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THE OTHER SIDE OF THE MOON

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From time immemorial it has been known that the Moon always turns the same face towards us. Everybody knows that, unlike the Sun, the face of the Moon is spotted and shaded. These spots are best seen at full moon when the general appearance is that of a somewhat rough-looking human face staring at us, very much after the way in which the Sphinx stares fixidly at the same spot over the sands of Egypt. The earliest savage races noticed this and the Roman historian Plutarch, wrote about "The Face in the Moon," hence arose the age-old expression "The Man in the Moon." In one respect the faces of the Moon and the Sphinx differ—the "Man in the Moon" has been staring for a much longer time. In all probability the moon man has stared at us for millions of years, long before there was any life on the Earth, certainly any human life, and must have seen many strange things happen on our planet. The important thing to note is that whether the Moon is a crescent, a half-moon or full, the face still looks at us from the sky. This can mean only one thing—the Moon always keeps the same side towards the Earth, the other side being forever turned away from us.

Does this mean then that we know absolutely nothing about the other side and can know nothing until the first space-ships take off and men actually land on the Moon? Until recently, people thought so and all manner of curious speculations were made about the further side. The side we see has neither air nor water, being, in fact, an arid desert, plastered over with mountains and vast ring-like objects, the so-called craters; but at one time it was seriously thought that the other side was quite different. There, we were told, were both air and water and, possibly, vegetation, animals or even people. The idea behind this strange fancy was that the Moon was oval or egg-shaped, the pointed end being directed towards us. It was argued that the face we see was a sort of gigantic montain-top sticking up out of the atmosphere and water, which were supposed to be confined to the relatively low-lying other side. This fantastic theory has long been given up and it is now known that there is neither air nor water on any part of the Moon.

Although we said the Moon always turned the same face towards us, the truth is that, like a drunkard, the "Man in the Moon" does sway a little from

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side to side and also nods up and down and this allows us to peep a little around the edge and see a part of the other side. The proper name for this swaying is "libration" and because of it we can see, at one time or another, one tenth of the other side, or over 100 miles around the edge. Apart from these peeps, why does the Moon always keep the same face turned towards us? There must be some reason for this strange state of things and it is evidently in some way due to the Earth. Some power or force must have been in action to compel the Moon to turn the same face towards us, and then keep it so.

This question leads us into rather deep waters, in fact to the query as to where the Moon itself came from. The argument goes like this. If, as some people have thought, the Moon was originally a little planet moving in a path of its own around the Sun, which path at one point lay close to the Earth's orbit, and eventually came so close that our own planet captured it, then there would be no reason why the Moon should always turn the same face towards us; provided the Moon was already solid. If, however, the Moon ages ago was not solid but fluid, or at least plastic, or if at that time there were seas on the Moon, then the attraction of the Earth would raise enormous tides in the seas, which would act as most efficient brakes and eventually so slow down the Moon's rotation as to cause her to always turn the same face towards us. Even with ourselves, the much weaker tides which the Moon raises in our oceans are slowly, almost imperceptibly, slowing down the Earth's rotation, but it will take millions of years before the Earth turns one and the same face towards the Moon.

On the side of the Moon which faces us the action of the once active tides must have resulted in a sort of bulge towards us, a kind of frozen tidal wave, which is, so to speak, the lever by means of which the Earth having once brought the Moon to a relative fixity, keeps it so. Some people, indeed, regard the craters not as extinct volcanoes or caused by meteors striking the surface, but as due to plastic or molten matter in the interior which has been literally sucked out through weak spots, or "pin-holes" in the crust, by the once gigantic tidal action of the Earth.

As we have said, owing to libration, we can actually see a strip or zone, about 100 miles wide of the mysterious other side all around the borders. In addition to what can actually be seen, we can trace certain light rays which are obviously converging towards foci on the remote hemisphere. Since, on the visible side, the light rays radiate from craters of 20 to 50 miles in diameter, there can be little doubt that the invisible foci are also craters, the approximate positions of which we can plot. Judging by analogy on both the Earth and Mars, there is a sort of balancing on planetary globes, an excess of matter, i.e., a continent or extensive mountainous region, being compensated at the point diametrically opposite by a depression. On the Earth we have the great continental mass of Europe and Asia, with, on the opposite side, the Pacific Ocean.

