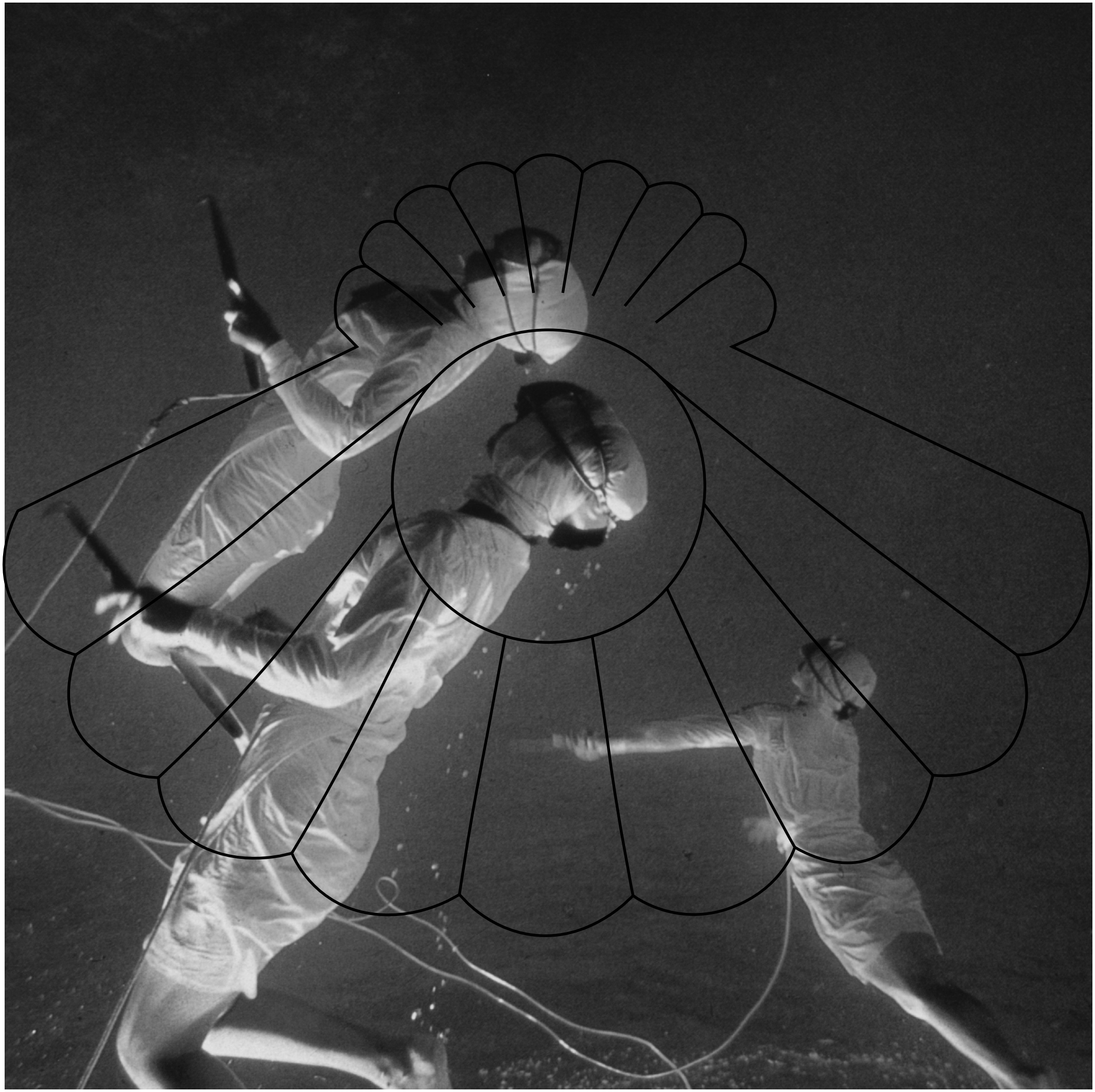

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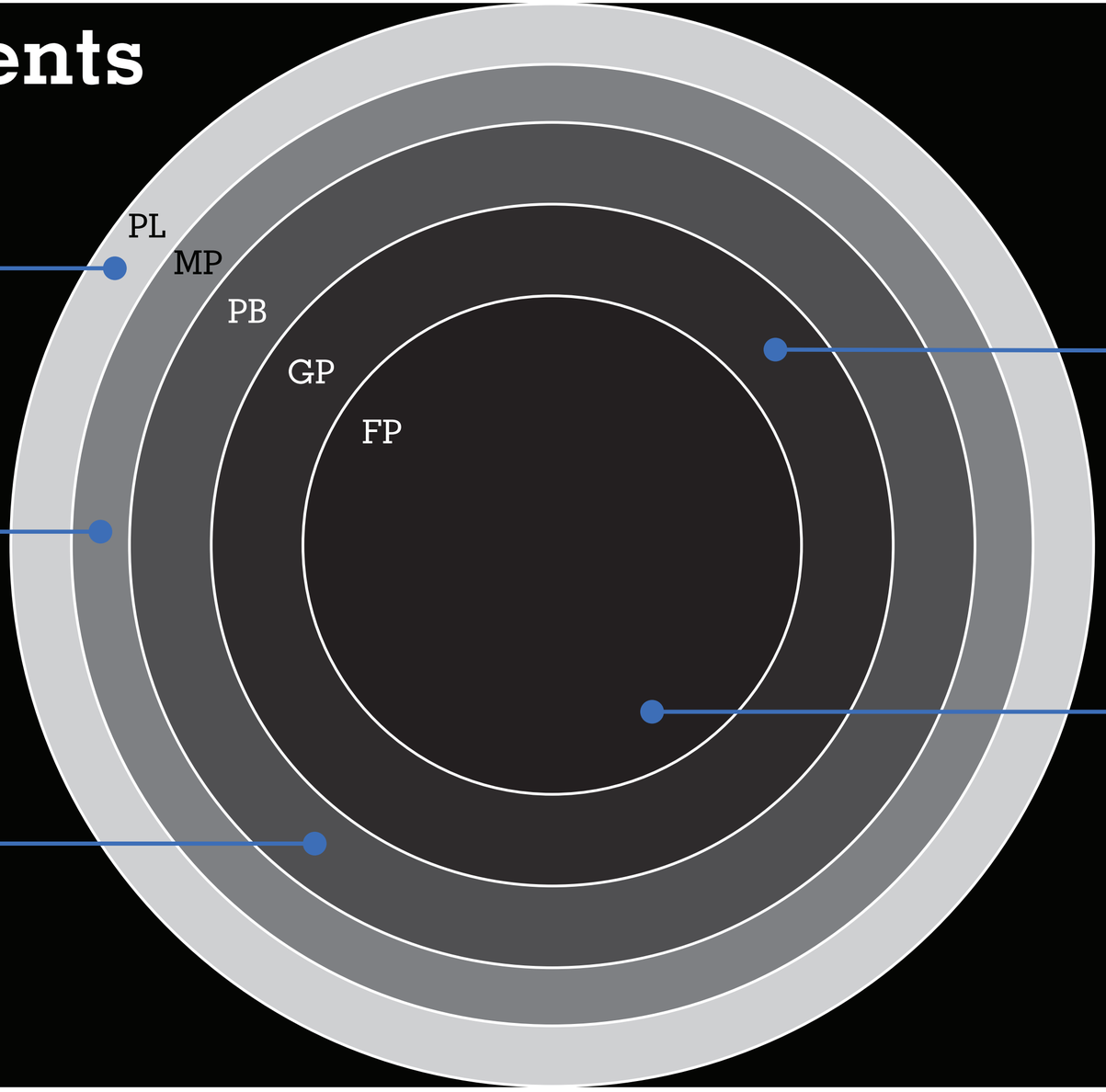
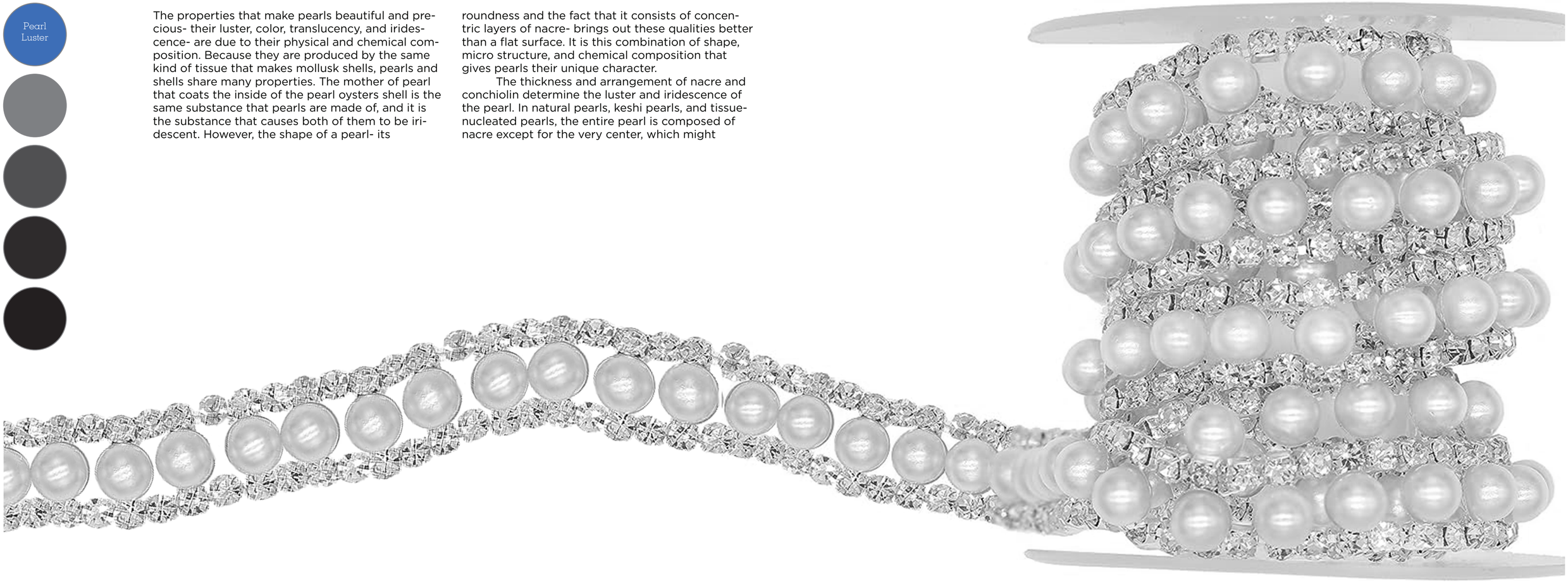


