



**Secrets of the Dead Sea**  
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**Full Earth Apollo 17**

On their way to the moon, the astronauts of Apollo 17 captured this rare image of the full Earth – centered on Africa, birthplace of humanity.

This is an ancient land. The Nile River still flows northward to the Mediterranean - just as it did when the great pyramids rose on the Plain of Giza. Eastward, the Red Sea splits and encircles the Sinai Peninsula, dividing two continents and separating Egypt from the sacred sites of Judaism, Christianity, and Islam.

Once trade routes ran northward from incense kingdoms at the southwestern tip of the Arabian Peninsula. Caravans bringing frankincense and myrrh traveled up the eastern coast of the Red Sea, past the Gulf of Aqaba, northward toward the Dead Sea.

**Fade to Dead Sea**

King David, King Herod, Jesus, and John the Baptist are linked to the Dead Sea. Old Testament prophets knew it from the infamous Sodom and Gomorrah. During the Roman conquest, it is said that Queen Cleopatra obtained rights to build cosmetic and pharmaceutical factories in the area. Egyptians used bitumen extracted from the Dead Sea for embalming their mummies. Aristotle wrote about its remarkable waters.

No seaweed or plants surround the Dead Sea. No fish or any kind of swimming creature lives in its waters. White salt crystals encrust its shore. Fish accidentally swimming into the Sea from freshwater streams die instantly, their bodies quickly coated with a preserving layer of salt crystals and then tossed onto shore by the wind and waves.

**night panorama**

But the Dead Sea lives through stories preserved in its cliffs and caves --- and in the stars overhead. Here ancient scrolls chronicle time’s passage by motions of the sun and moon while rock and sand preserve a living record of a place as timeless as the star patterns above.

**The Houston Museum of Natural Science  
 Presents  
 Secrets of the Dead Sea**

**Part 1: Secrets of the Ancient Past**

**Dead Sea imagery**

The Dead Sea is the lowest point in a rift valley extending northward from the Red Sea to Syria. From sea level at the Gulf of Aqaba, the valley drops over 1200 feet to the dead sea shore. Mountain ranges border the valley on both sides, challenging caravans bringing the wealth of the East to the markets of Europe.

Petra The Dead Sea anchors a land rich in physical and spiritual wealth. Just east and South of the Dead Sea lies Petra, capital of the Nabatean trading empire. Spices from the East and South traveled over the desert to ports on the Mediterranean Sea on their way to markets in Europe. Each caravan enjoyed the protection of the Nabateans and increased the wealth of their hidden city.

A long canyon winds into the crumpled mountains east of the Dead Sea. Natural hues of red and gold give little indication of the splendor within, the glory of ancient Petra, the Nabatean city of rock.

Facades of rock mark the doorways of tombs that once looked down on a thriving city. Drainage channels along canyon walls brought water into cisterns buried under the plazas. This fabled sandstone city rose to power at the same time the Dead Sea scrolls were written and faded into desert myths after the Roman empire arrived and trade routes shifted from land to water. Its people, the Nabateans, may have become the Bedouin who kept the city hidden and protect it even now.

Jerusalem Mountains west of the Dead Sea are home to another great and ancient city, perhaps, the most cherished of all cities, Jerusalem – sacred to Jews, Christians, and Moslems.

At the center of old Jerusalem is the Dome of the Rock, built at the place where the patriarch Abraham sacrificed his son Isaac, where Solomon built his temple, and where Mohammed ascended to heaven.

The walls of Jerusalem's old city are part of the second Temple, the most sacred site in Judaism. Unlike Petra, Jerusalem is alive and as jealously cherished today as it was when the Dead Sea scrolls were written.

Over two thousand years ago, religious groups fled the secular wealth symbolized by Petra and the formal religion of Jerusalem for the isolation of the Dead Sea's shores.

## **Part 2: Secrets of the Scrolls**

Cliffside cave In 1947, near the northern border of the Dead Sea, a young Bedouin shepherd tossed a rock into a long-untouched cave and heard the crack of breaking pottery.

