What is a Diamond?

A concise guide to natural diamonds - Earth's billion year story captured in a tiny time capsule.

Suresh H.

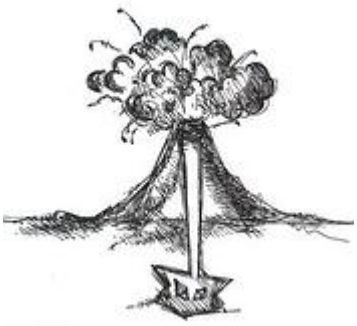
EVOLUTION & FORMATION

A natural diamond's creation begins a very long time ago in the mantle about 100 miles below the Earth's surface. It is an unusual mineral being an allotrope of carbon, in the

purest crystalline form of the element.

Diamonds are unquestionably the hardest naturally occurring substance known to man and their unique chemical and atomic structure enables them to last forever. Their extreme hardness gives them a characteristic, perpetual lustre appropriately termed '*adamantine*'.

Formed under extreme conditions of temperature and pressure as a result of the constant movement and activity of material deep within the Earth, a serendipitous chain of events then transports these diamond bearing fragments contained within this uncommon rock known as Kimberlite, via a funnel of volcanic magma to the surface. Weather and erosion with the help of rivers and coastal seas spread these beautiful crystals over wide areas showering a blessing of bounty on the regions where they are ultimately found.



"Diamonds are the oldest thing you will ever touch. Nothing else comes close!"

Table of Contents

HISTORY & FOLKLORE

The first diamond was discovered in an Indian cave in the Golconda region of South India nearly 4,000 years ago. But the diamond journey? That began a few billions years before. The stones you see in diamond jewellery today began forming one to three billion years ago, making a natural diamond the oldest thing you will ever touch. A natural diamond's surface blemishes and inclusions are symbols of their age which can be considered tiny time stamps that tell stories of the Earth's formation.

Diamonds have a long history as beautiful objects of desire and awe. Being rare and difficult to mine, they were relatively expensive even during ancient times and continued to be privileged possessions right up to the Middle Ages. In the very early days, they were used as

talismans and lucky charms by the ruling class and were believed to bestow upon the wearer superpowers. In the first century AD, the Roman naturalist, *Pliny the Elder* stated: *"diamond is the most valuable, not only of precious stones but of all things in this world".* Pliny's statement remains largely true, even today, two millennia later.

The world's love of diamonds had its origins in India, where they were first found in the Golconda region along the Krishna riverbed and adjacent streams (*the earliest instances of alluvial riverbed mining*). Some historians estimate that India was trading in diamonds as early as the fourth century BC. That output yielded limited quantities for an equally limited market of India's very wealthy classes.

Gradually though, this changed. Diamonds from India and the eastern territories of Asia found their way, along with other exotic merchandise and spices to Western Europe in the caravans that travelled to Venice's medieval markets. By the 1400s, diamonds were becoming essential fashion accessories for Europe's elite.

It was a little-known fact at that time and through till the 1700s, that the Indian mined supply was depleting, and Indian traders were supplementing their supply via Chinese and Arab middlemen operating from the eastern territories of Asia, supplying diamonds of Borneo*/Sumatra and Myanmar/Thai origins. Large quantities of diamonds were being excavated along the alluvial riverbeds of the western and central Kalimantan province of Borneo. These Indian traders were practicing their trade even as we do now - supplementing supplies from wherever they were available and keeping their sources secret.

** It is an interesting fact that diamonds found on the island of Borneo are all from alluvial sources which begs the question – where were the kimberlite pipes whence these diamonds came from? These diamond bearing pipes were left behind in North-western Australia when Borneo broke away from the Australian continent 150-160 million years ago , these pipes having discharged large parts of their diamond bearing load into the rivers that in turn deposited the diamonds a very long distance away on the Borneo corner of the breakaway Indo-Australian plate that rifted from Gondwana. Diamond once again providing evidence to confirm a geological reality.*

SYMBOL OF LOVE & EMOTION

"Diamonds are a symbol of love and life's significant moments".

The name "diamond" stems from the Greek word *adamas*, meaning *unbreakable*. In 1477, Archduke Maximilian of Austria wanted to propose to his love, Mary of Burgundy. To ensure she knew how he felt, he commissioned a ring to be made with a diamond - a resilient stone as precious and enduring as his love. That day, the diamond engagement ring was born, a symbol of everlasting love.

