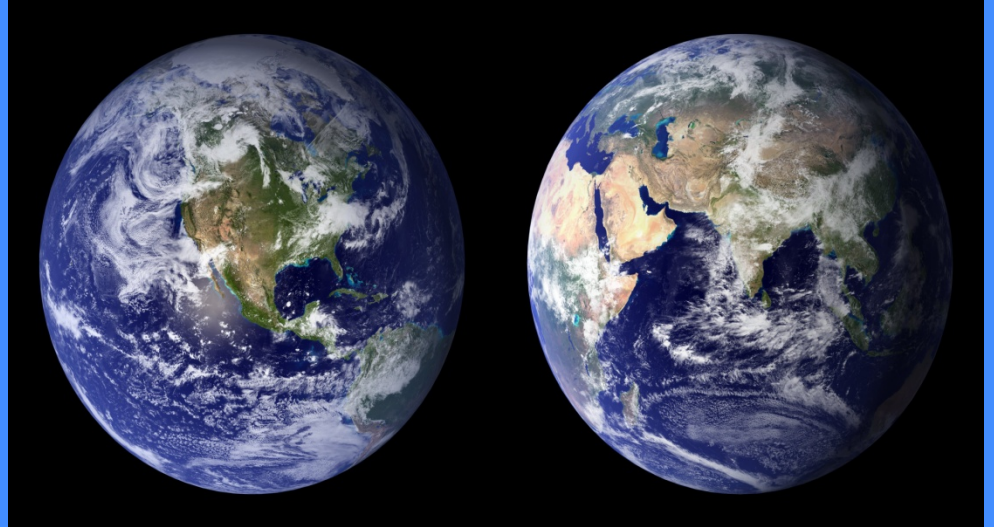


# Origin of water

**Prof. Anil Kumar**  
**Department of Geology**  
**Patna Science College**  
**Patna University , Patna**

- The astronauts recorded some of these views in a series of strikingly beautiful photographs that show Earth as a small blue planet floating in the darkness of space.
- The presence of water vapour in the sky and liquid water on the surface give the planet its bright blue colour.



Water covers about 75% of the earth's surface

# Different hypotheses

- The origin of water on earth, or reason that there is clearly more liquid water on the earth than on the rocky planet of the Solar System, is not completely understood.
- There exist numerous more or less mutually compatible hypotheses as to how water may have accumulated on the earth's surface over the past 4.6 billion years in sufficient quantity to form oceans.

## 1. Planetary cooling :

The cooling down of the primordial world to the point where the outgassed volatile components were held in an atmosphere of sufficient pressure for the stabilization and retention of liquid water.

## 2. Extrplanetary sources :

Comets, trans-Neptunian objects or water rich meteoroid (protoplanets) from the outer reaches of the main asteroid belt colliding with the earth may have brought water to the world's oceans.

### 3. Hydrated minerals :

Gradual leakage of water stored in hydrate minerals of the earth's rock.

### 4. Volcanic activity :

Water may also have come from volcanism.  
Water vapour originating in volcanic eruptions condensing and forming rain.

## 5. Water in the development of the earth :

A sizeable quantity of water would have been in the material which form the earth.

Hydrogen & Helium are expected to continuously leak from the atmosphere.

Astronomers have long held that water – two hydrogen atom and an oxygen atom was a relative late comer to the universe. They believed that any element heavier than helium had to have been formed in the cores of stars and not by the Big-Bang itself.

Since the earliest star would have taken some time to form, mature, and die, it was presumed that it took billions of years for oxygen atoms to disperse throughout the universe and attach to hydrogen to produce the first interstellar “water”.

## 6. Role of organisms :

Some terrestrial water may have had a biochemical origin, during the Great Oxygenation Event, via redox reaction and photosynthesis.

In the early 1930s, Cornelis Vin Niel discovered that sulfide – dependent chemoautotrophic bacteria (purple sulfur bacteria) fix carbon and synthesize water as a byproduct of a photosynthetic pathway using hydrogen sulfide and carbon dioxide .





# Types of groundwater

Almost all groundwater can be considered as a part of the hydrologic cycle, including surface and atmospheric (meteoric) water.

Different types of groundwater :

1. Connate water
2. Magmatic water
3. Juvenile water
4. Metamorphic water

## 1. Connate water :

Water that has been out of contact with the atmosphere for at least an appreciable part of a geologic period is known as **Connate water**.

It is trapped in sediments at the time of deposition that's why it is also known as **Fossil water**.

## 2. Magmatic water:

Water derived from magma is known as **Magmatic water** .

If the separation of water from the magma is at deep level, the term **Plutonic water** is applied. While **Volcanic water** designates water from relatively shallow depth.

### 3. Juvenile water:

New water of magmatic or cosmic origin that has not previously been a part of the hydrosphere is referred as **Juvenile water**.

#### 4. Metamorphic water:

**Metamorphic water** is water that is or has been associated with the rocks during their matamorphism.

**THANK YOU**