**Inside cave** Inside the cave he found jars filled with ancient scrolls. Their discovery led to a search that lasted nearly a decade and eventually produced thousands of scroll fragments from eleven caves.

**Qumran close up** Close to the caves holding the Dead Sea Scrolls are the ruins of an ancient

community called Qumran.

A group of religious scholars moved here toward the end of the second century BCE. Here they lived a communal monastic life on a cliff above the Dead Sea, away from cities and towns. They studied ancient writings and were said to be heirs of Chaldean astronomy and the Egyptian arts of healing. Scholars here disapproved of the Jerusalem priesthood, encouraged a strict and pious way of life, and expected an imminent confrontation between the forces of good and evil.

These people were ascetics and paid great attention to ritual bathing and purity. Their community had an assembly hall, a central dining room, a kitchen, ritual baths, and a pottery workshop. Most important was the scriptorium with desks and inkstands where scribes created the scrolls found in the adjoining caves.

Here they transcribed most of the Old Testament and many books of common law and practice. In haste they hid their scrolls and in so doing preserved the earliest copies of the scriptures that have survived to the present. The scrolls are older than any other surviving biblical manuscripts by almost a thousand years.

### **Scrolls shrine**

Today most of the scrolls are housed in Jerusalem in the Shrine of the Book. A dome covers the monument, which is two-thirds below the ground. A lower level entrance leads to a tunnel resembling a cave with artifacts in cases along the walls. At the tunnel's end is the grand room with the scrolls magnificently displayed. This scroll is one of the longest and best preserved of the Dead Sea Scrolls.

A winding staircase leads down to a cave below the scroll room, housing additional artifacts found with the scrolls.

### **Scrolls lab**

Scroll preservation is a delicate and tedious task, performed in a lab designed especially for curators handling these artifacts. To provide support, Tanya is sewing scroll fragments between two layers of nylon net. Over time each scroll must be reattached and smoothed.

Scroll fragments must also be identified, described, and translated. Here Asia examines a fragment and removes residues. Then the fragment is matched to other fragments, like putting together the pieces of a jigsaw puzzle.

During earlier preservation work, scroll fragments were scotch taped to glass plates. Unfortunately the tape and its glue caused permanent damage to the fragile fragments. The preserver must examine each taped fragment carefully to determine if there is any way to undo the damage. Working

under a hood, Lena carefully tries to remove tape residue with drops of solvents.

This preservation process continues as fragments are analyzed, preserved, and archived.

## Starfield

### **Part 3: Secrets of the Ancient Astronomers**

Once they were preserved, the scrolls could be read and their knowledge shared,, especially the knowledge of ancient astronomers. An ancient scroll of the Book of Job pays tribute to God through constellation patterns still recognized today.

*He is the Maker of the Bear and Orion, the Pleiades and the constellations of the south. Job 9*

Ursa Major, the Great Bear, still roams the northern horizon where the Jordan River flows into the Dead Sea. Each day it circles the sky's North Point – the spot directly above the Earth's North Pole. Today the star Polaris is very close to this point.

Imagine looking up at the sky from the Dead Sea. Watch as the stars move westward throughout the night as the spinning Earth carries us eastward under the heavens. This daily motion is a fundamental unit of time –the period from one sunrise to the next.

Now imagine that the stars could leave trails – showing how the sky's daily motion could tell time for ancient civilizations along the Dead Sea.

## Southern Stars

The Book of Job sites other star patterns and indicates that they are related to the seasons.

*Can you bind the beautiful Pleiades? Can you loose the cords of Orion? Can you bring forth the constellations in their seasons...*

*Job 31-32*

In the southern sky, the constellation of Orion, the hunter, still chases the famous seven sisters star cluster called the Pleiades. As the Earth turns eastward, these patterns move westward, reaching the horizon near dawn in the late autumn. The author of Job understood the connection between these patterns and the repeating seasons.

Each year these patterns mark the coming of winter in regions north of the Earth's equator. Their departure from the evening sky promises warmer weather and the arrival of the growing season.