A natural diamond never goes out of style. If you have had a classic piece of diamond jewellery passed down through generations in your family, you would know. Your grandma's diamond can retain its aura, and still be all you - whether through a different setting, style or attire, you name it! **With a natural diamond, old is always new.**

DIAMONDS IN MODERN TIMES

Diamonds boast of a rich anecdotal history spanning more than 2000 years, but its journey of the last 800 years has been well documented. The fame of Indian diamonds spread far and wide in Europe beginning in the 1300s and this popularity from the European (and Indian) elite continued unabated right though till the 1800s. The market was being met by supply originating from India and east Asia but could not keep up with demand until diamonds from Brazil entered the market beginning in the 1700s. Brazilian diamonds had a good run for 150 years. Up until 1866, when the first mines began producing in South Africa, diamonds remained the purview of only the wealthy nobles and royalty of Europe and parts of Asia who had developed the fondness for diamonds as a measure of wealth and power.

The story of the modern diamond market really begins on the African continent, with the 1866 discovery of diamonds in Kimberley, South Africa. Entrepreneur Cecil Rhodes established De Beers Consolidated Mines Ltd 22 years later, in 1888. By the early 1980s, De Beers, through its mines in South Africa and marketing arrangements with producing countries, controlled an estimated 80% of the world's distribution of rough diamonds.

**In the 1870s, annual production of rough diamond was well under a million carats. By the 1920s, the figure was around 3 million carats. Fifty years later, annual production approached 50 million carats, and in the 1990s it surpassed 100 million carats per year. Today annual production stands at 130 million carats.*

As one of the trade's major participants, De Beers had to change, too. The De Beers of today bears little resemblance to the De Beers of 1998. After that year, the company greatly

reduced its role as the custodian of diamond supply. Instead of flowing into the market in a single-channel path from De Beers, diamonds now flow into the market through multiple channels.

Not everything changed, though. Regardless of the path they take, diamonds still flow from mines through to cutting centres, and then to the trading/jewellery manufacturing centres and ultimately to retail customers.

BEAUTY & PHYSICAL PROPERTIES

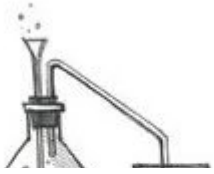
A diamond's splendour has been recognised for centuries, but there wasn't much scientific knowledge available about a diamond before the twentieth century. Since then, diamond knowledge has grown steadily, with research by chemists, physicists, geologists and mineralogists.

Unique Physical Properties: A diamond's characteristic chemical composition and crystal structure make it a unique member of the mineral kingdom. It is the only gem made up of a single element, namely pure Carbon. Its atoms are arranged in a cubic structure giving it the properties of extreme hardness and exceptional transparency.

Typical Crystal Shapes: Natural diamond crystals grow in typical shapes of an octahedron (8 faces), dodecahedron (12 faces) and less frequently a tetra hexahedron (24 faces). One look by an expert can immediately identify them as diamond crystals. A typical diamond may contain trace elements in very minute quantities (less than 0.05%), and it is these trace elements that influence its colour and crystal shape. And highly prized!

A few facts about diamonds:

- It is the hardest material known to man, being almost 10 times harder than the next hardest natural material - sapphire.
- It is an extremely inert (non-reactive) and stable material which will not change shape or physical properties even over a thousand years.
- It is a perfect **non-conductor** of electricity but also the most efficient **conductor of heat** - a unique property not possessed by any other material, natural or man-



made.

- It is not vulnerable to chemicals or solvents unless simultaneously heated.
- Heated to above 1,800°C in a vacuum, it can turn to black graphite, because it is after all carbon. However, it can burn at a lower temperature (650°C) in an oxygen rich atmosphere.
- Its weight is measured in **carats**. One carat is exactly one-fifth of a gram - so one kilo of diamond equals 5,000 carats.

Diamonds are eternal: Natural diamonds don't just exude an aura, they are also known for their versatility and timelessness. These beauties are for every generation, occasion and setting—as heirlooms or memory makers, as style statements or friends of the Earth.

Sustainability: When the world asks you to stop, slow down and reflect on Environment Day, look no further - especially when it comes to conscious luxury. There is no better showstopper than a natural diamond, naturally!