Pearl Luster

Pearl Luster

The properties that make pearls beautiful and precious- their luster, color, translucency, and iridescence- are due to their physical and chemical composition. Because they are produced by the same kind of tissue that makes mollusk shells, pearls and shells share many properties. The mother of pearl that coats the inside of the pearl oysters shell is the same substance that pearls are made of, and it is the substance that causes both of them to be iridescent. However, the shape of a pearl- its roundness and the fact that it consists of concentric layers of nacre- brings out these qualities better than a flat surface. It is this combination of shape, micro structure, and chemical composition that gives pearls their unique character.

The thickness and arrangement of nacre and conchiolin determine the luster and iridescence of the pearl. In natural pearls, keshi pearls, and tissue-nucleated pearls, the entire pearl is composed of nacre except for the very center, which might



Composition

PL

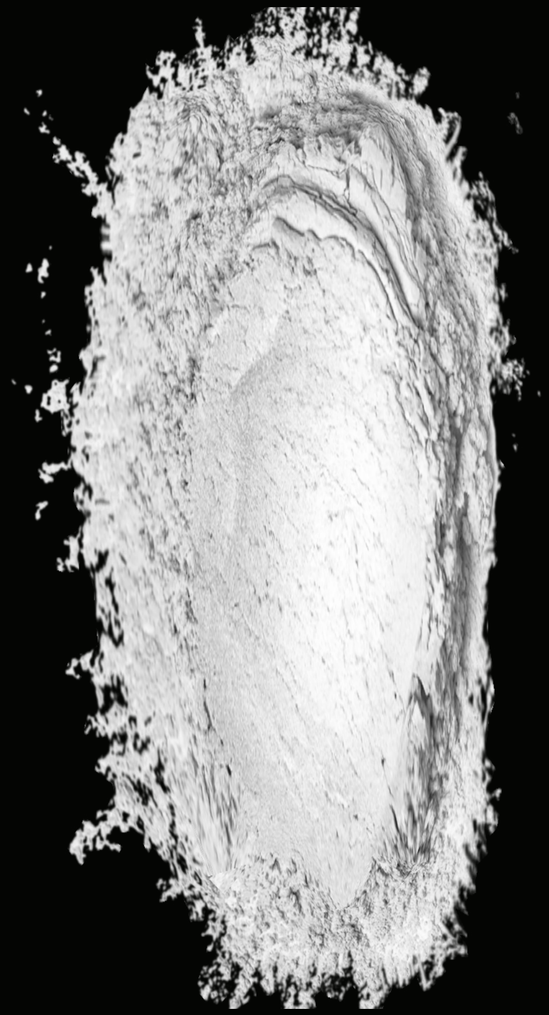
preserve the remains of the organism or tissue that induced pearl formation or it might be hollow.

A hollow space is the void left after the decomposition of the organic material that stimulated nacre secretion. In the gem trade, a hollow pearl is called a souffure. In bead-nucleated cultured pearls, the thickness of the nacre surrounding the nucleus varies depending on the species of pearl oyster or mussel and culture conditions.

In some pearls, needle-like prismatic crystals are present in addition to nacreous crystals. For example, in some Japanese cultured pearls, a thin concentric layer of calcitic prismatic crystals surrounds the nucleus.

Such a transformation from one crystal type to another can occur in a variety of mollusks and is the result of a complex interaction between organic material and the ions of calcium and carbonate. Other pearls such as conch pearls, and melo pearls, are composed entirely of prismatic crystals and conchiolin.

During the growth of the nucleus of a pearl, layers of nacre and conchiolin are secreted on the surface, on top of one another. These layers are not absolutely continuous



around the entire pearl. As a result, in microscopic view, the surface of a pearl appears as a landscape of irregular plateaus forming a finger print like pattern of meanders. The edges of these plateaus are the irregular edges of the nacreous sheets.

This visible crystalline landscape contributes to the luster and iridescence of pearls. It is as though there were a series of crystalline staircases refracting light like a prism. This rough surface also provides a tell-tale tooth test to distinguish real pearls, either natural or cultured, from imitation glass or plastic pearls. If a real pearl is gently run across real front teeth, it will feel gritty. An artificial pearl will feel slippery and smooth.

Luster is one of the most distinctive features of a pearl. Variously defined as sheen, gloss, brilliance, radiance, or glow, luster is more than a surface reflection. It appears to originate from within the pearl, a ball within the pearl- the more intense the image of the ball, the better the luster.

One measure of luster is the quality of reflec-

Measurement

PL

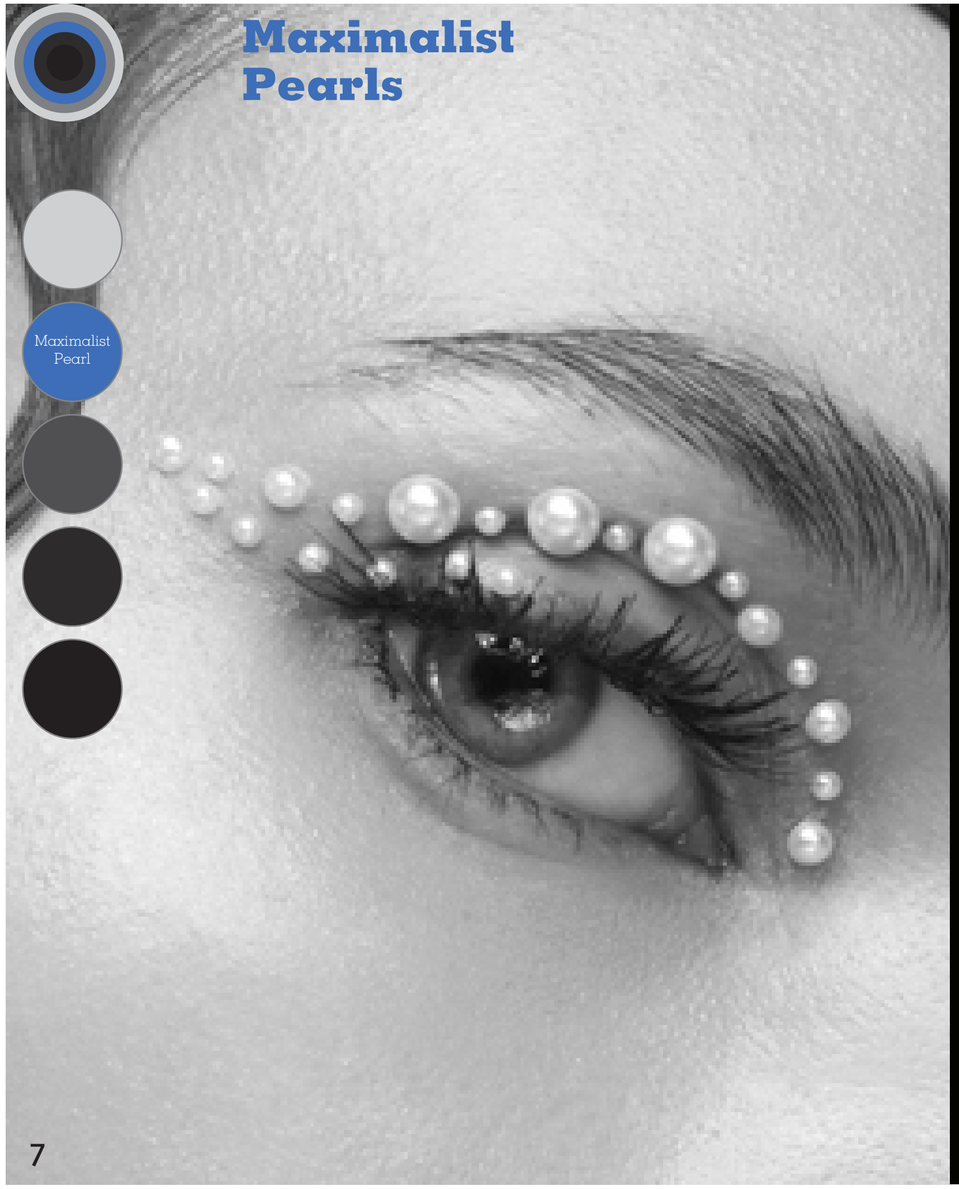
tion. If a pearl with high luster is examined under a regular source of light, a rectangle with sharp, clean contours will be reflected in the pearl. A dull luster pearl will, in contrast, produce a hazy, indistinct reflection. Another assessment of luster is the contrast between light and dark areas on the pearl. The more lustrous the pearl, the greater the contrast.

Pearls with very high luster, such as high end Akoyas, are highly prized. Pearls with a satiny, or silky luster, characteristic of Australia and Myanmar, are also very desirable in today's market. "Black" pearls from Tahiti show a mirror-like luster. Freshwater pearls from the united States and China range in luster from milky to satiny. Poor quality pearls have a dull or chalky luster and very thin nacre.

