

● Man's closest look at Mars as recorded by the American unmanned spacecraft Mariner 6.

Scars from the stars

By
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PHOTOGRAPHS of the surfaces of the moon and Mars show that the earth's satellite and the planet have at least one common characteristic. Both bear the scars of bombardment from space. Their appearance is such that they might have been used as targets by high-calibre celestial artillery.

Pictures of Mars sent back to earth from Mariner 4 showed craters, but those revealed by the latest Mariner 6 pictures have amazed even the experts.

The question by this evidence of the cruel pounding of Mars—one crater is 500 miles across—is why the earth should escape similar catastrophic blows. The answer is that the earth does not escape completely.

As the scars of the moon and Mars are examined in unprecedented detail following the Apollo 11 landing and the Mariner 6 flight, so scientists are detecting evidence of the pounding to which the earth's crust has been exposed.

Detected

Some ancient blows have long been known, including that inflicted in Arizona, in the United States, where a great meteoric mass, believed by some to have weighed as much as 1,000,000 tons, created a depression nearly a mile across and about 600ft. deep.

But others are now being discovered by scientists using aerial photographs to study the earth's surface. It was by this method that a major crater was recently detected in the Province of Quebec, Canada.

It may seem strange that the earth's scars should be difficult to detect while those of the moon and Mars show up so clearly.

But a spokesman at the Royal Greenwich Observatory at Herstmonceux, Sussex, explained yesterday that the earth's scars tended to heal. He said: "Because of the earth's atmosphere, natural processes set in which tend to blur the sharp outlines of craters. Rainfall, for example, produces erosion and the contours are softened. This is why some craters can only be identified by advanced techniques of aerial photography."

The moon had no atmosphere capable of similar cosmetic surgery, and the atmosphere of Mars was at best tenuous.

The air, in fact, has a vital role not only in smoothing away evidence of meteor blows but

also in saving the earth from a regular pounding.

The planet is subjected to a sustained cannonade and one authority has calculated that the number of meteors which might be seen to have encountered the earth's atmosphere in a single day is of the order of 24,000,000—about one to every eight square miles of the surface. The number so small as to be unseen is put as high as 8,000,000,000.

In size they may amount to no more than the equivalent of a grain of sand, and, though the number encountered in a day is so large, their total mass has been placed as low as one ton.

The earth is preserved from continuous assault because as the meteors enter the atmosphere, a cap of heated air is formed in front of them. The temperature is such that the solid material first turns to a liquid and then to a gas. The Herstmonceux spokesman commented: "In simple terms, they burn up. The friction caused by the earth's atmosphere destroys them before they land."

"It is the same friction which makes a spacecraft's re-entry one of the most dangerous and difficult times of a journey."

Toppled

Though the earth's atmosphere can absorb punishment like a punch-bag, the moon and Mars lack similar efficient protection. Even the atmosphere, however, is incapable of absorbing the bigger meteors.

It can minimise their effect. Stony meteorites are usually shattered and fall in a large number of fragments. More than 14,000 pieces were collected over an area of 1½ square miles after a meteorite had exploded over the United States in 1912.

But some get through, and one of the most recent major meteoric falls was in a remote area of Siberia in 1908. Trees to a distance of up to 20 miles were toppled by blast and scorched by heat. Aerial shock waves, spreading at about 11 miles per second, were recorded 6,000 miles away. The area of damage was estimated at 1,000 square miles. The Russians now say that the

force of the explosion was no less than that of a hydrogen bomb.

"About four or five meteorites are seen to fall and are recovered every year," said the spokesman at the Royal Greenwich Observatory. "But it seems that the bigger they are, the rarer they are."

"This is extremely fortunate. One of the dangers is that an impact like that caused in Siberia before the First World War might be of such a nature that someone could mistake it for the first act in an atomic war. The consequences of such a mistake could well be appalling."

It is not known to what extent, if any, blows suffered by the earth have influenced the planet.

Landed

But if the theory of an American geologist, Dr. Warren Hamilton, of Denver, Colorado, is correct, the influence of one major collision was profound. Dr. Hamilton believes there is evidence to suggest that a big bump in the Transvaal Province of South Africa many millions of years ago tilted the earth off its axis.

He has suggested that the impact was spread over a 10,000 square mile area when a huge missile split in four and hit the earth with unimaginable force.

Dr. Hamilton says the four pieces probably landed within 15 seconds of each other and were travelling at a speed of up to 100,000 miles per hour.

He commented: "The impact would have been felt all over the earth's surface. It was an enormous catastrophe. Even the largest megaton nuclear explosives today do not seem remotely close to the energy released."

Dr. Hamilton's belief is that the South African collision represented the descent of a comet.

Fortunately for the human race such incidents are rare. Most meteorites generate more interest than alarm. In April this year one swept across England towards Northern Ireland. The main body plunged into the Irish Sea but some fragments were

recovered in Ulster. Fragments of a meteorite were found in Leicestershire in 1965.

Meteor swarms are believed to be the remains of old comets. Astronomers are able to predict with a fair degree of accuracy when they can be expected. During this month, for example, the Perseid meteor shower is expected, and the peak will be reached on or about August 12.

In the case of the Perseids and other meteor streams it is not so much that they are bombarding the earth but that the earth in its journey through space, passes through the elliptical course followed by the fragments.

Specially bright displays Leonid meteors occur every 33 years. The Leonids were responsible for the most astonishing meteor shower on record when in 1833, when as many as 200,000 an hour were reported over a period of several hours. They fell "like snowflakes."

The orbit of the Leonid meteors takes them through the orbits of Jupiter, Saturn and Uranus as well as earth. They are remembered here as a pleasant spectacle in the night skies of November; on planets or satellites lacking the protective envelope of an atmosphere they might well represent a real hazard.

The pock-marked surfaces of the moon and Mars are evidence of the batterings they have sustained

Succeeded

The evidence of meteors that succeeded in penetrating the earth's atmospheric safety net may be less dramatic and easy to detect but it certainly exists.

While Wold Newton was content with a monument, people in other parts of the world worshipped meteorites. The great stone of a pyramid in Mexico was indebted for its sanctity to a report that it had fallen from heaven.

In studying the astonishing pictures from Mars and the more familiar moonscape photographs, there is food for contemplation in the fact that the earth is so protected that only the largest missiles encountered get through, and even those which reach the surface are much reduced in size through the attrition of the atmosphere and often shattered.

The more is known of the universe, the more it seems there is no place like home.