

PREHISTORICAL WONDERS —NANJING YUHUA PEBBLE

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Preface

The Nanjing Yuhua Pebble has been eulogized for its brilliant colors, various expressions of texture, and rich cultural connotations for a long time. It has been regarded as "a unique pebble in China" and "the most beautiful pebble in the world". In recent years, more and more fossil animals and plants have been found in the pebbles, which attracted broad curiosity and interest among the public. It is well-known that fossils are one of the most important witnesses for the changes of the earth's crust in the geological past. Similarly, fossils in the Yuhua Pebbles witnessed numerous changes in the geological history of Nanjing area.

With a long-standing history, people in Nanjing all love and collect the local pebbles. At the Beiyinyangying site of Gulou in Nanjing city, a primitive village has been excavated since 1955, which dates back to more than 5000 years ago. There are 76 pebbles with chalcedony texture and gorgeous color among the findings. The pebble lovers and collectors, especially the literary intelligentsia in the past dynasties, show special preference to it and give the Yuhua Pebble a suggestive quality of poetry and painting with numerous poems, expressing their praise and adoration to it. Consequently, the pebble culture that has gradually formed is unique around the world.

Ancient people mostly viewed the pebble for its beauty, and praised its wonderful composition in pictures. However, there was only limited attention on its formation process and scientific significance. From the early 20th century, there has been much development of geological science in China, however, most of the concerns were mainly focused on the geological age and sedimentary environment of the gravel layers. We still lacked knowledge on how these deposits were formed, and what is their relationship with the development of the Yangtze River and the nearby Qinhuai River until the 1990s.

Given the wide range of people on the pebble references but the lack of knowledge on the relevant scientific background, this book tries to explain these profound scientific problems in a simplified way, including the formation and development of the pebble culture, scientific understanding of the origination, formation of the pebble deposits, and their relationship with the geological history in the Nanjing area. We can thus popularize the scientific connotation of the Yuhua Pebble and further promote its cultural property.

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Cultural History of Nanjing Yuhua Pebble

■ *As a well-known, unusual stone, the Nanjing Yuhua Pebble is not only elegant, but also bears a profound cultural background. Its name comes from a beautiful legend and its cultural history can be traced back to the Neolithic time some 5000 years ago. It has become a precedent for the culture of ornamental stones in China. Under the influence of Chinese tradition, the pebble culture has lasted over thousands of years and has a unique quality of artistic enchantment, which constitutes an independent cultural system in Nanjing.*

Long Cultural History

As early as the Neolithic period some 5800 years ago, the local people in Nanjing had already collected and appreciated the Yuhua Pebbles. It was evidenced by 76 local pebbles found in a series of archaeological excavations at the Beiyinyangying site of Gulou in Nanjing city during the years 1955-1958. The pebbles are mostly chalcedony and agate with crystal-like brightness and gorgeous colors. They are one of the sacrificial objects along with jade ornaments and other daily necessities in tombs. This means that these beautiful pebbles had already been used as keepsakes and decorations, which opened a prelude for the pebble culture and marked the Yuhua Pebble as one of the world's oldest natural ornamentals.

Beautiful Folklore

Throughout Chinese history, Buddhism was the most prosperous in the Liang Dynasty (AD 502-557). The Emperor Yan Xiao was a avid believer of Buddhism; as a result, he constructed many temples in the capital of Nanjing. It has been said that one day, there was a senior monk Master called



Local pebbles excavated from Beiyinyangying site in Nanjing city

Cultural History of Nanjing Yuhua Pebble

Yunguang expounding the texts of Buddhism in the Gaozuo Temple at the Yuhua Terrace in AD 503. When his talk went to the affecting parts, Buddha was also deeply moved. Consequently, many flowers fell from the sky and transformed into the colorful pebbles on the ground, which was considered an auspicious sign. Since then, the Yuhua Pebble has been integrated with the myths and legends of Buddhist culture, and quickly became widespread.