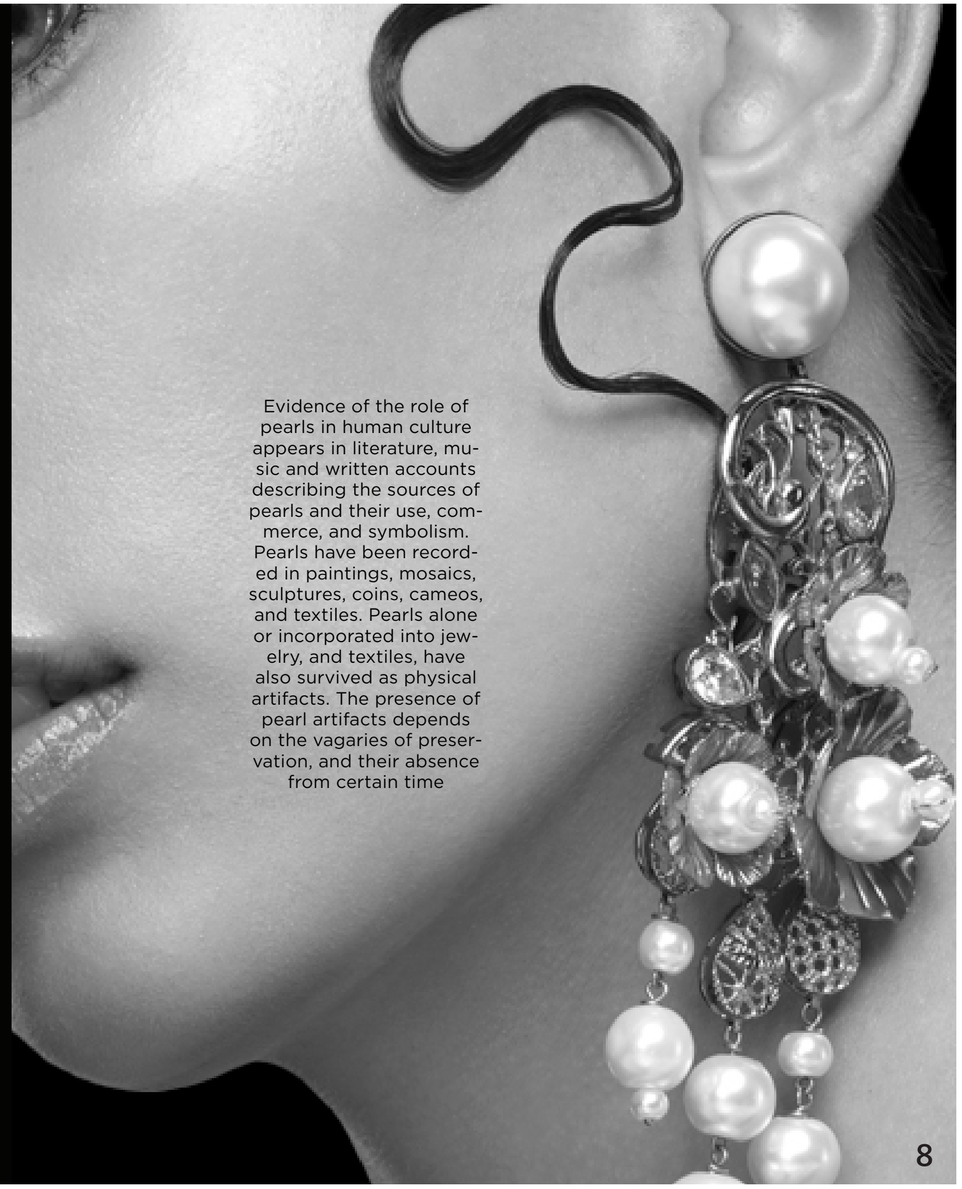
The luster of a pearl is the product of both the shape of the pearl and its structure and composition. Because a pearl is spherical, its surface is like a curved mirror. As a result, reflected light rays appear to emanate from within the pearl. In addition, the surface of a pearl is not opaque. The layers of nacreous crystals range from translucent to transparent.

Maximalist Pearls

Maximalist Pearl

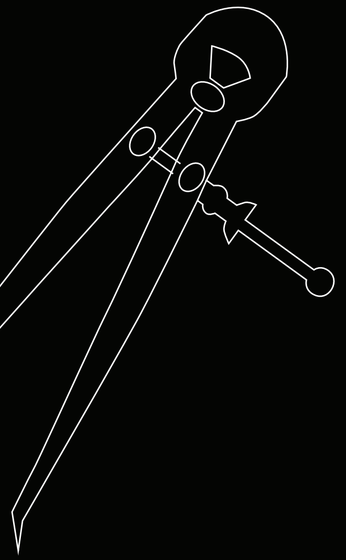


The round and silky luster of pearls have always appealed to the aesthetic sensibilities. The fact that living animals produce them makes them unique amongst gems and added to their fascination. Their color and origin have combined to imbue them with precious and symbolic associations, and over the centuries they have been used as religious artifacts, personal adornment, and royal trappings.



Evidence of the role of pearls in human culture appears in literature, music and written accounts describing the sources of pearls and their use, commerce, and symbolism. Pearls have been recorded in paintings, mosaics, sculptures, coins, cameos, and textiles. Pearls alone or incorporated into jewelry, and textiles, have also survived as physical artifacts. The presence of pearl artifacts depends on the vagaries of preservation, and their absence from certain time

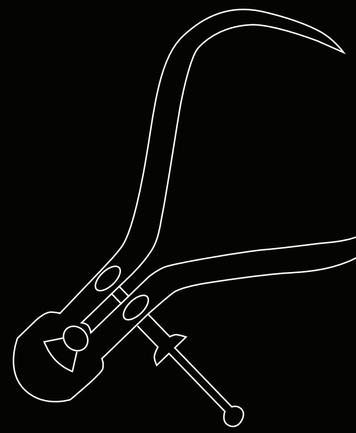
Historical Decadence

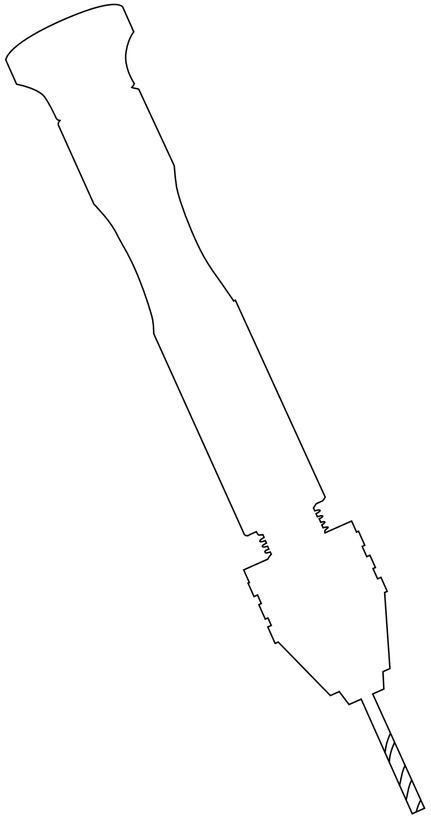


periods does not always mean that pearls were, in fact, absent at those times. On the basis of these pieces of evidence, we can construct a cultural history of pearls. The place of pearls in Roman society is illustrated by the writings of Pliny, Seneca, and other social commentators. Most of their comments are critical and especially target women, as documented by Pliny:

Or ladies quite glory in having [pearls] suspended from their fingers or two or three of them dangling from their ears... Nay, even more than this, they put them on their feet, and that, not only on the laces of their sandals, but all over their shoes; it is not enough to wear pearls, but they must tread upon them and walk with them under foot as well.

Sumptuary laws were enacted by Julius Caesar to limit the display of pearls. By women below a certain rank, thus making pearls an immediate indicator of status. Another target of social criticism was the extravagant use of pearls in the Imperial Court. The emperor Caligula “in addition to other feminine luxuries, used to wear shoes adorned with pearls”. Throughout the history of

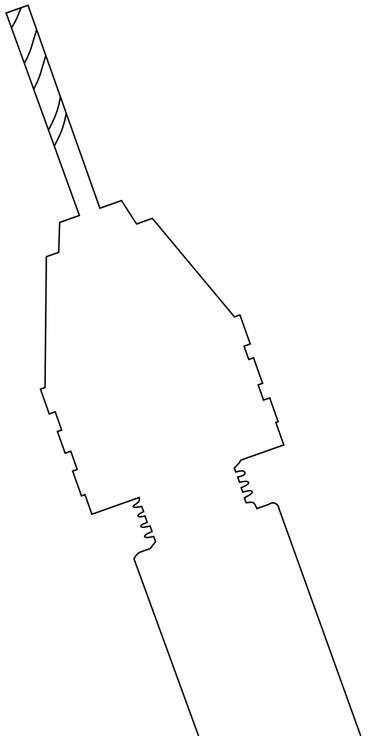




the Byzantine Empire, pearls were used lavishly at the imperial court. Rulers wore diadems, necklaces, and collars of pearls and colored gemstones. Imperial robes were encrusted with pearls and, according to one historical account, the canopy above the throne was made of purple cloth embroidered with pearls. As Byzantium grew in power in the sixth through the eleventh centuries, much of western Europe was in a state of war and turmoil. Pearl treasures were destroyed or resurfaced in new dynasties. Several such treasures have survived and reflect Byzantine workmanship or influence.

The Crusades in the twelfth and thirteenth centuries renewed interest in pearls, as these campaigns to capture the Holy Land from the Muslims introduced Europeans to the riches of Byzantium and the Islamic world. As a result trade routes were reopened, leading to a fresh supply of pearls in the European market.