If this also holds on the Moon, we might expect that the Southern portion of the other side, would be largely mountainous and thus opposed to the so-called "seas" which occupy so much of the Northern portion of the side which faces us. For similar reasons, the Northern part would contain several "seas"

or plains, but these are probably less extensive than the plains on our side, since the results of past tidal action must be far less marked there.

Taking everything into consideration, fact and surmise, what in all probability does the other side look like and how does it differ, both in broad outline and detail, from the side we know so well? In short, can we prepare an advance guide for the space-explorers of the, probably, not far distant future?

The elucidation of this interesting problem has occupied the writer for many years and such parts of the mysterious other side as are brought into view have been carefully scrutinized, first with his own 15¼ in. reflecting telescope and lately with some of the finest telescopes in the world; such as the 33 in. refractor at Meudon and the 25 in. at Cambridge.

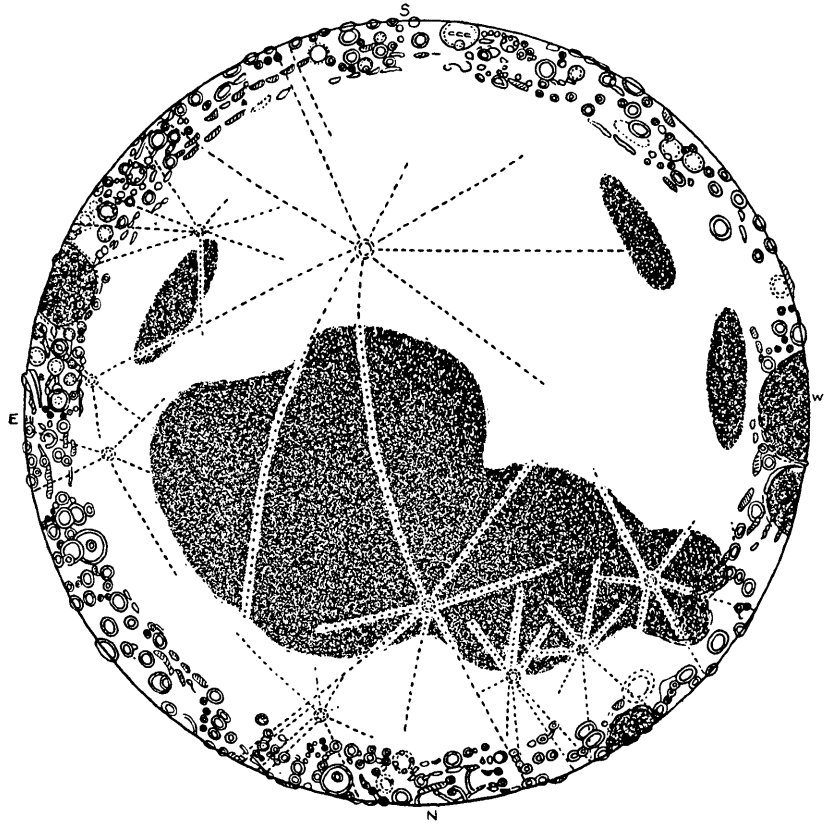
A moment's thought will show the difficulties of properly observing, and hence mapping, the 100 mile zone already mentioned. Even at its best it appears as a narrow strip owing to the foreshortening on the edge of the Moon globe. Mountains will tend to hide such objects as craterlets or depressions of any sort; what nearer the centre of the disc would be a fine, nearly circular crater, is, on this zone, a mere streak; very often only the nearer wall can be detected and its true nature has to be inferred from its shape. It is also easy to understand why large telescopes are necessary for such research. The advantage of a large telescope is that the true nature of whatever detail it does show, is rendered apparent without any difficulty. Some objects in small instruments might be either a mountain ridge or a crater in profile; a speckled region might be covered with either hillocks or minute craterlets; but such possible misinterpretations vanish completely when a giant telescope is employed. We can see at a glance whether an object is a ridge or a crater, a hillock or a craterlet, not to mention the numerous objects which are so small as to be completely invisible in inferior instruments.

But, admitting this, other factors make the charting of features on the very edge of the Moon a slow process. Unfavourable weather, unsuitable libration, the region we wish to examine not being brought sufficiently into view or, given good weather and libration, the region being on the darkened portion of the Moon owing to phase, are the principal obstacles to success, quite apart from the observer himself.

