

# THE "OTHER SIDE" OF THE MOON.\*

BY WALTER GEORGE BELL.



**A**n Irishman once maintained that the moon was worth two of the sun, because, he argued, the moon shines at night, when light is wanted, whereas the sun only shines by day.

This appreciation of the moon is shared, though not exactly for the same reason, by all astronomers, who have devoted to its study more painstaking care than has been given to any one other of the heavenly bodies. It has been mapped out more accurately than has the African continent, but a limitation of our knowledge of lunar things is always enforced by the fact that so large a portion of its surface is turned away from us.

What is on this "other side" of the moon? It does not seem at first blush a very profitable subject to inquire into. A fact in lunar lore which everybody in the street observes and understands, is that the moon always turns the same face to the earth, that one half of it is visible to us at night when illuminated by the sun's rays, and the other half is for ever hidden from our sight. Consequently, that half may be numbered among the things which we shall never know.

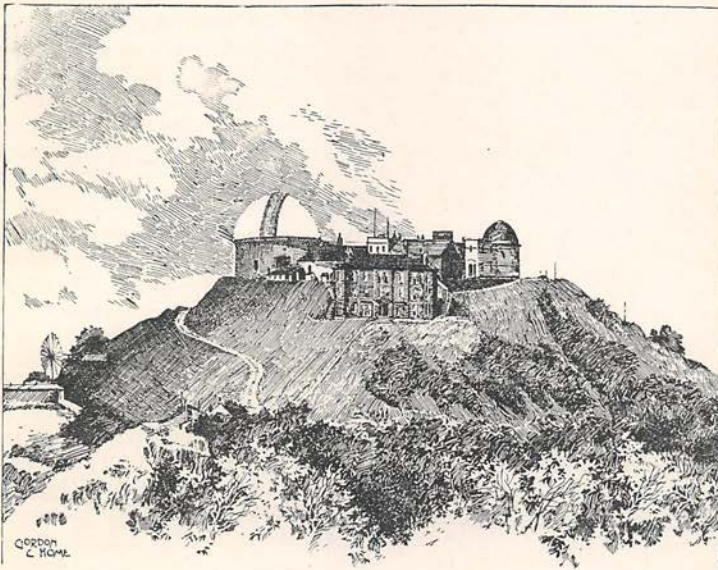
Lord Beaconsfield was troubled over a more simple matter than this. "What

puzzles me," he once observed, "is how they find out the names of the stars!"

It would be hopeless work trying to peer into the mystery of the "other side" of the moon but for the fact that the moon always turning the same face to the earth is true only in a general sense. They will tell you at Greenwich that the face of the moon—that so-called "constant face"—is never alike on two successive nights; that its aspect is continually changing, not only by varying illumination as the crescent waxes and wanes, but by the actual shifting in

position of the orb itself—in short, that the popular idea of a changeless moon is all wrong.

So far from "the other side" of the moon being entirely hidden from us, we are enabled to glimpse a complete zone of it, and nearly one-fifth of its entire



THE LICK OBSERVATORY, MOUNT HAMILTON, CALIFORNIA.

area, and from this, and from our knowledge of the surface always exposed, make out a tolerably good case for what remains. It is rather a complicated matter to explain, but a few simple illustrations make it clear.

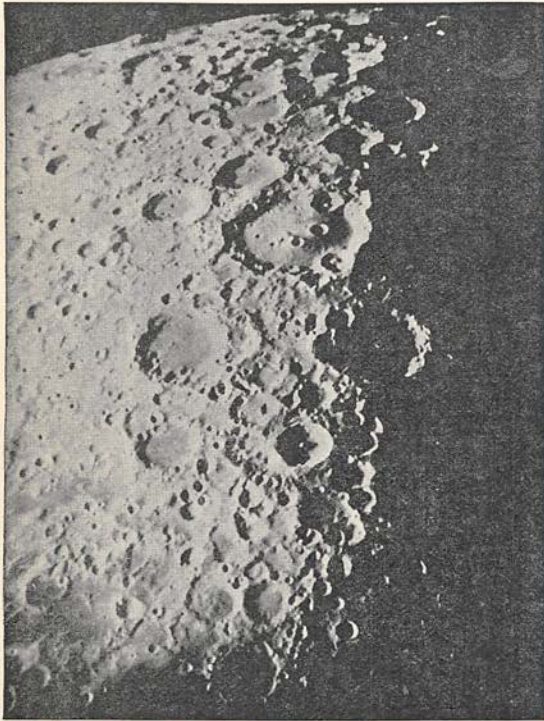
First, it must be understood that in each circuit it makes of the earth the moon makes one revolution on its own axis. We do not see this movement, and, not seeing it, some people find it difficult to believe; but the mere fact of the moon turning always the same face to the earth is itself proof. If it did not rotate on its axis, then a chain of lunar mountains pointing, say, towards a