Natural diamonds are not only one of Mother Earth's most wonderous creations, they are also precious for the people and the economies of the countries where they are found. When mining is carried out in an orderly manner, diamonds are nature's benevolent gift to a country's development.

MINING & EXTRACTION

After the discovery of the first diamonds in South Africa in 1866, mechanised mining enabled a large increase in mining output and diamonds have since become affordable and accessible to the masses.

There are two main methods of diamond mining. Alluvial or riverbed mining is typically pan-mining similar to gold dust mining and the more capital intensive kimberlite mining which is essentially open-pit mining.

Alluvial mining has been the traditional mining method for the last 1000 or more years and generally yields better quality gems and larger stones as compared to kimberlite mines.

Only 15-20% of diamonds found in Nature are of gem

quality. Out of over 130 million carats mined today, only about 15 million are gem quality and 10 million are smaller lower qualities used in commercial jewellery.

The five largest producer countries in order of production volume are Russia, Botswana, Australia, Angola, Canada. Four other countries DR Congo, Zimbabwe, South Africa and Namibia have substantial and important productions followed to a lesser degree by Sierra Leone, Ivory Coast and Venezuela.

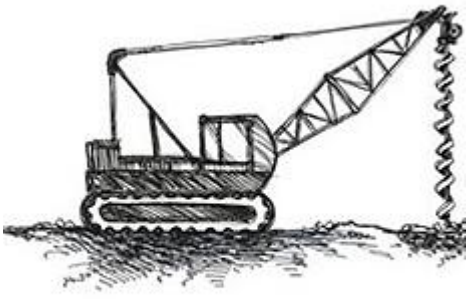
It was only in 1982 that a highly productive new mine in Botswana added to world production. A prolific source of high-quality diamonds, the Jwaneng open pit mine boosted Botswana's production so much that the country rose to third in the world in total diamond recovery, and second in diamond value. De Beers contracted with the Botswana government to buy the mine's production and Botswana set out to build its own diamond-cutting industry.

World diamond mining expanded dramatically with the coming on stream of an exceptionally large mine in western Australia in 1985 and the discovery of important new deposits in northern Canada in the year 2000. The Argyle* mine in Australia is famous for it's production of rare pink and red diamonds and some exceptional blues, which in the last 20 years have become an investor's favourite.

** The Australian Argyle mine will cease production as of early 2021. The rare pinks will only get rarer.*

Diamond mining ends up doing a lot of good for the communities in whichever countries diamonds are mined in an orderly and regulated manner. The figures speak for themselves. Consider this - diamond mining companies provide over $16 billion in total net benefit contributions, with $4 billion going towards salaries and benefits. Diamond mining can sometimes also transform the fortunes of a whole nation.

Take Botswana, for instance. From being one of the poorest countries in the world, Botswana harnessed the power of its diamond resources and today has become one of the globe's great development success stories.



Together, the world's leading diamond producers create $16 billion worth of positive socioeconomic and environmental benefits annually in countries where they operate – almost 80% of which stays within the local communities.

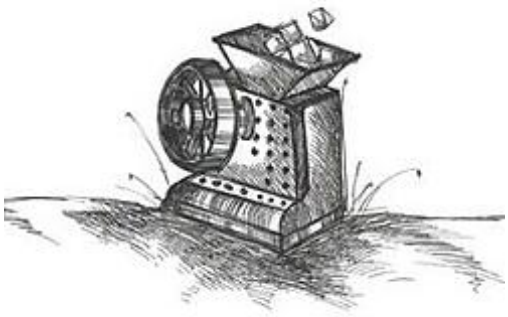
80% of diamonds found in nature are classified as 'industrial' and due to their extreme hardness find use in numerous industrial applications and abrasive tools.

INDUSTRIAL USES OF DIAMONDS

Diamond's industrial uses take advantage of its overwhelming strength and wear resistance properties as well as its unequalled heat conducting* ability. Some of the better known applications are for specialised deep sea drill bits for the oil and mining industry, diamond encrusted saws and abrasives in the tool and die industry, medical scalpels and bio-medical implants in surgery, including many recent uses in high technology applications.