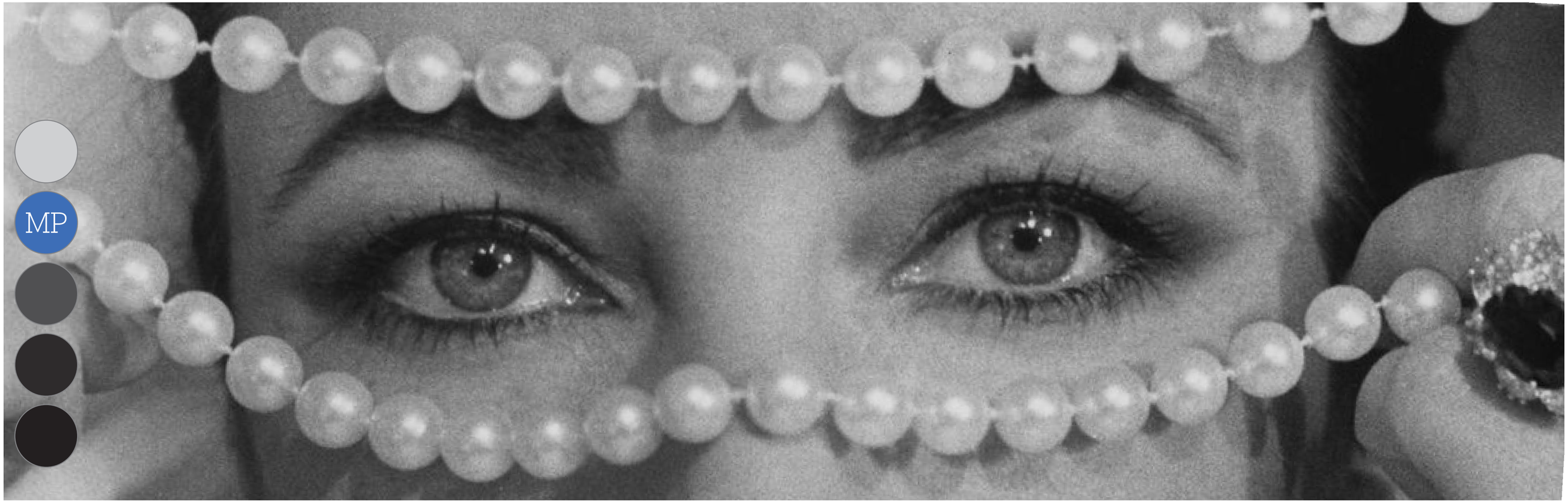
During the Renaissance there was a revived taste for art and pearls, as they became an ever-present gem symbol of wealth, status, and taste in an age of splendor. The availability of pearls was unprecedented. The voyages of Columbus and his successors opened up new pearl grounds in the Americas, in addition to the availability of pearls from India, Ceylon, and the Persian Gulf. Kings, Queens, and nobility wore



Royal Pearls

Pearls in abundance. One contemporary writer observed that “the better sort of women are observed wearing rich chains of pearls”. The lavish use of pearls during this time was captured by numerous official portraits. Portraits of King Henry the VIII of England show the king adorned in pearls. He is portrayed in clothes embroidered in pearls, and broad necklaces made of gold and studded with pearls and gems. The many portraits of Queen Elizabeth I throughout her fourty-five year reign document the vastness of her pearl collection. She wore enormous quantities of pearls to convey different images: the purity of the “Virgin Queen”, the power implied by access to the pearling grounds of India and the Americas, the pomp of majesty, and the actual wealth of the pearls. The prominent Medici family of Florence are also depicted wearing pearls, men and women. What is evident is that throughout history the rich and powerful and anyone who could get their hands on a pearl, would use them as a display of wealth and power.

Early in the twentieth century, fine natural pearls were still reserved primarily for the rich.



Culture(d) Pearls

With the advent of cultured pearls in the 1920's, a new market was created. Pearls became more abundant and larger pearls became more affordable. Perliculturists learned to standardize pearls to the extent that major jewelery firms could guarantee the availability of cultured pearls of a particular size and color. By the end of the twentieth century, cultured pearls were produced in numerous areas, resulting in a greater variety of pearls than ever before and at prices that made them affordable to nearly everyone.

In the United States and Europe in the 1920's, long ropes of pearls were very popular. Flappers wore them as they danced the Charleston in their new short dresses. Entertainers such as Josephine Baker performed for Parisian audiences wearing two or three long ropes of pearls and little else. The dancer Irene Castle, performing with her husband, Vernon, wore ropes of pearls and popularized the "headache band", a velvet ribbon embroidered with pearls worn around the forehead.

Pearls were occasionally used in Art Deco jewelry of the 1920's and 1930's but did not play a major role. At about this same time, the Parisian designer Gabrielle "Coco" Channel promoted a new casual approach to pearls: "A woman needs ropes and ropes of pearls." Chanel mixed her pearls, real or imitation, and advocated wearing pearls with sweaters and skirts. She invented the "little black dress" that, when worn with pearls, was appropriate for nearly any occasion.

The 1920's and 1930's saw the introduction of Japanese cultured Akoya pearls to the international market. These pearls were white, perfectly spherical, and 6-8 millimeters in diameter. Initially, these pearls were not considered "real gems", but eventually won acceptance through the publicity campaign of the Japanese perliculturist Kokichi Mikimoto.

The culturing processes has effectively

Pop Culture Pearls

changed the concept of the perfect pearl. A Cultured pearl is spherical, a shape that rarely exists in nature. Even the most spherical natural pearls are slightly off-round, commonly described as the past hazelnuts, or filberts. The irony of cultured pearls is that perfectly round pearls is now the standard.
Following World War II, Japanese cultured pearls became increasingly prevalent. Part of their popularity in the United States stems from American GI's stationed in Japan who brought pearls back home as gifts. Prestigious jewelry firms also began promoting cultured pearls, as pearl production in Japan peaked in 1966.
One of the traditional associations of pearls in the twentieth century was with weddings, reaching a peak of popularity when American actress Grace Kelly married the Prince of Monaco in 1953. Her wedding dress, veil, and shoes were all trimmed with pearls. A wedding dress in the Brooklyn Museum in New York is nearly covered with seed pearl embroidery. These dresses elevated every American bride to the status of princess, at least on her wedding day.

Pearls passed out of vogue in the 1970's but reemerged in the 1980's with an upswing in the American economy and a renewed taste for opulence. The popularity of pearls was heightened by the reintroduction of images of celebrities, royalty, and movie stars wearing pearls- Wallis Simpson, Marilyn Monroe, Audrey Hepburn, Grace Kelly, Maria Callas, Diana Vreeland, and Elizabeth Taylor. Pearls also appeared in official portraits of almost all American first ladies including Eleanor Roosevelt, Bess Truman, Mamie Eisenhower, Jackie Kennedy, Pat Nixon, Barbara Bush, and Hillary Clinton. These women endowed pearls with their own glamour and enhanced their appeal.
One of the most celebrated figures of the late twentieth century, Lady Diana Spencer, Princess of Whales, especially favored pearls, underscoring the association of pearls with royalty in the modern era. She often wore pearl chokers and earrings, and occasionally, the Lover's Knot Tiara with nineteen pearl drops. Most notable among her famous dresses was the "Elvis Dress", a strapless gown and jacket with a stand-up

Icon Pearl

collar designed by Catherine Walker and heavily embroidered with imitation pearls. Elaborate pearl costumes have been designed for theatre, opera, and movie studios, emphasizing the fantastic, exotic appeal of pearls in Western culture. French couturier Paul Poiret created the style known as “orientalism”, an exotic interpretation of eastern fashion that emphasized pearls. The French artist Erte created glamorous

outfits covered with pearls for the French nightclub, Folies Bergeres. Hollywood stars of film Rudolph Valentino, Lucille Ball, Jack Lemon, Audrey Hepburn, and Tim Curry, to Natalie Portman, have reflected a continuing taste for pearls in fashion in all dimensions. Whether it be natural pearls, cultured pearls, or even imitation pearls, it is clear that the pearl has been an influential symbol that has adapted throughout history.