Portrait of Monk Master Yunguang

Prehistorical Wonders—Nanjing Yuhua Pebble



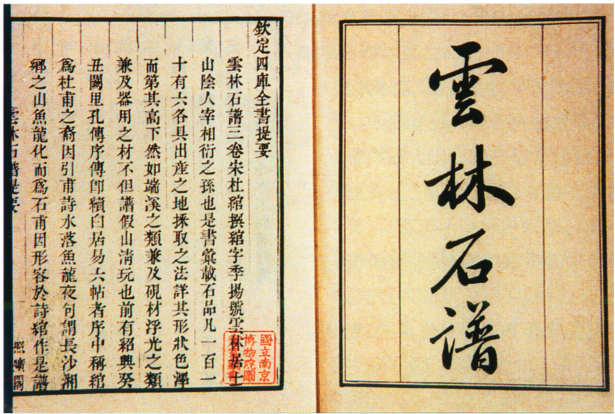
Vivid image of Monk Master Yunguang in Yuhua Pebble



Image of falling flowers from the sky in Yuhua Pebble

Cultural Accumulation

During the late Song Dynasty, the Yuhua Pebble was incorporated into literature and art. The pebble became part of items in the den and occurred in the intellectuals' daily life. It began to make its influence in their literary works. The well-known writer Dong-Po Su (AD 1037-1101) from the Northern Song Dynasty was also keen on the pebbles and wrote two articles entitled "Worship of Strange Stone" and "Additional Worship of Strange Stone". During AD 1118-1133 in the Southern Song Dynasty, Wan Du wrote China's first stone pedigree called "Yunlin Stone Pedigree". The book listed 116 kinds of various ornamental stones in China, and clearly documented two kinds of Yuhua Pebbles from the Nanjing area. In AD 1613 of the Ming Dynasty, the book "Stone Pedigree in Su Garden" by You-Lin Lin included 35 figures of the Yuhua Pebbles, which are the earliest figures for the pebbles in China. After the Song, Yuan, Ming, and Qing dynasties in recent millennium, the elegance of pebble culture has occupied a more and more important position in social and cultural life. Additionally, it became a solid foundation for the development of the pebble culture in modern time.

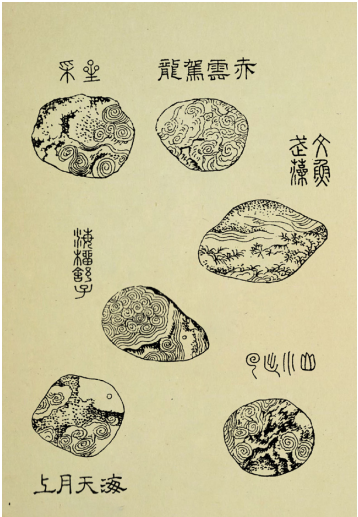
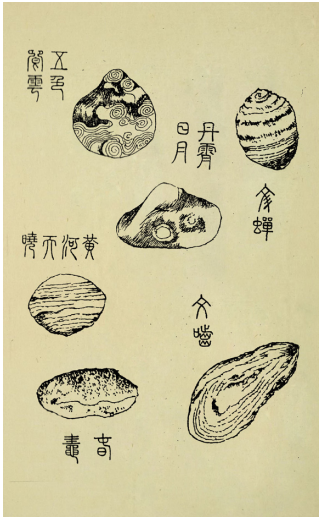
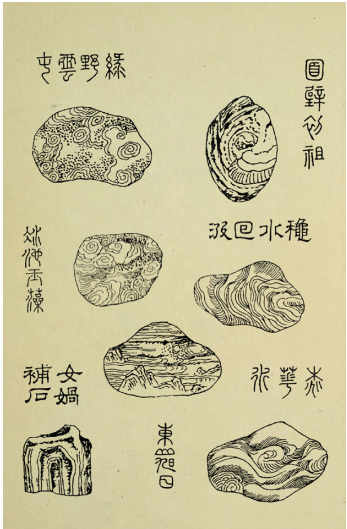
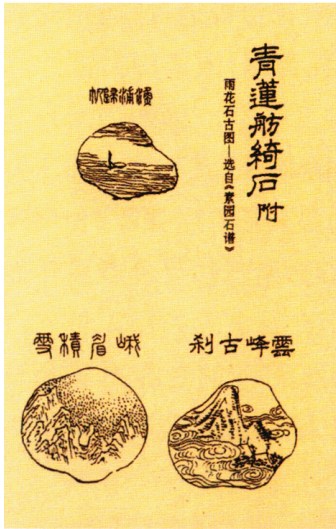


“Yunlin Stone Pedigree”



Decorative Yuhua Pebble of Song Dynasty unearthed from Luhe in Nanjing

Cultural History of Nanjing Yuhua Pebble



"Stone Pedigree in Su Garden"