The lesser known but critical applications being in high energy optical lasers, diamond lenses and windows for space use and now increasingly in heat management of ever faster quantum speed computer chips and literally thousands of other uses in daily life. **Industrial diamonds are in fact on the list of the top five strategic industrial materials.**

Thankfully, the ever-expanding use for industrial diamonds in the less critical areas is being supplemented by synthetic lab-grown production. Mined production of diamonds has been unable to satisfy the demand for industrial diamonds ever since the end of the Second World War.



It is a perfect **non-conductor of electricity but also the most efficient **conductor of heat** - a unique property not possessed by any other material on this planet. Taking advantage of this, diamonds find many specialized (and critical) industrial and commercial uses. Many applications have yet to be discovered but the potential is enormous.*

MANUFACTURING & DISTRIBUTION

The market probably changed as much after **1990** as it did in all the years after the **1866** discovery of diamonds in South Africa and the establishment of De Beers. The 1990s brought exciting new sources and encouraged the dramatic growth of some newer cutting centres in China, Thailand while cutting and polishing (diamond manufacturing) continued to expand rapidly in India. All this was happening as the world economy fluctuated wildly.

This conversion of rough into polished diamonds today happens mainly in India, Russia & Botswana and

to a lesser degree in China, Belgium and Israel. Very little polishing takes place today in South Africa or Thailand.

India polishes 85% by volume and about 70% by value of the gem diamonds in the world using state of the art automated technology combined with the skills of traditional manual cutting methods. These days it doesn't really matter where a diamond is polished.

" 'Belgium cut' today refers to a diamond cut by a Belgian owned company in India using Israeli technology".

PRICING & VALUE

Back to the Top

Aside from the much touted 4Cs, the story of a natural diamond is a story a billion years in the making. It is essential to appreciate the unique qualities of a diamond in order to understand why it commands the awe, respect and the price that it truly deserves.

The Earth no longer actively creates diamonds (those that exist have already been formed but not discovered), making them a finite natural resource. Diamond recovery peaked in 2005 and there have been no significant diamond discoveries in the last 30 years after the Canadian discovery. There are such few one carat diamonds being recovered each year, that the total number would fill only one exercise ball. As these diamonds grow rarer by the day, they become increasingly valuable.

Rarity is by far the greatest single factor influencing the price of a natural diamond. ***Rarity is also the primary factor that has supported the value of a diamond over the centuries.*** Likewise, over the centuries, many a tulip rush have come and gone but the value of a diamond has endured.

"It is still the most expensive material (by weight) known to man"

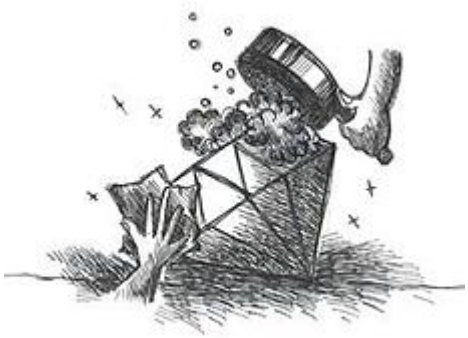
FAMOUS 4Cs – DETERMINING THE PRICE OF A DIAMOND

- ***Carat** is most significant* - When it comes down to the first 'C', **carat** refers to weight, not the size. Larger diamonds are much rarer than smaller diamonds as found in Nature. Size has an exponential effect on price and has a direct impact on the amount of brilliance that a diamond emanates. Logically so.

- *Then the **Cut*** - The second most important 'C' is the quality of a diamond's **cut** (proportions, symmetry and finish). It is of prime importance in determining the value of a diamond. A 'poor' or 'average' cut will significantly affect its brilliance which has a direct correlation to its value.

"The only human contribution to a diamond's beauty is a well-executed Cut. Hence the importance of cut quality to a diamond's value."

- ***Colour** too matters* - The next important factor after Cut is colour. The highest colour band of natural diamonds is colourless (D-F) while the lowest colour band (X-Z) has a pale-yellow or brown tinge. D to F colour diamonds are inherently rarer in Nature (but not necessarily prettier) and therefore more valuable. A diamond in every colour range has an appropriate market value.

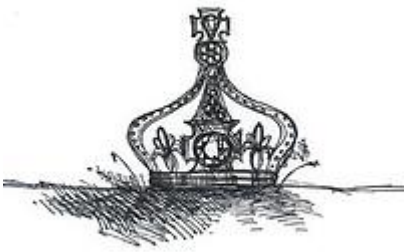


- ***Clarity** not as significant* - The clarity (presence of natural inclusions and blemishes inside the crystal) of a natural diamond is important inasmuch as it too reflects rarity. These inclusions are usually too tiny to be seen by the naked eye and insignificant to the beauty of the diamond. However, in the real world, the influence of clarity on a diamond's price is disproportionate to its significance as it is the simplest of the 4Cs to

understand (or misunderstand).