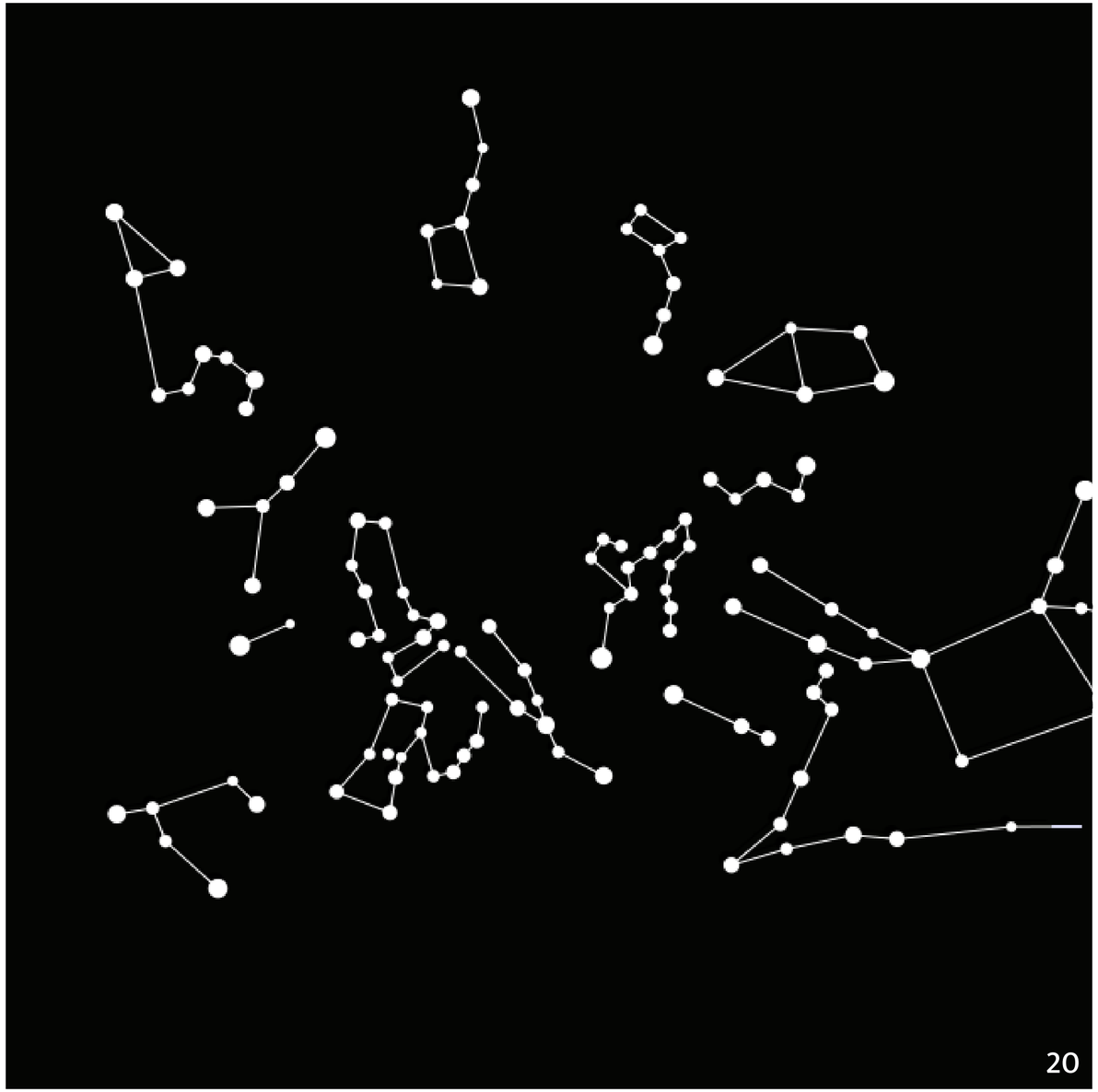
Pearl as a Birthstone

Pearl as a Birthstone

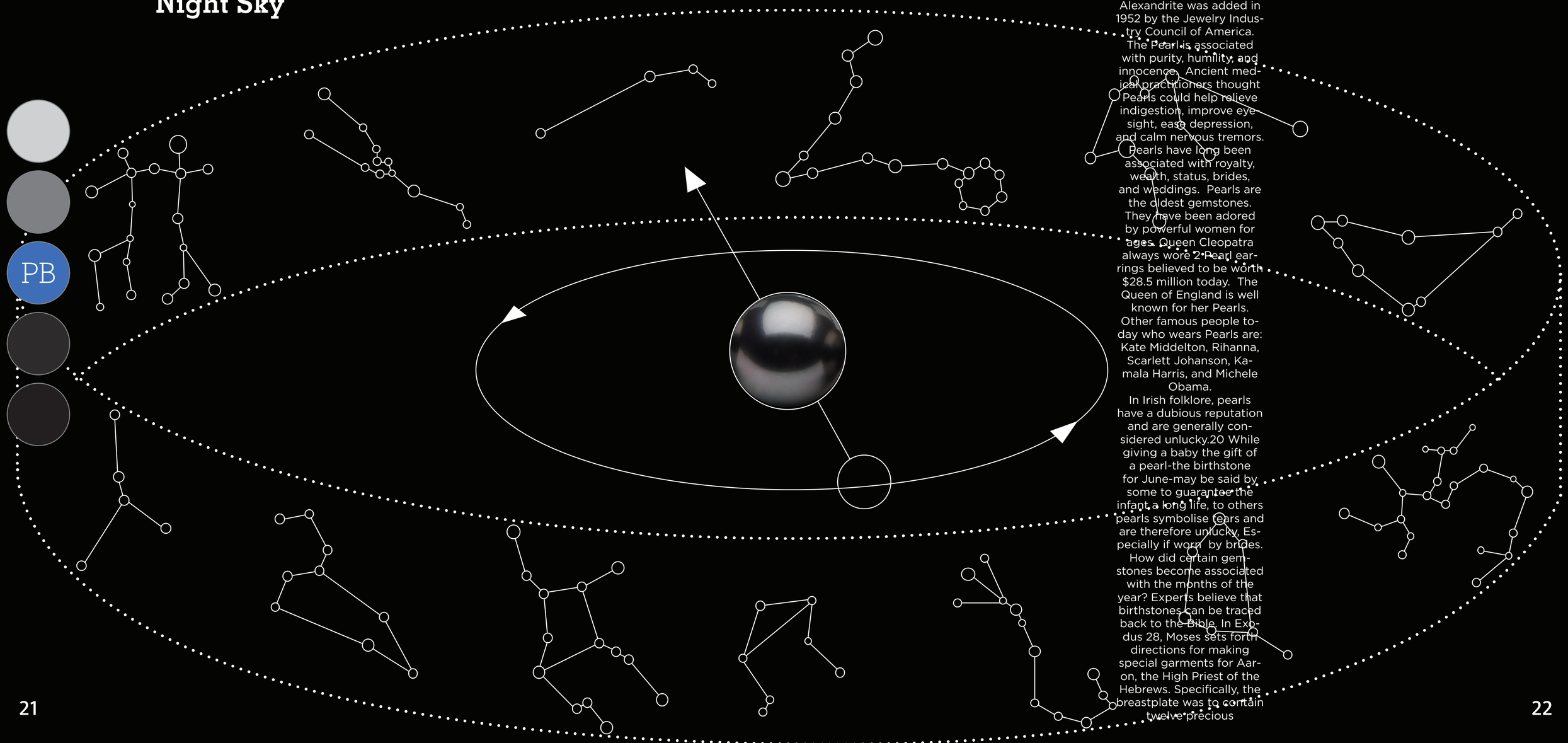
Those born in June are lucky enough to have three birthstones: pearl, alexandrite and moonstone. Of these three, pearl is the most popular – and so it is pearl that we will focus on. Like other gemstones, pearls are deeply symbolic. They are considered demure, delicate, and pure, but are also associated with female power. Wealthy women – such as royalty, politicians, and CEO's – are often seen wearing a string of pearls. The pearl is aligned with the zodiac sign of Gemini and has been said to bring love, luck, wisdom, and peace. The whiteness of pearls is associated with purity, making pearls popular in wedding jewelery, such as vintage wedding rings.

Why does June have three birthstones?

The original birthstone for June was the Pearl. Ancient Greeks believed that Pearls were the tears of the gods. Moonstone became another birthstone for June in 1912 when the National Association of Jewelers of American



Night Sky



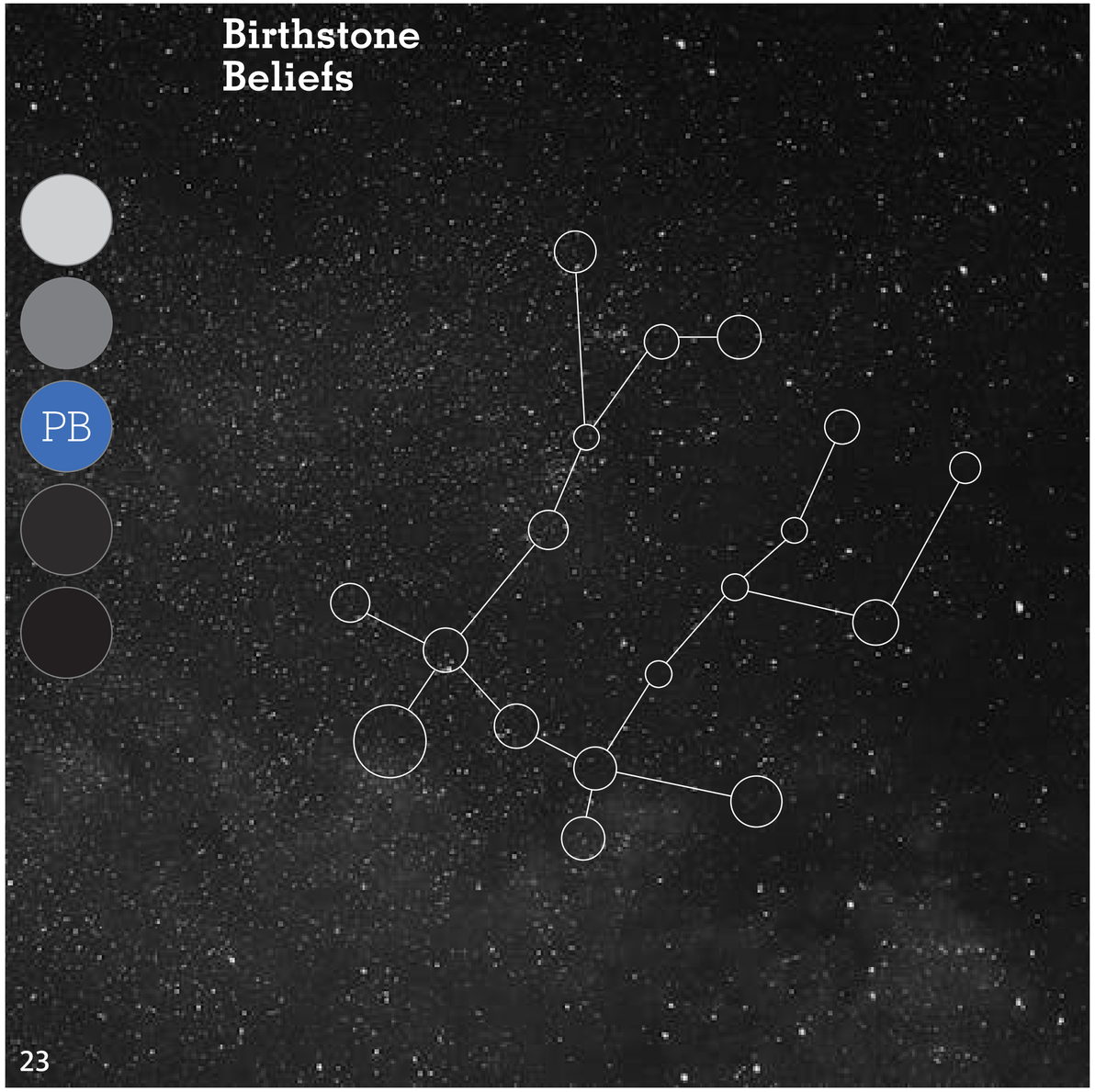
dardized birthstones. Alexandrite was added in 1952 by the Jewelry Industry Council of America.