Name Origination

Throughout history, the Yuhua Pebble got a variety of titles, such as “Yao”, “Kun”, “Literary Pebble”, “Luozi Pebble”, “Luhe Pebble”, “Gorgeous Pebble”, “Colored Pebble”, “Agate”, etc. The pebbles came from the gravel deposits along the banks of the ancient Yangtze River in the Nanjing area. The sedimentary layers mostly occur in the second terrace about 40-50 meters high, which forms a hillock topography. The top of the hillocks, which all look like a platforms, were also called Pebble Hillock and Agate Hillock. It was not until the Liang Dynasty that the folklore on the monk Master Yunguang’s story became popular; the current name, Yuhua Pebble, was gradually adopted. Yuhua means rain and flower in Chinese. The terrace where the Gaozuo Temple located is also called Yuhua Terrace.



Reconstruction of hillock topography at Yuhua Terrace

Wonders of the World in Small Gravels

■ The Yuhua Pebble is generally small, but contains a wealth of geoscientific knowledge. To better understand it, people have categorized it into three types: fine pebble, coarse pebble, and fossil pebble. The Yuhua Pebble is sometimes colorful with magically changing veins, such as rock veins, mineral veins, structure veins, fossil veins, etc. The beautiful agate, chalcedony, opal, and rockcrystal are regarded as the top grade within the Yuhua Pebble category. But how were these agates formed? What are the differences between opal, chalcedony, and rockcrystal? Let's explore the answers in the next chapter.



Fine pebble

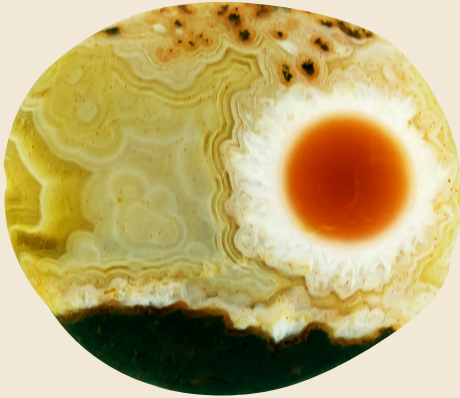
Recognizing Yuhua Pebble

The Yuhua Pebble is a typical type of gravel formed in river deposition. It occurs in the Neogene Yuhuatai Formation, which is dated to be approximately 23-2.58 Million years ago. The Yuhua Pebble generally refers to an ornamental stone, such as chert, quartzite, sandstone, dolomite, aragonite, opal, agate, rockcrystal, chalcedony, silicified fossils, etc. The gravel deposits are mainly distributed in Nanjing, Luhe, Pukou, Jiangning, and Yizheng of the Jiangsu Province, and Hexian of the Anhui Province. After a long period of geological weathering and river transportation, the original rocks gradually became pebbles with round edges. The Yuhua Pebble in a narrow sense only refers to agate, opal, rockcrystal, chalcedony, and silicified fossils with fine quality. These natural pebbles do not need to be cut or polished, and are generally put into a bowl of water for better view and appreciation. Based on material composition, the Yuhua Pebble can be divided into three categories: mineral pebble, rock pebble, and fossil pebble. However, people in the pebble community usually classify them into fine pebble, coarse pebble, and fossil pebble.

Fine Pebble

This group of pebbles mainly includes agate, chalcedony, opal, and rockcrystal. Mineralogically, they belong to the quartz cluster, with silicon dioxide (SiO_2) as the main component. They are often semi-transparent, showing a hazy beauty. Fine pebbles are regarded as top grade or curiosa because of their changeable pattern and gorgeous color.

Agate is a cryptocrystalline quartz (crystalline particles can be observed in a high power microscope) with a variety