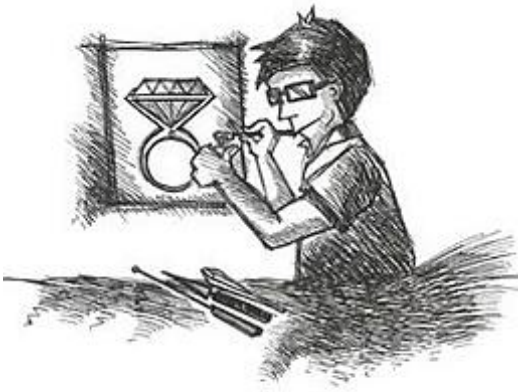
USE IN JEWELLERY

Historical: Jewellery is a universal form of personal adornment. Its use dates back to as far back as the first excavations of prehistoric man, weaving its way through every culture in recorded history. This common thread amongst all ancient cultures, spread over time and geography confirms without question that the use of jewellery was an essential part of social behaviour.



The knowledge gathered through these observations also provide useful insights on how ancient societies interacted and how jewellery with gemstones, pearls and other precious metals have evolved.

The point at which adoption of diamonds for use in jewellery began is unclear but in the early Middle Ages, diamonds were believed to have healing properties and were used as good luck charms. This belief evolved with time and diamonds became objects of value - primarily as gemstones used in jewellery for the priviledged of society.



The first recorded use of a diamond in jewellery was on the crown of a Hungarian queen in 1074 AD. From then on, diamonds were used in many royal crowns and jewels, deepening their perception as a symbol of status and power. This lasted for a few centuries till Archduke Maximillian of Austria commissioned the first diamond engagement ring in 1477. This event started an unstoppable desire for diamond rings amongst European aristocracy, kings and queens and the maharajahs and sultans of the East.

Recent Past: From Medieval times through to the Renaissance and the Age of Discovery right till the late 19th century, to the Art Deco and Art Nouveau periods of the early 20th century, jewellery has always had a purpose and a message. And through this long period,

the significance of diamonds in jewellery has only grown.

With the De Beers takeover of diamond production and distribution in the early 20th century, diamonds were presented as affordable luxury to the American middle class. The age of the diamond truly arrived with the launch of the iconic '***A Diamond is Forever***' campaign by De Beers in 1947. The famous slogan implied the durability of a diamond (specifically the round brilliant) and symbolized the commitment of marriage. The belief, that a diamond's purity and brilliance signified a man's true love for a woman spread all over the world. The opening of more De Beers mines in Southern Africa enabled a massive expansion of the market for diamonds.

Contemporary: Today, the diamond engagement ring is universally known to represent love, commitment and a 'forever union', with couples opting to choose other fancy diamond cuts and modern ring styles. Natural diamonds are now used not only for jewellery, but also on jewelled watches and objects d'art. Celebrities, sports persons, Hollywood and Bollywood film stars have further popularised the use of diamond jewellery making diamonds an aspirational product amongst the wealthy and the middle class. With the wide range of diamond cuts produced today, and the fancy colours and styles available, contemporary jewellery design options are endless!

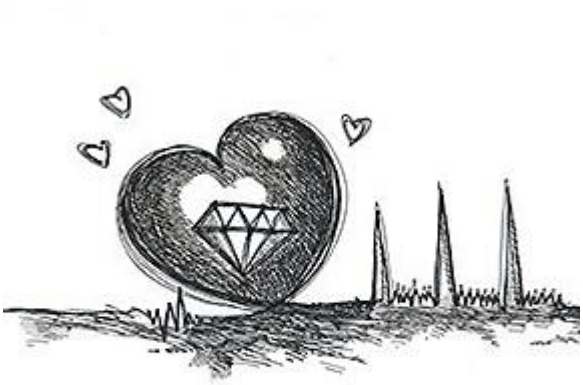
In the last 20 years, D flawless and fancy colour diamonds have been a much sought after category for investment purposes and asset diversification. Fancy pinks, blues and violets are fetching record breaking prices reaching millions of dollars per carat at the important auction houses.