The Pearl is associated with purity, humility, and innocence. Ancient medical practitioners thought Pearls could help relieve indigestion, improve eyesight, ease depression, and calm nervous tremors. Pearls have long been associated with royalty, wealth, status, brides, and weddings. Pearls are the oldest gemstones. They have been adored by powerful women for ages. Queen Cleopatra always wore 2 Pearl earrings believed to be worth $28.5 million today. The Queen of England is well known for her Pearls. Other famous people today who wears Pearls are: Kate Middelton, Rihanna, Scarlett Johanson, Kamala Harris, and Michele Obama.

In Irish folklore, pearls have a dubious reputation and are generally considered unlucky.20 While giving a baby the gift of a pearl-the birthstone for June-may be said by some to guarantee the infant a long life, to others pearls symbolise tears and are therefore unlucky, Especially if worn by brides.

How did certain gemstones become associated with the months of the year? Experts believe that birthstones can be traced back to the Bible. In Exodus 28, Moses sets forth directions for making special garments for Aaron, the High Priest of the Hebrews. Specifically, the breastplate was to contain twelve precious

Birthstone Beliefs



gemstones, representing the twelve tribes of Israel. Later, these twelve stones were likely also linked to the twelve signs of the zodiac. Eventually, they also became associated with the twelve months of the calendar year. Throughout history, many cultures have believed that birthstones have magical healing powers or bring good luck. Not all cultures have agreed on which stones correspond to which months, though, so you can find different lists of birthstones through time.

Getting Pearls

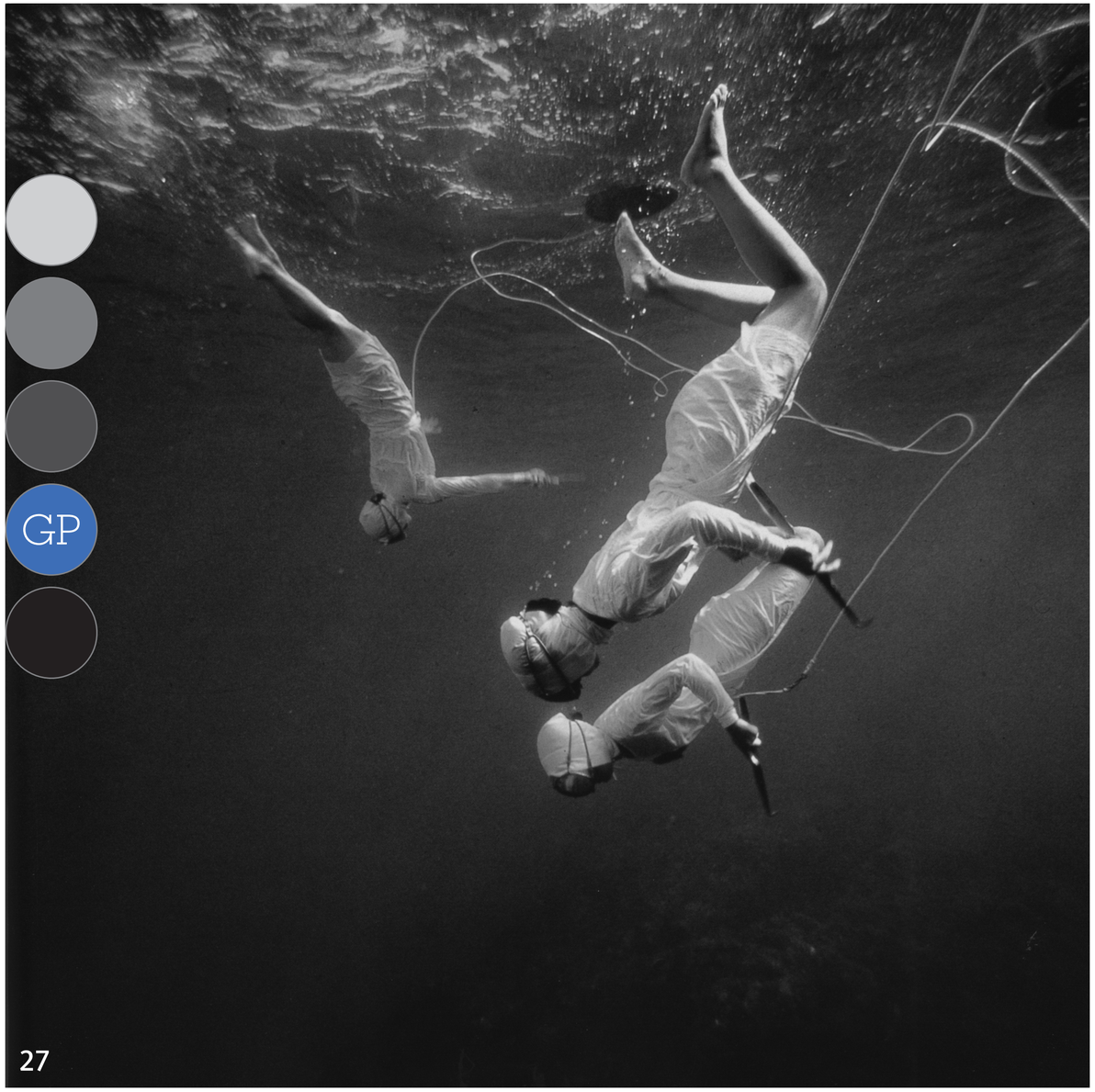
The days when pearls could be found by wading into the sea are long gone. The last time and place for this kind of pearling was northern Australia in the early 1860's, where a pair of former sailors named Tays and Siebert founded what would become a major pearling industry. In that case, it took less than ten years for white adventurers and forcibly recruited aboriginals to collect all of the pearl oysters- of the smaller Australian species, Pinctada Albina Lamark, 1819 accessible by wading or swimming from shore. From then on, Australians turned to deeper waters and larger species, *P. Maxima,* which required divers operating from boats to gather pearls. In other parts of the world, this switch occurred much earlier. Deep pearl diving into the Persian Gulf probably began in the third millennium B.C.E. and was being practiced in most pearl producing areas bu the time the first historical descriptions were written. Early diving methods were similar in all areas

before the invention of underwater breathing devices. A diver held his or her breath, went down 10-15 meters (to more than 30 meters in some areas), collected a few clams, and then surfaced to prepare for another dive. Diving was dangerous, and divers were usually poor or unfree.

The movement of pearls from diver to market was also similar across cultures. The divers turned their pearls over to their employers- small scale businessmen or local leaders- who in turn funneled the pearls into a surprisingly unified international trading system dominated by gem traders and their aristocratic clients. During most periods, the leading buyers of pearls were wealthy Southwest or South Asians. East Asians and Europeans generally lacked money for, or interest in, pearls until the first few centuries C.E. of the Roman Empire and again during the European Great Age of Pearls.

The Western Indian Ocean

Three small areas in the Western Indian



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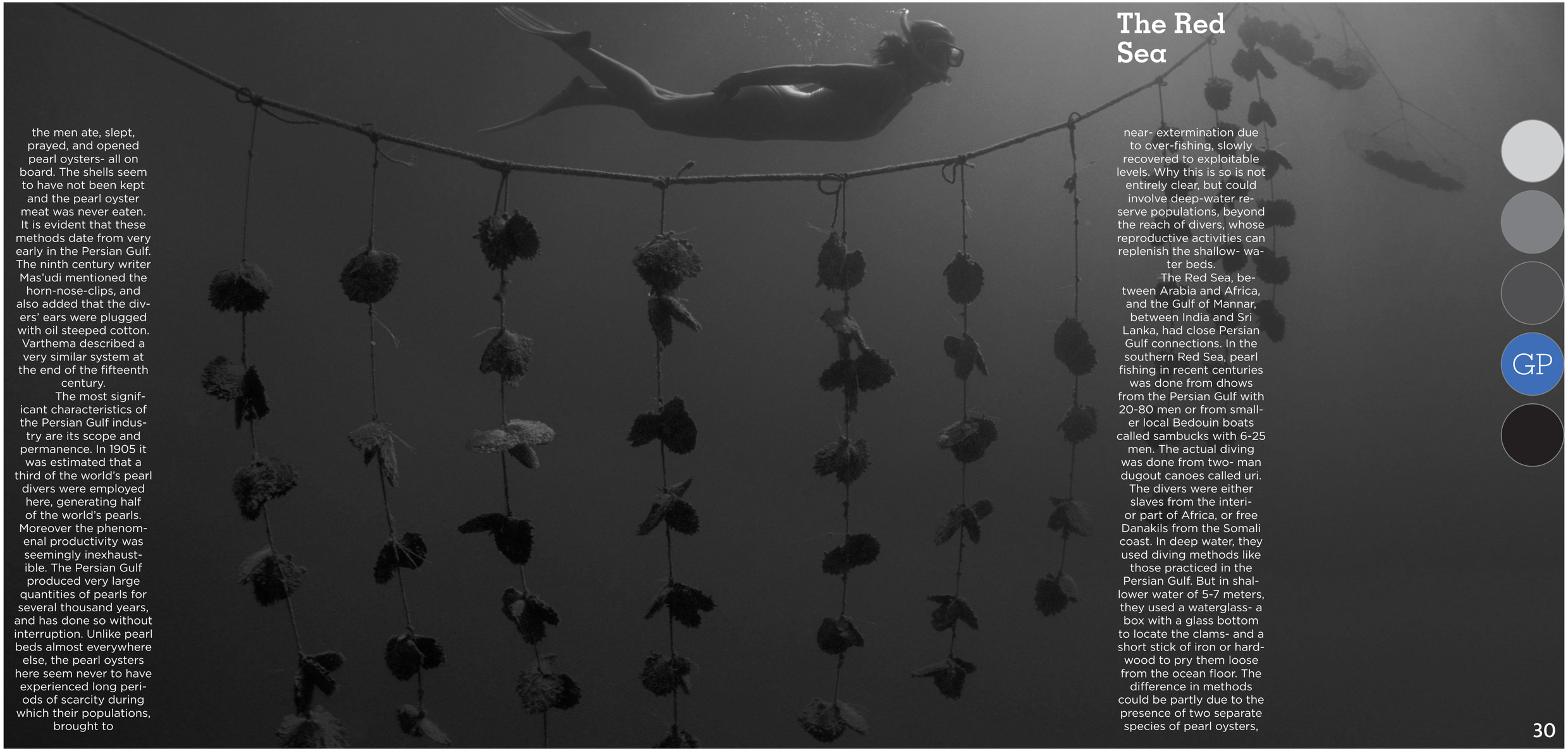
Persian Gulf