This knowledge of changing star patterns led to calendars that determine the year's religious festivals. Twenty of the Dead Sea Scrolls relate to

calendar making and monitoring.

### **Qumran**

In the Dead Sea Scrolls, Qumran scholars described their solar calendar, which identified times to celebrate the sacred feasts prescribed in the Law of Moses. The scrolls make it clear that the Qumran group felt that other Jewish sects were mistaken in using a calendar based on the phases of the moon. For this reason they probably withdrew from Jerusalem to celebrate their own feasts at the times they felt were correct according to their calendar.

### **Pyramids**

The use of a solar calendar dates back to Ancient Egypt, where a great civilization grew around the delta of the Nile River over 3,000 years before the writing of the Dead Sea Scrolls. Egyptian astronomers used rising and setting positions of stars to align the faces of the three great pyramids of Giza -- precisely north, south, east, and west. Inside the great pyramid of Cheops, passageways lead due north and south - perhaps aligned with Thuban, the North Star 5,000 years ago, and with the middle star of the hunter Orion's Belt.

Egyptian astronomer-priests recognized that the bright star Sirius, would appear in the morning twilight just before the Nile River's annual flood -- an event that turned this barren desert into fertile cropland. The return of Sirius to the pre-dawn sky marked the beginning of a new year in the world's first solar calendar.

The scholars of Qumran produced a solar calendar as accurate as the one from ancient Egypt.

### **Dead Sea to Scale**

We do not know if Qumran scholars studied the Egyptian solar calendar, but they were certainly aware of it. Marc Anthony had given Cleopatra, the Queen of Egypt, large parts of the region -- especially the Dead Sea.

The Holy Land is a small place with the pyramids of Egypt only 300 miles away. The Dead Sea is only 46 miles long and 3-10 miles wide.

Stories from the Old and New Testaments, from Abraham through the life of Christ, cover a geographic area smaller than the state of Texas. Even with primitive transportation by foot, donkey, camel or horse, this whole area was connected and scientific knowledge from agriculture to astronomy was easily shared.

**Mosque and moon** In contrast, other ancient societies surrounding the Dead Sea kept a lunar calendar. They recognized that the moon changed its appearance in a regular and repeating manner that everyone could see, making it a very convenient calendar marker. Both the Jewish calendar and the calendar of Islam are based on the moon's phases. The fundamental unit of time is the period from one new moon to the next – a period of 29 and a half days.

### **Sunrise**

Aware of the lunar phases, the scholars of Qumran kept a solar calendar aligned with the seasons, but used moon phases to set exact times for events. In their calendar, the first day of each year fell on the same day of the week: Wednesday, the day in which God made the sun, moon and stars. All festivals also fell on the same day of the week each year.

### **sundial overlay**

The Qumran calendar makers needed a method for connecting the seasons to the calendar – a date that could be determined precisely every year. A calendar scroll from Cave 4 begins with this description of such a day:

*"the sun rises due east, and shines at the celestial equator, on the horizon at dawn (as night becomes morning) on Wednesday"*

A limestone sundial has been discovered at Qumran. This sundial could be used to measure sun angles during the year and allow the scholars of Qumran to identify the day in the spring when the sun rises due East and sets due west. It could fix the Qumran calendar to the seasons and verify the days for feasting and fasting.

## **Part 5: Death at the Dead Sea**

### **Caesarea segment**

As the scribes of Qumran transcribed the scrolls, political unrest was brewing in the area. The Roman Empire claimed the region and Roman cities like Caesarea grew in power along the Mediterranean coast. The Roman civilization with its amphitheaters and colonnades brought new threats to the monastic way of life. This port city even had an aqueduct bringing in fresh water from distant mountains. Everywhere Roman culture and rule grew and increasingly threatened the traditional ways of life. The Jewish community staged a great revolt over Roman rule beginning here in Caesarea in 66 CE.

### **Qumran caves**

Within two years Qumran fell to the Roman army. We can imagine scribes and scholars rushing to hide their precious scrolls in the cliffs overlooking the Dead Sea. In all, they used 11 caves with Cave 4, the one closest to Qumran, containing almost half of all scrolls. Carefully they closed up the caves, hiding any evidence of the scholarly treasure within.