Annular agate

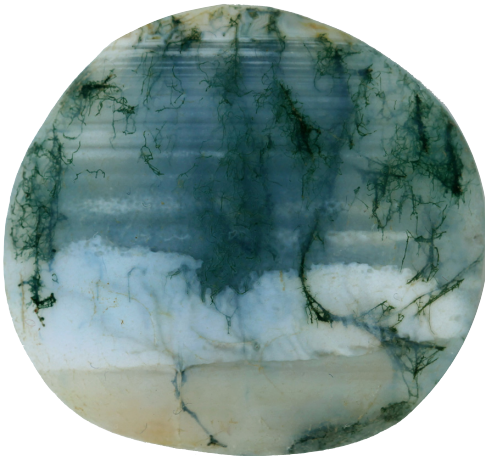


Annular agate



Moss agate

Prehistorical Wonders—Nanjing Yuhua Pebble



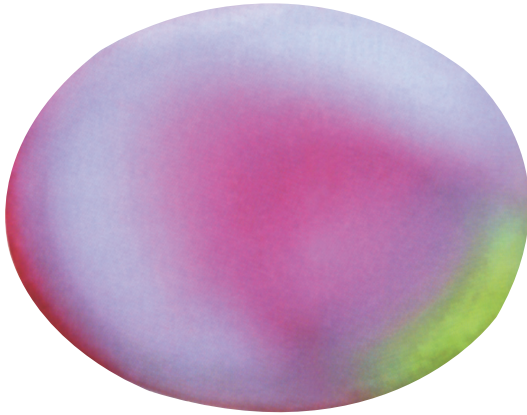
Moss agate

of textures, such as annular, concentric lamellar, stratiform, corrugated, and so on. Pure agate is white, but it generally has a variety of colors due to pigments containing ions and impurities. It often appears in a transparent to translucent state with lipidic to glazy luster. There are red agate, yellow agate, blue agate, purple agate, white agate, and black-blue agate, etc. based on color, and zygote agate, sardonyx agate, onyx agate, annular agate, moss agate, etc. based on texture. In addition, there are also water bile agate, cat eye-like agate, rainbow agate, etc. which are very representative and costly, and regarded as “Yuhua Agate” for reputation.

Opal is an amorphous mineral and a kind of silica gel containing water (about 6-10% of the total), which is classified as a precious stone. There are ultra micro silica spheres closely packed inside opal. It is due to the existence of micro voids



Opal



Opal

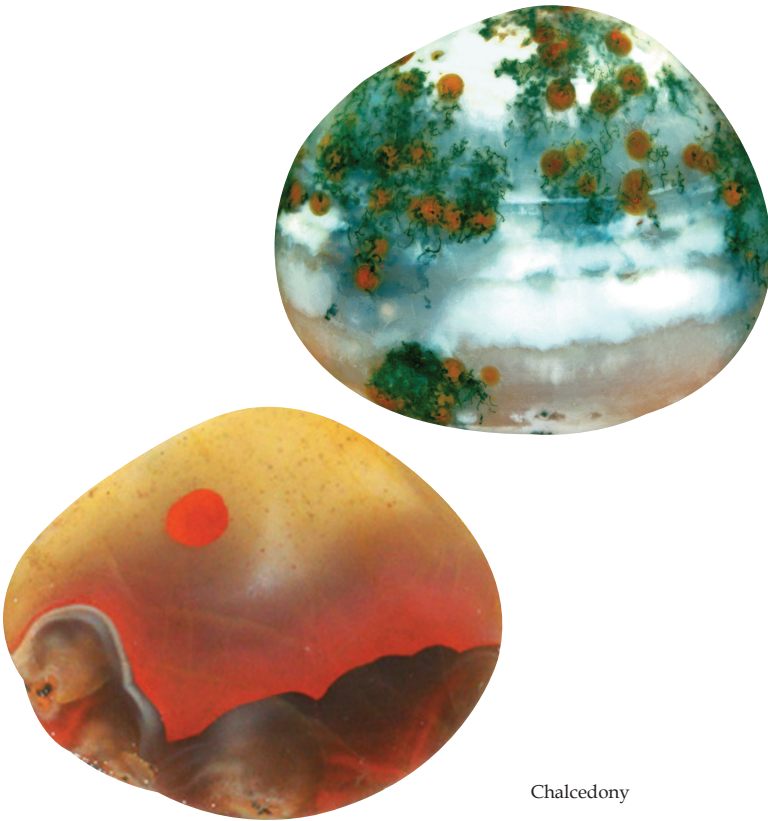
between the spheres that opal has the capacity for adsorption. It can adsorb coloring elements, which allows it to display different colors. It can also adsorb much water, which creates a protein gloss finish but allows lower resistance toward temperature. When it is in a micro transparent state, it presents a kind of hazy beauty. Opal is smooth, soft, and scarce, and usually pure in quality. It belongs to the jade family and has high ornamental value.

