ANCIENT KNOWLEDGE IN METEOROLOGY

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The man's understanding of the nature has reached the today's level through a number of mileposts. As in any other field, in Meteorology, the initial explanations of weather phenomena were based on some kind of belief of mith.

There are a few historical records on how the ancient Ceylonese (Sri Lankans) understood and forecast weather. But some stories particularly those on rural themes contain information of some methods used by our ancestors to understand changes of weather.

Natural feelings stimulated by the atmospheric conditions like hotness and humidity and some visual observations have been used by people as tools to forecast weather in short range. Cold nights and mornings were regarded to be followed by days with dry weather. Hot and warm feelings during the day times were positive signals of rainy evenings.

People, particularly those sho were engaged in agriculture, used to forecast weather through observants of the sky and movement of clouds. Red sky on sun rise and sun set had been regarded as warning for rainless days ahead. The direction of movement of clouds were regarded as indicators grain. Movement of clouds in one direction indicated rainy weather while the movement in opposite direction signaled dry weather.

It was known to man even a long time ago, that the behaviour of some creatures had some relation to weather parameters and such particular behavior were used as tools to forecast weather. The loud noises of frogs were regarded as signs of arrival of rainy weather condition. Bees are also supposed to be good forecasters of weather. They do not come out of the lives if it is going to be rainy. Some animals like buffalos and cats use to make unusual noises before bad weather conditions like those influenced by cyclones.

Some ancient Knowledge in meteorology in other countries

Buffalo hunters who lived on the northern great plains of North America believed that the weather events were created by four thunderbirds which could not be seen as they were concealed by dark clouds but their voice was thunder and their symbol was forked lightning.[1]

All the great civilizations of antiquity (in India, in China, along the Tigris and Euphrates, and in Egypt) had systems of belief in which weather was under the control of the gods. The belief in an unseen power, called God, is the basic concept of many religions. This has led the man to accept the creation of all weather

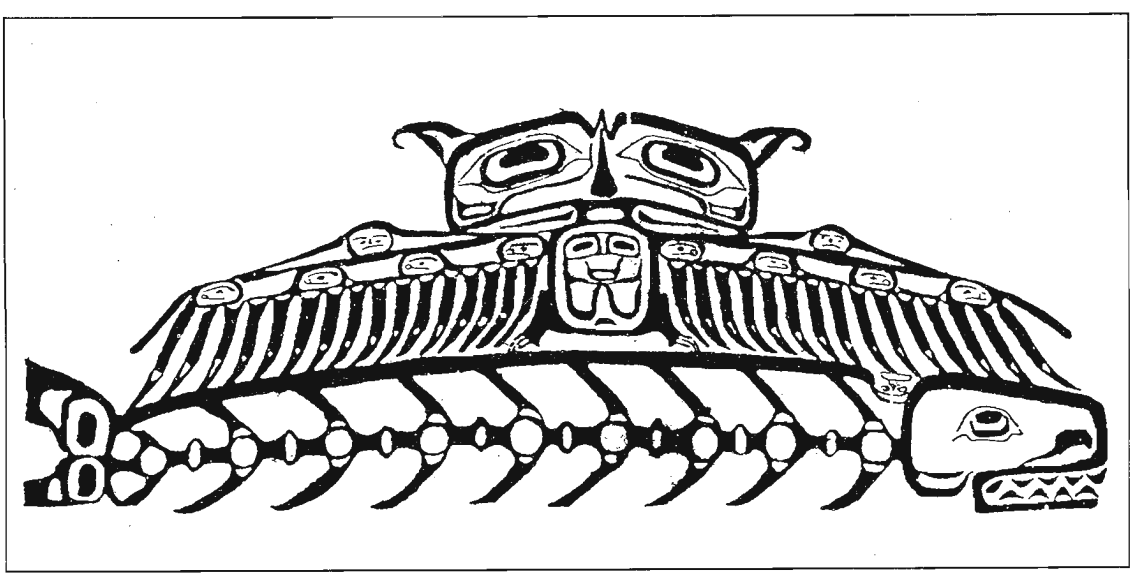
events by a 'Weather God' and this concept can be found in many historic literature of civilizations.