In 70 C.E., the Romans destroyed Jerusalem, along with the Temple and

almost all documents of Jewish history. Only a few documents including the scrolls hidden by the Dead Sea remained -- a library with half of its books unknown to modern scholars before their discovery in 1947.

## **Masada**

Some of the people of Qumran fled to Masada, a rugged mountain near the southwestern shore of the Dead Sea. Here archeologists have found a place for tanning hides to make scrolls and places these exiles might have used to continue their writing. Access to the top of Masada is difficult and Masada could store food and water for many months.

In 72 C.E. the Romans arrived and began their siege. They created a giant ramp to carry their battering ram to the citadel. The Jewish zealots, last of the rebellion, knew that they would soon be captured and enslaved.

On their last night of freedom, the group's leader, Eleazar ben Yair had made an impassioned speech to his beleaguered compatriots. "Let us die before we become slaves under our enemies and let us go out of the world, together with our children and our wives, in a state of freedom."

## **Sunrise**

The next morning, the first day of Passover, the Roman general Flavius Silva and his troops put on their armor and eagerly marched to the crest of Masada. But no enemy confronted them. Only two women and five children appeared. From them, Silva and his men learned the truth. The others were dead and their homes burned – choosing freedom in death, rather than a life of slavery.

With the fall of Masada and the death of the remaining Qumran scholars, the Dead Sea faded from Jewish history – carrying the secret of its scrolls into obscurity.

## **Part 5: Secrets of the Sea**

### **Plate tectonics**

The Dead Sea itself relates to a time frame far longer than the years of hiding for the scrolls. The Sea belongs to a rift valley extending 3,000 miles from Northern Syria to central Mozambique.

It also separates moving plates in the Earth's crust. The eastern side belongs to the Arabian plate that is moving eastward,. The valley's western side is part of the Africa plate, pushing northwestward to close the Mediterranean Sea. As these plates pull apart, the rift valley has dropped between them and produced Earth's lowest point, the Dead Sea, over 1,300 feet below sea level.

### **Elevation fly over**

Fresh water flowing downstream through the Jordan River empties into the Dead Sea. Having no exit point, the water evaporates, causing salts to accumulate in the lake and in its sediments. As a result, the Dead Sea's salt concentration is about 33 percent, compared to 3 percent in the ocean. In

the 1930s, the inflow of freshwater equaled the rate of evaporation. Today irrigation projects have diverted about 90 percent of the river's water, leaving precious little for the Dead Sea.

### **Change Dead Sea**

In 1968 Apollo astronauts photographed the Dead Sea with two basins -- a larger, deep northern one and a shallow southern one -- separated by a peninsula at Masada. Today, the southern basin is essentially dry, except for evaporation ponds and the Dead Sea's water level is dropping by as much as 13 inches per year.

The astronauts of the Space Shuttle Columbia photographed the Dead Sea on January 23 and 24, 2003 -- just a week before their deaths during reentry. Their photographs show how much the sea has shrunk since the Apollo mission 40 years earlier.

As the Dead Sea dries up, so too does the underground reservoir of fresh water -- a one-time reserve that may never be replaced.

### **Jordan River**

The Bible says Jesus was baptized where the Jordan River meets the Dead Sea. King Herrod made his winter home on Masada, and scribes created the Dead Sea Scrolls along its shore. Now this delicate ecosystem at the lowest point on Earth is threatened. For five million years it has survived, but how much will there be for future generations.

### **Shuttle**

Colonel Ilan Ramon watched the Dead Sea drifting below him from the Space Shuttle Columbia. Here he saw hope and a vision for the future:

"The world looks marvelous from up here,  
so peaceful, so wonderful and so fragile."

"From space our world looks as one unit without borders.  
So ... let's work our way for peace and better life for every one on  
Earth."

### **Ramon's tomb**

This presentation is  
Dedicated to the  
Courage of the crew of STS 107,  
including Ilan Ramon, Israel's First Astronaut