"After all, the true value of a diamond is in effect a measure of its brilliance".

Future: Diamond jewellery demand is expected to rise once the turmoil from the COVID pandemic settles, as countries with major population centres such as China, India, Brazil and Indonesia continue to expand their middle class. There is the common belief that Gen

Y and Z is not interested in materialistic possessions, and diamonds in particular don't excite them. However a 2019 report by Bain and Co. came to the opposite conclusion. Younger shoppers will play a major role in the rise of the luxury industry, Bain stressed, with Generations Y and Z contributing a significant portion of the future market growth. Diamond jewellery is one of the 3 luxury products identified.

DIAMONDS AS A STORE OF VALUE



A diamond is the most concentrated form of wealth (extreme weight to value ratio) and is relatively easier to price and evaluate compared to many other gemstones. Accurate cutting and polishing helped by modern technology and better grading standards has greatly reduced subjectivity.

" It is a great form of personal adornment and an important symbol of family legacy and a coveted asset in wealth inheritance "

In times of strife, it is a highly mobile form of convertible currency - just ask the European survivors of Nazi Germany, the Vietnamese boat people of the 70's, the Kuwaitis who were pushed out of their homes overnight in 1992 by Iraqi forces and the countless Indonesians who escaped the riots in Indonesia in May 1998.

Many who fled these troubled areas survived and rebuilt their lives because the elders in their families had the foresight to diversify some of their hard-earned cash into diamonds. Indeed, many refugees took their gold ornaments and ingots too - but one cannot beat diamonds for **portability.**

LAB GROWN or SYNTHETIC DIAMONDS

Synthetic diamonds for industrial use were first produced in the lab almost 70 years ago by General Electric. Since then, many large industrial giants in Japan, the US, Russia and China have produced industrial diamonds in large quantities to satisfy purely industrial needs. It has taken almost 60 years for gem diamonds to be produced in larger sizes and sufficient quantities, to be of any value as gems. With the new CVD technology that eliminates the need for crucibles using high pressures and temperatures, size is no longer a restricting factor and costs are quickly coming down and qualities getting better.

Today, there are many varieties of laboratory-grown synthetic diamonds on the market. These are all made of pure carbon and have the same physical properties as (mined) diamonds. Without the earthly origins of natural diamonds, ***they lack the unique colours and inclusions infused by Nature.***

To keep up with the demand for industrial and jewellery use, scientists have ramped up production. Costs are rapidly coming down, the crystals are getting larger and purer and while a laboratory-grown diamond has the same chemical makeup as a natural diamond, their mass-produced origins are just as easily detected with improved technology ***preventing them from being passed off as natural.***

The natural industry players and the producers of lab grown diamonds themselves have developed sophisticated yet portable detection equipment to differentiate natural from lab grown diamonds. **This detection ability has kept ahead of the curve in advances of lab grown diamond production.**

Even though mass-produced lab-grown diamonds are sold at comparatively attractive prices, they have little to no resale value because they can be endlessly replicated and have no history or emotional story to talk about.

Due to the immense amount of energy required to replicate a real diamond's billion-year natural growth process in only a few weeks, laboratory-grown diamonds produce 3 times more carbon emissions per carat than natural diamonds. And of course these diamonds can be mass produced making them effectively worthless as a store of value or a sentimental possession. Lab-grown diamonds will never have the same allure of natural diamonds as the consumer recognises anything rare and valuable can only be Natural.

"In the long term, synthetic diamonds will find greater value in high-end industrial applications with their prominence in jewellery use diminishing".

CONFLICT DIAMONDS

Diamonds were the first mined mineral to come under the NGO radar when the term 'conflict' was first coined and became an issue – the original definition of conflict was narrow and referred specifically to the diamonds origination from the conflict zones due to the civil wars that were ongoing in the four diamond producing countries in Central and

West Africa. In 1999-2000, about 4% of all diamonds mined came from conflict areas but by 2001, when the diamond industry spearheaded the Kimberly Process (KP) certification scheme for rough diamonds, this figure had come down to less than 2%.

Under the original definition of conflict, today less than half a percent of all mined diamonds could be termed as being from "conflict" origins, which is still a half percent too much. The KP certification scheme is functioning well and is monitored and regulated by the UN. It is probably the only industry run self-policing scheme that has borne results.