Ocean- the Persian Gulf, the Red Sea, and the Gulf of Mannar- dominated the world's pearl markets from antiquity through the 1920's they not only yielded the lion's share of the world's pearls, but their inhabitants were more interested in pearls and paid higher prices for them.

In the Persian Gulf in the nineteenth century, pearling boats were fairly large and standardized. The typical Persian Gulf pearler was a large dhow of 18-30 meters. Persian Gulf pearler was a large dhow of 18-30 meters in length, displacing 10 to 50 tons of water, with a crew of about 65; 25-30 divers, 20-25 rope tenders, plus sailors, cooks, a navigator, and a skipper. Each diver is equipped with a basket attached to his waist as well as a horn nose-clip, leather finger guards, and possibly a knife. He descended feet first, weighed by a 30-pound stone with a rope attached to it so that it could be retrieved, Upon reaching the bottom, he would drop the stone weight and swim around, gathering as many oysters as possible into the basket. A tug on the rope then signaled to the rope tender to pull up both the stone and diver. Boats stayed on the pearl banks for several weeks;



The Red Sea

the men ate, slept, prayed, and opened pearl oysters- all on board. The shells seem to have not been kept and the pearl oyster meat was never eaten. It is evident that these methods date from very early in the Persian Gulf. The ninth century writer Mas'udi mentioned the horn-nose-clips, and also added that the divers' ears were plugged with oil steeped cotton. Varthema described a very similar system at the end of the fifteenth century.

The most significant characteristics of the Persian Gulf industry are its scope and permanence. In 1905 it was estimated that a third of the world's pearl divers were employed here, generating half of the world's pearls. Moreover the phenomenal productivity was seemingly inexhaustible. The Persian Gulf produced very large quantities of pearls for several thousand years, and has done so without interruption. Unlike pearl beds almost everywhere else, the pearl oysters here seem never to have experienced long periods of scarcity during which their populations, brought to near- extermination due to over-fishing, slowly recovered to exploitable levels. Why this is so is not entirely clear, but could involve deep-water reserve populations, beyond the reach of divers, whose reproductive activities can replenish the shallow- water beds.

The Red Sea, between Arabia and Africa, and the Gulf of Mannar, between India and Sri Lanka, had close Persian Gulf connections. In the southern Red Sea, pearl fishing in recent centuries was done from dhows from the Persian Gulf with 20-80 men or from smaller local Bedouin boats called sambucks with 6-25 men. The actual diving was done from two- man dugout canoes called uri. The divers were either slaves from the interior part of Africa, or free Danakils from the Somali coast. In deep water, they used diving methods like those practiced in the Persian Gulf. But in shallower water of 5-7 meters, they used a waterglass- a box with a glass bottom to locate the clams- and a short stick of iron or hardwood to pry them loose from the ocean floor. The difference in methods could be partly due to the presence of two separate species of pearl oysters,

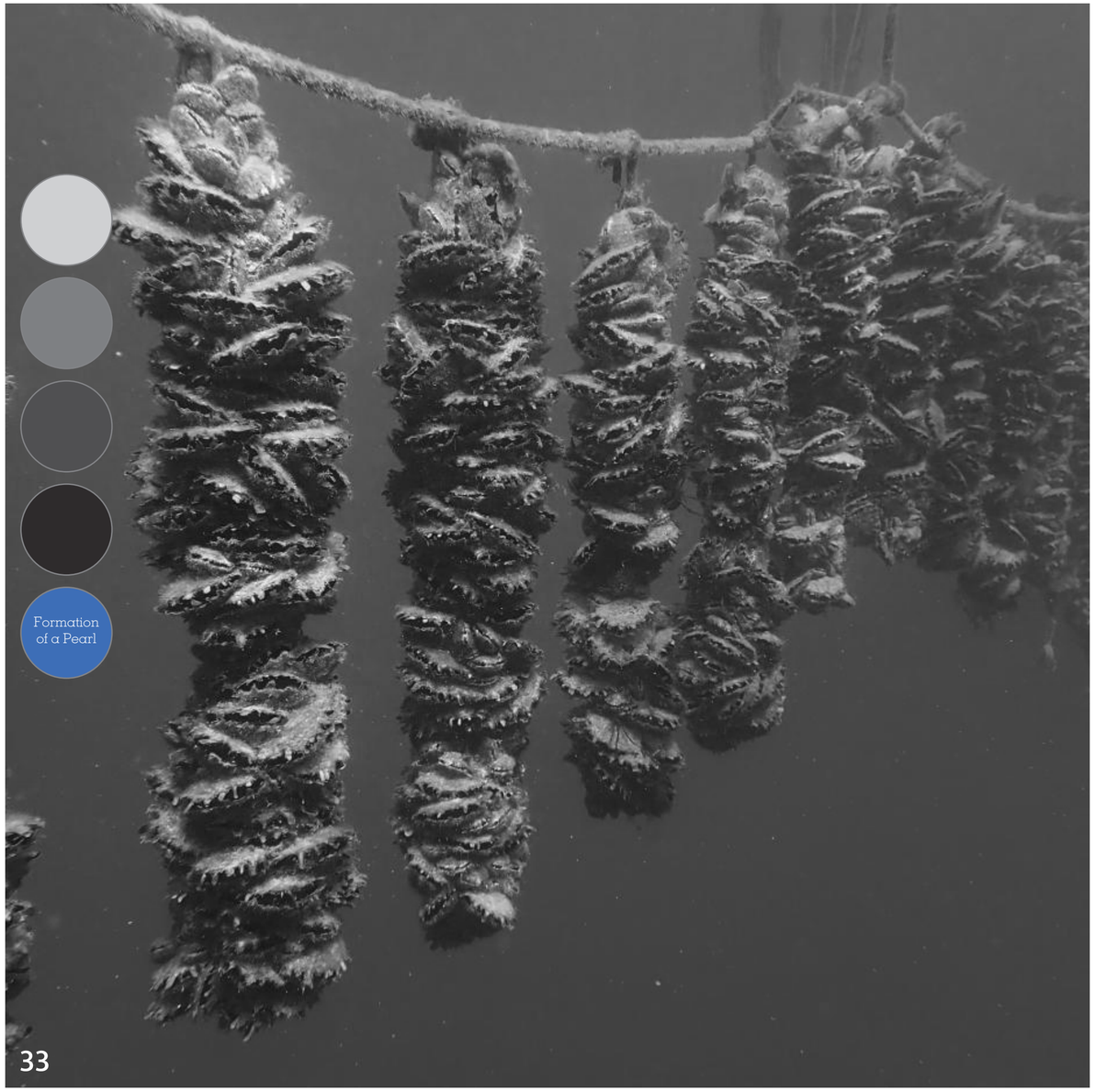
GP

Gulf of Mannar

the smaller bil-bil(Pinctada radiata) and the larger sadaf (Pinctada margaritifera). The bil-bil is thinner shelled, and produces numerous, smaller pearls, while the thick- shelled sadaf, sought primarily as a source of mother of pearl, produces fewer larger ones. Some sources said that the quality of Red Sea pearls was very high. They were “whiter than either Gulf or Ceylon pearls and with stronger luster.”

The Gulf of Mannar must have already been fished for pearls in the early first millennium C.E., when major civilizations emerged in Sri Lanka and southern India. However, these pearl banks did not become historically prominent until about 1000 C.E., when Arab and Chinese rulers noticed them.

In later centuries the Mannar pearl banks were exploited by boats ranging from dugout canoes to big cargo lighters. Some seem to have been specialized driving barges- open one ton vessels with very shallow draft, 14 meters long by 2 meters wide. Crews averaged 20-30 men, including a master, pilot, water bailer, government inspector or “boat guard”, and about ten divers with one rope tender each.



Formation of a Pearl

Pearls are primarily composed of calcium carbonate, expressed as the chemical formula $CaCO_3$. The shells of all mollusks are formed of this same substance. Calcium carbonate also forms the shell or “skeleton” of many other marine organisms, including corals, tube worms, sea urchins, and calcareous algae.