Early in the history of the human race, man's realization of the order embodied in the events around him and in the forces that gave him life came from his observation of the skies and the luminous objects that had wandered in the firmament for thousands of years. Priests searched the heavens from wide open plains, from the terraces of temples and from towers, thinking about the mysteries of the universe, the essence of all being and the origins of life and death.

The observation of the sky and its forces by ancient man can be traced back to the oldest civilization in the history of man as a key expression of man's will and is expressed most strongly in ritual exercise, mythological concepts and superstitious divinations.[2]

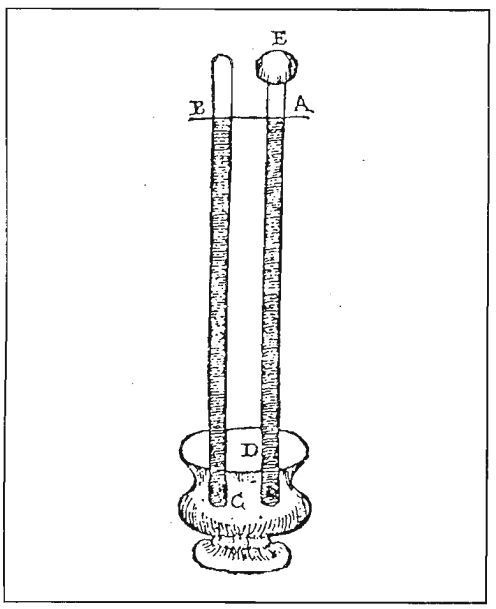
One of the hazardous weather events is lightning. In viewing the interplay of the forces of heaven the human eye was bound to detect lightning as the most magnificent form of the fiery lightning path. Accordingly, the symbols based on the concept of fire are among the oldest pictorial representations of lightning. They emerge from the archaic high culture of Mesopotamia, a country with frequent lightining. Around 700 B.C. Greek art began to use the lightning symbols of the Middle East, attributing them to Zeus, the lightning throwing God. In Chinese mythology of the opposite Yin and Yang, lightning is represented by the colorful goddess Tien Mu.

Many, different beliefs are found even in the more recent mythological concepts in many parts of the world. Some believe that the god Esege Malan exercises his powers of thunder and lightning by throwing round stones from the skies down upon the earth. In Africa it is not a thunderstone, but a magic thunderbird called Umpundulo which flashes down to earth from a cloud in a storm to work his flapping wings.



THE GREAT THUNDERBIRD CARRIES A WHALE ALOFT *in a depiction symbolizing the weather god's dominion over the sea.*

Old descriptions of other weather parameters like wind, rain, sunshine, mist, clouds etc and weather systems like storms, cyclones, tornadoes, fronts etc were also mixed with some kind of belief.



TORRICELLI'S BAROMETER.

The Greeks were the first to attempt an explanation of the weather that relied entirely on physical science rather than on a traditional cosmology. In the seventh century B.C., Thales of Miletus tried to associate weather with the movement of heavenly bodies, and considered water to be the basic element of all matter. He knew that water rises from the earth and then descends from the sky, but he did not understand the process of condensation or the nature of clouds. His student Anaximander understood that wind was moving air, an idea that was rejected by other Greek philosophers, including Aristotle, the greatest philosopher that time.[1]

Empedocles the great natural philosopher before Aristotle proposed in the fifth century B.C. that there were four basic elements: earth, air, fire and water. Fire and water were antagonistic, since water quenches a fire, but earth and air had an affinity for one another. This opposition and affinity governed the four qualities of heat, cold, moistness and dryness.

