls strung in this necklace. The nacre of all pearls tested was identified to be aragonite, a form of calcium carbonate that is commonly found in nacreous shells and pearls.



Raman analysis using a 514 nm argon-ion laser excitation on the pearls' surfaces showed a doublet at 701 cm⁻¹ and 705 cm⁻¹ as well as a peak at 1085 cm⁻¹, characteristic of aragonite.