Calcium carbonate makes up 82-86 percent of any pearl and approximately 10-14 percent is organic membrane; the final component of pearls approximately 2-4 percent, is water. The thin organic membranes, composed of conchiolin are interspersed throughout the aragonitic matrix of the pearl. Conchiolin consists of plolysaccharides and protein fibers. In addition to these basic constituents, pearls contain trace elements that are present in the water in which the mollusk lives- strontium and magnesium. Sotrontium occurs in higher concentrations in saltwater than freshwater,

Freshwater and Saltwater

and therefore, the pearls produced by saltwater and freshwater mollusks differ in strontium concentration.

The differences in trace element composition and the amount of organic matter in pearls cause different reactions when the pearls are exposed to X-rays and ultraviolet radiation. When natural freshwater pearls are exposed to X-rays, they usually fluoresce yellowish white whereas natural marine pearls usually do not fluoresce at all. In contrast, when natural marine pearls are exposed to long-wave ultraviolet radiation, they usually fluoresce sky blue. Naturally dark colored pearls, such as those from Tahitian Black-lipped Pearl Oysters or the two species from Baja California, show reddish fluoresce under long-wave ultraviolet radiation.

The presence of water and organic membranes in pearls makes them susceptible to both cracking and dehydration. The organic membranes are interleaved with the aragonite crystals. If the organic membranes dry out, the outer layers of the pearl can peel off, leaving a damaged surface. If pearls are subjected to high temperatures,

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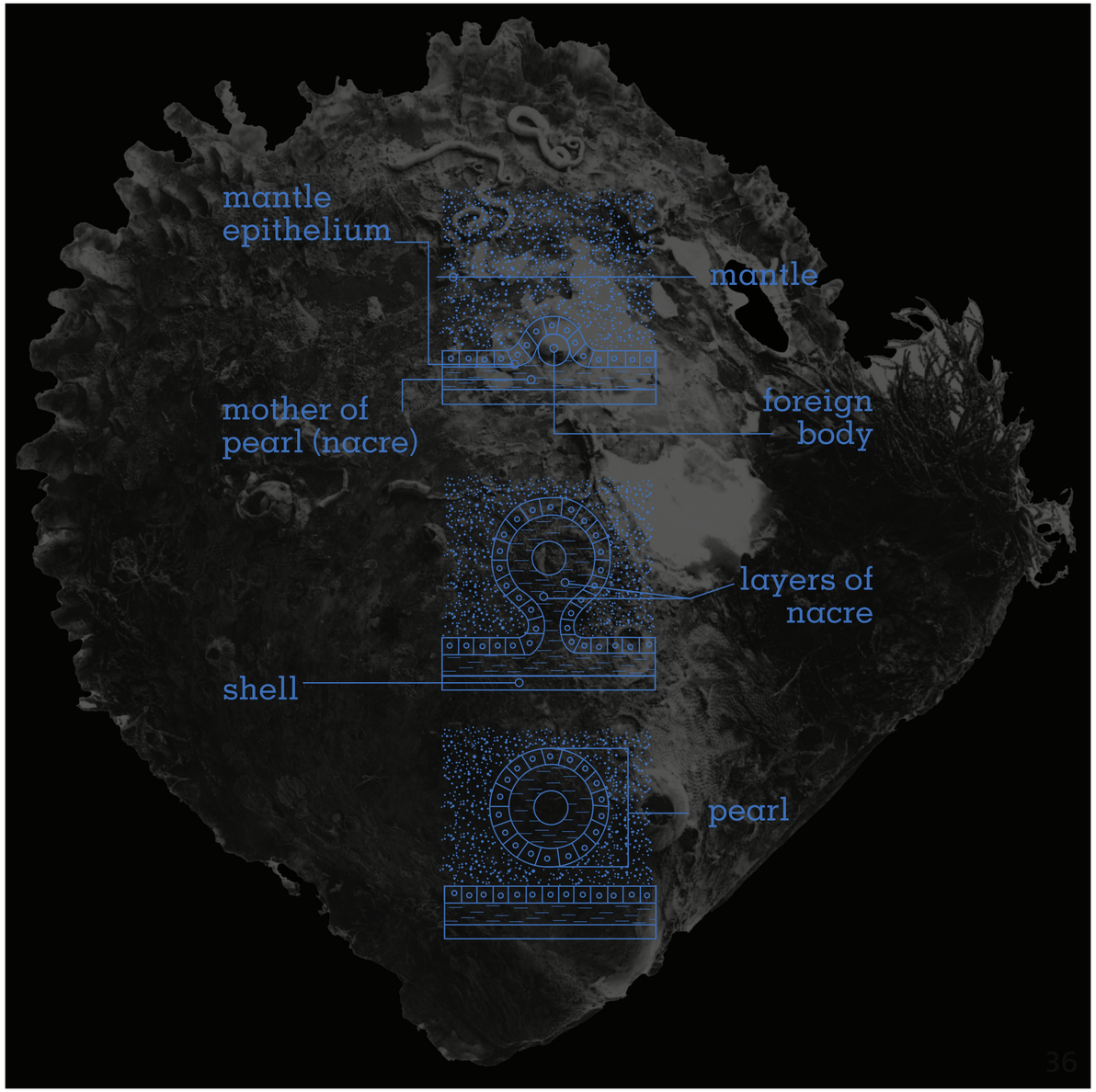
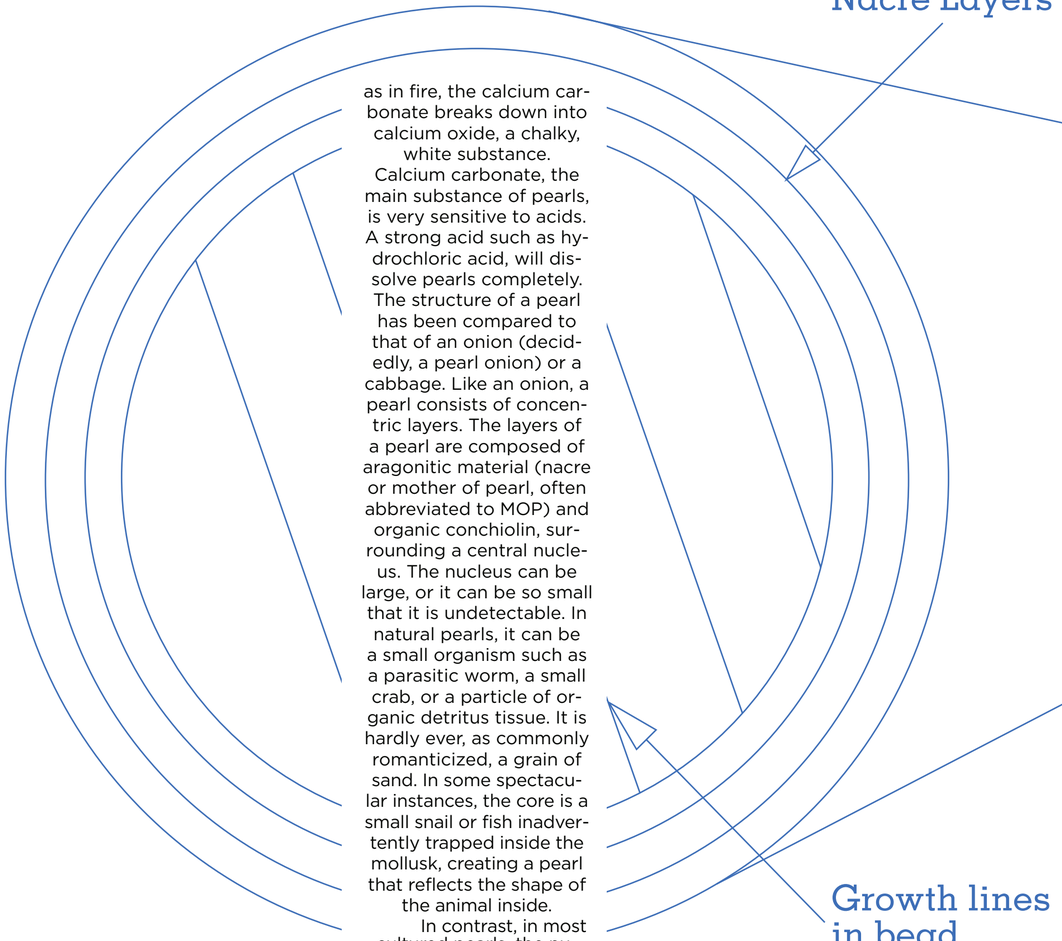


Pearl Core



Nacre Layers

Growth lines in bead Nucleus

as in fire, the calcium carbonate breaks down into calcium oxide, a chalky, white substance.

Calcium carbonate, the main substance of pearls, is very sensitive to acids. A strong acid such as hydrochloric acid, will dissolve pearls completely.

The structure of a pearl has been compared to that of an onion (decidedly, a pearl onion) or a cabbage. Like an onion, a pearl consists of concentric layers. The layers of a pearl are composed of aragonitic material (nacre or mother of pearl, often abbreviated to MOP) and organic conchiolin, surrounding a central nucleus. The nucleus can be large, or it can be so small that it is undetectable. In natural pearls, it can be a small organism such as a parasitic worm, a small crab, or a particle of organic detritus tissue. It is hardly ever, as commonly romanticized, a grain of sand. In some spectacular instances, the core is a small snail or fish inadvertently trapped inside the mollusk, creating a pearl that reflects the shape of the animal inside.

In contrast, in most cultured pearls, the nucleus is a spherical bead made from the shell of a North American freshwater pearl mussel that has been implanted into the soft tissues of the mollusk.