Only by patiently taking advantage of every favourable opportunity and being willing to observe at any hour from sunset to sunrise, can work of scientific value be accomplished, and it requires a certain effort for even the most enthusiastic of observers to get out of a nice warm bed and stand in the frosty, early morning air with, possibly, a chilling wind thrown in as well. Yet the best observations are usually secured under these conditions, and it is at the dead of night, in silence, with the Moon and stars as the only witnesses, apart from an occasional curious cat or hedgehog, that the charting of our neighbouring worlds goes on.

We can conveniently divide the Moon's surface into three parts. First, the portion we always see, about two-fifths of the whole, then the portion we never see, also two-fifths, while the remaining one-fifth is a part all around the edge, half on this side and half on the other, which the swaying first brings into view and then takes out again.

Our chart, the first of its kind ever published, shows the probable appearance of the Moon's other side as it would be seen by anybody viewing it from a distance above the centre; in other words, from a point directly away from the Earth. Our planet would, indeed, be directly behind the Moon and completely hidden by it when the rocket carrying the observer came within 60,000 miles. The writer has found the following features on the other side.



The other side of the Moon.

A large plain or "sea," probably even larger than the Mare Imbrium, or the "Sea of Rains" on our side, covers much of the northern part and probably extends westwards with a bay on the north-west. This bay can just be detected under the most favourable conditions and has been called the Mare Incognito, or the unknown sea, on a special section of the writer's large map of the Moon. There are also smaller plains, the general appearance being that shown on our chart. Anyone can see that if the shading was reversed, the light parts being darkened and the dark areas made light, it would roughly correspond with the distribution of light and dark areas on our side. In other words, elevations on our side correspond to depressions on the other.

As for details, craters and mountains on the light and dark areas, little can be said and nothing is known with certainty. However, we have traced light rays on our side which obviously converge to foci on the other. Since on our side light rays diverge from conspicuous craters, i.e., Tycho, Copernicus and Kepler, there can be little doubt that there are similar craters on the other side. The converging rays show that there are three such ray centres on the north-western part, four smaller on the eastern part near the Equator and south of it. The chief ray centre, probably a crater 50 or 60 miles in diameter, lies on the south about one-third of the way from the centre to the south limb and a little east of the central meridian. This crater is in the middle of the mountainous region, but those on the north are probably situated on the great northern plains.

Coming near the edge, or limb, we are on more secure ground. We can see the details in these regions as they are carried into view in extreme libration. Great craters, some already named, and lofty mountain ranges, lie on the southern portion. Along the top or south edge are great rings, giant craters and between them great mountain masses towering up into the sky. Some of them can be seen in profile on the very edge itself; the highest is so lofty that it would be necessary to pile two mountains like Snowdon on top of our Mount Everest before we could equal it. It is a veritable, celestial sky-scraper and can occasionally be seen from the Earth. As the east point is approached they become more crowded, while on the edge itself is a small plain, the Mare Orientalis. An almost continuous array of mountains runs from the south-west to the east point, they are the D'Alembert and the Doerfel mountains, some of the peaks of which rise 20,000 feet. Large craters, rivalling the finest on our side, occur along the western edge, but the north polar regions have few lofty mountains. The chief features are large, comparatively low-walled enclosures. The actual pole itself lies within one of them, in striking contrast with the deep craters and lofty mountains on the south polar regions.

The more delicate features such as pits, craterlets and clefts, which exist in great numbers on the side facing the Earth, doubtless also exist on the other side, but it is quite impossible to confirm this supposition by direct observation, owing to the great foreshortening.

This sketch of the Moon's other side, although of necessity imperfect and incomplete, does indicate that the same characteristic features, although with differences of detail, are found on the entire lunar globe.

Anybody on the Moon in what is to us the centre of its face, would naturally see the Earth overhead. But as they move towards what we consider the edge, the Earth would seem to get lower and lower in the sky, until if they camped at a certain spot, the Earth, although most of the time well up, would touch the horizon once every month. As a person went further, more and more of the Earth would be hidden at times until, when they reach the border of the other side, the Earth would be hidden most of the time, and would, to a greater or lesser degree, pop into view once a month. Finally, about 130 miles from the border, the Earth would just touch the horizon without any part of it becoming visible. The travellers would then be literally in an unknown world; but it is hoped that when the first space-ships take off and men actually land on the other side of the Moon, they will find our chart and descriptions more or less reliable guides.