At present besides diamonds, there are four other legally designated *'industrially significant'* conflict minerals, namely tantalum, tin, gold and tungsten.

"Lab-grown diamonds will drastically come down in price and find their own distinct market with their own set of value seeking customers while conflict diamonds will serve as a reminder of the industry's coming together to set right an injustice." *Suresh Hathiramani, at a Maybank presentation, Kuala Lumpur, September 2016*

THE CASE FOR NATURAL

The natural diamond industry is one with many facets. What brings us together as one is our love and appreciation of this rare gift from Nature that allows us to share the beauty of billion-year-old natural diamonds with the people of the world.

Another priority for the diamond industry, of course, is the need for conservation of the planet. Natural diamond miners and producers are committed to controlling and reducing their environmental impact on the Earth's fragile ecosystems in the remote regions where diamonds are mined. From the rural lands of Canada to the resource rich grasslands of Botswana all the way deep within the Australian desert... making the modern diamond mining an industry with a positive world-wide influence. Along with this positive social impact, the natural diamond industry supports the livelihood of 10 million people globally and means happiness and security to many hundreds of millions more.

History tells us that the diamond's attraction has endured

across the wealthier and developed societies over centuries. There have been compelling reasons for this. Now this desire for combined with a better understanding of diamonds is spreading to many developing societies. The natural diamond's future is shining bright.

"Every natural diamond is unique, like a fingerprint"

- It has remained a highly portable, lasting and beautiful store of value that is treasured for its rarity, brilliance and its unique physical properties.
- Diamonds across a wide range of sizes and grades are stores of value, some greater some lesser and unlike other luxury products do not have a "use by" date and do not go out of fashion.
- A narrow range of diamonds of a size greater than 3 carats up to 20 carats in the higher colour/clarity grades (D to F, IF to VS2) and some rare pink, blue, green and yellow diamonds, if judiciously selected and acquired with professional advice can be extremely rewarding investments.
- It happens very often that a diamond is bought purely for investment but often lands up being a family heirloom kept for generations in one family.
- Above all, a diamond's enduring value is in the emotional links it forms with our past generations - there is nothing like wearing your late grandmother's ring - feels like she is with you through all your ups and downs of life.
- Diamonds are Nature's gift to mankind and only a natural diamond has attributes that bestow upon it the right to be called the king amongst gemstones.

In conclusion, I am reminded of the very appropriate catchphrase in the long running advertisement for Patek Phillipe watches – "*you never really own a Patek but merely look after it for the next generation*" and this also applies to diamonds.

Back to the Top

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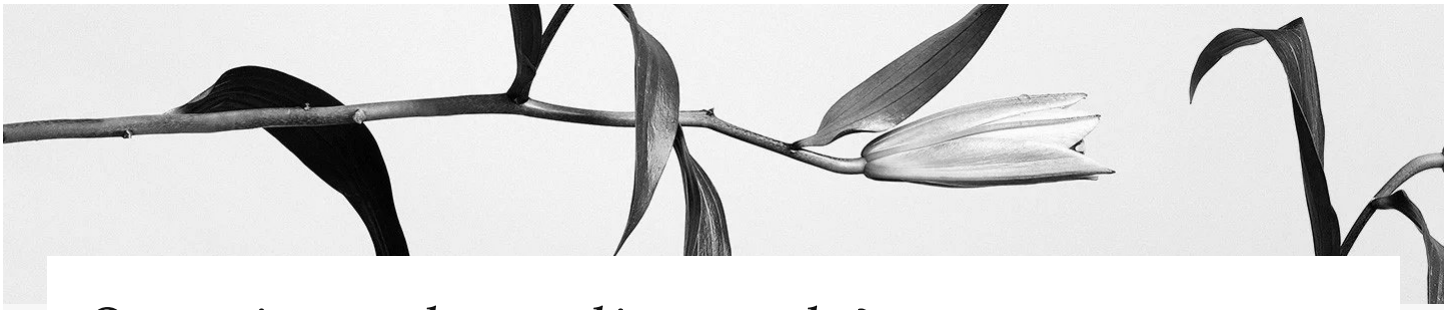

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Blog
Reviews

Diamonds

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Explore Selection

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Jewellery Resetting
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Ring Size Guide

Trade Services

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