Wonders of the World in Small Gravels

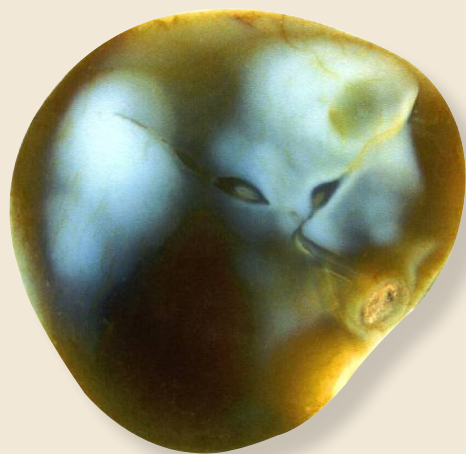
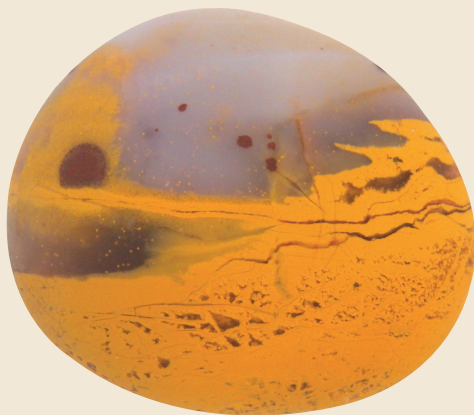


Opal

Chalcedony is cryptocrystalline quartz with a fine and smooth quality. It is semitransparent to translucent, fibroid, stalactitic or racemose, and is mostly gray white in color. It can also be red, yellow, white, purple, etc. if contains some other minerals. Chalcedony is different from agate since it lacks an annular or stratiform pattern. We can also distinguish chalcedony from opal by its cryptocrystalline property. Its refractive index and density are thus higher than opal. It is also a type of jade with high ornamental value.

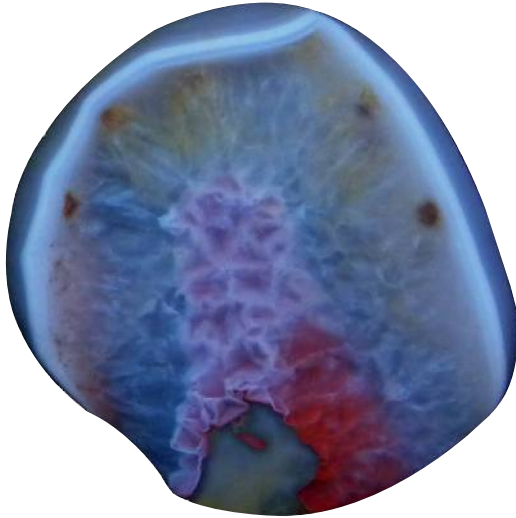


Chalcedony



Chalcedony

Rockcrystal is a colorless and transparent quartz containing SiO_2 . It is often columnar or drusy in habit. It has various colors because of the presence of impurities such as citrine, amethyst, rosaceous crystal, cairngorm, etc. It belongs to a precious stone with high ornamental value.



Purple Rockcrystal

Wonders of the World in Small Gravels



Agate with Rockcrystal Geode



Rockcrystal

In addition, there are some agate or quartzose stones with peculiar structures in the Yuhua Pebble category known as the “Sun Stone”. They are chalcedony with acetabuliform, cap-shaped and square appearance, or a plurality of polyhedra together. Recently, most geologists relate these agate, quartzose, or chert stones to volcanic activity based on the analysis of mineral composition and slice structure.



“Sun Stone”

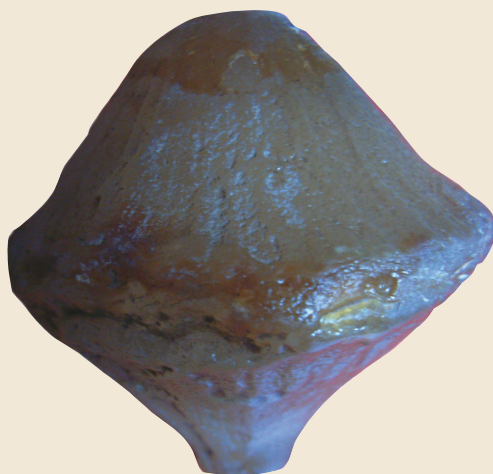
Wonders of the World in Small Gravels



"Sun Stone"



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