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Aristotle was the greatest of the Greek scientists. In his book 'Meteorologica' written about 340 B.C., he had attempted to explain weather events. He believed the universe to be spherical, composed of concentric layers with the earth at their center. The outer layers, beyond the orbit of the moon, were the realm of the planets and stars, and Aristotle identified these layers as the province of astronomy. What happened in the inner layers was the domain of meteorology. He assumed of four inner layers composed of four elements fire, air, water and earth, the inner most layer. Also he realized that four layers could mingle and elements were interchangeable; heat could cause water to evaporate, changing it into a moist substance similar to air. This moist substance, though not water, gave rise to clouds and rain, while another of his 'exhalations' hot and dry was the cause of winds and thunder. Aristotle theorized that clouds could not form above the tops of mountains because this was in the layer of fire, too hot for condensation to occur.

The experimental methods in science became possible only with the development of precision instruments for measuring and

recording information. At initial stages, most scientific research was done in libraries rather than in laboratories. Any way with the birth of experimental science, accumulation of experimental evidence and the precision of data gathered were improved and this was very useful in understanding the weather.

The first important meteorological device developed by the German methematician Nicholas de Cusa, in the 15th century was a simple one to measure the humidity of the atmosphere. He hung out some wool and noted that it was heavier when moisture in the air had condensed onto it.[1] Johann Heinrich Lambert, the German Physicist, in 1768 developed a hydrometer to observe the changes of humidity in the atmosphere by hanging cord of twisted catgut with a metal arrow attached to its free end. As the cord picked up or lost moisture, its coil tightened or loosened, causing the arrow to turn along a dial.

Galileo was the first to realize that the expansion of a substance could be used to measure temperature. In Padua (around 1593). He invented the first thermometer a simple glass tube with a bulb at one end. This simple device was quickly copied and refined by scientists in several countries; precise and comparable measurements of temperature became standard.

In 1701, Isaac Newton fixed the freezing point of water at 'zero degrees of heat'. Using mercury instead of water, the German physicist Gabriel Fahrenheit developed his scale in 1714, the Swedish astronomer Anders Celsius proposed his in 1736.

Other instruments, such as wind gauge and calibrated rain gauges were invented during this same period, and the stage was set for the next phase in the history of weather science, in which the properties of water and air were verified by experiments, and large-scale, systematic gathering of precise weather measurements and observation began.

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Ancient man believed that weather systems were created by God whenever he wanted to show his presence and his force to people of a particular area. So the weather systems were thought to be local. The movement of storms along the earth surface was not well known to man until Benjamin Franklin era. On October 21, 1743, an eclipse of the moon occurred and it was visible in eastern North America Benjamin had hoped to witness it in Philadelphia, but the eclipse was obscured by a storm. A few days later he received a letter from his brother, who had seen the eclipse in Boston because the sky there was clear, his brother happened to add that a storm had occurred in Boston on the following day. This fact caused Franklin to speculate that the storm in Philadelphia and the one in Boston were the same, and that this single storm had traveled northeast from Philadelphia to Boston. He therefore proposed the idea of the motion of storms. But the circular motion of wind around the center of a storm was realized several decades later firstly by William Tredfield, an English physicist. In 1831, after much study, Redfield proposed the theory of circular winds in storms, nothing that the pattern of fallen trees he had observed could only be explained if then storm had been a giant whirlwind.

Since the weather has its influences in all activities of human beings, man has taken every effort to observe, explain and forecast it during the whole length of the history. Today, with high altitude balloons, radar, satellites, buoys, automatic observing systems and advanced computers, the movements and behaviour of the atmosphere can be plotted with considerable precision, and weather forecasts can be made with an ever-increasing degree of accuracy.

Reference:

1. John Farrand, Jr, 1990: Weather, Stewart, Tabori and Chang, New York.
2. Golde, R.H, 1977: Lightning, Academic Press, London.
3. Herbert Riehl, 1978: Introduction to the Atmosphere, McGraw Hill, Kogakusha, Ltd, Tokyo.

Although it is not indigenous, author decided to include some information on Meteorology available in other countries as it is historically important

People in Ancient Sri Lanka obtained an understanding of climatic changes by studying the behavioural (flying) patterns of birds like swallows