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star in the west, would always point in that direction, and, as the moon made its circuit round the earth, all its sides would be presented to us in turn.

This rotation of the moon on its axis is constant, but the speed at which the moon moves along its elliptical orbit is not. As it approaches nearer the earth there is a stronger gravitational pull, and it hurries its pace to get away; as it recedes the gravitation is weakened, and the moon slackens its speed. Consider these two motions together, and it will be seen that at times the moon hastens along its circuit



SOUTH POLE OF THE MOON.

round the earth at a speed out of correspondence with its time of rotation, and a part of "the other side" is then brought round into view before the balance is restored—while, of course, an equivalent part on the opposite edge of the disc is taken out of sight. When the moon travels slower there is the same phenomena reversed. So, east and west, small regions of "the other side" of the moon are brought round for our inspection.

North and south we are also permitted to take furtive glimpses of "the other side" of the moon, but after a somewhat different method. Let us call the path along which

the earth travels round the sun level. Then the path along which the moon travels round the earth is not level, but tilted. Sometimes the moon is above our level in space, sometimes below it. When the moon is above us, we look up under the south pole into the regions rising beyond; when below us, we look over the north pole and spy out regions falling away to the south.

Yet another factor adds a further narrow strip to the visible area of "the other side" of the moon. An observer situated at the extreme east or west point on earth from which the moon is visible will see further round the eastern and western hemisphere; of the moon than one whose position is central, the diameter of the earth being four times greater than that of the moon.

This constant change in the face of the moon presented towards us is clearly illustrated in the accompanying photographs, taken at different librations, as these changes are termed. They were kindly sent to me by Dr. Edward Holden, the distinguished astronomer who for ten years directed the work at the Lick Observatory. In the pictures showing the nearly full moon, there is a dark area, named the "Mare Crisium" when these dark grey plains were supposed to be lunar seas, distinguished in both by the mark of a little white cross. In the narrower of the two pictures it is seen close to the edge of the moon's visible disc; in the fuller view of the moon it has been brought nearer the centre of the disc.

The change in the moon's face is shown even more clearly in the two photographs of the thin crescent. In both is seen a long walled gully, or ravine, near the south pole, again marked by a white cross. In the first picture this ravine is near the edge of the moon's visible disc; in the second it lies at a considerable distance from it, while a crowded volcanic area from "the other side" of the moon, invisible when the first photograph was taken, has now been brought round into view. It should be mentioned that two of the illustrations here shown are from excellent prints by the Taber Photographic Company, San Francisco, from the Lick negatives.

Speaking with strict accuracy, instead of presenting an unchanging face towards us, the moon appears to be never still, but always rocking backwards or forwards,



falling towards us or away from us, and by the amount of these variations—small, it is very true—regions of the hemisphere turned away from us are disclosed.

They are placed, unhappily, in the situation best calculated to defeat curiosity. We are permitted to take just a glimpse of "the other side," but to bring away only the minimum of information as to its condition. Seen only on the edge of the disc, our view is subjected to all the disadvantages of foreshortening, and, besides, the sunlight concentrated around the edge of the visible moon is too strong to allow the fine detail to be made out at all clearly, either visually or in a photograph.

They tell us nothing very startling, it is true, but sufficient to destroy the fanciful pictures of romancers who have made the other side of the moon a pleasant habitation, peopled it with weird, winged creatures, and made its landscape picturesque with forests and vegetation, oceans and rivers. They tell us just this :

So far as human beings can ever know, the other side of the moon is a counterpart of the side we know so well.

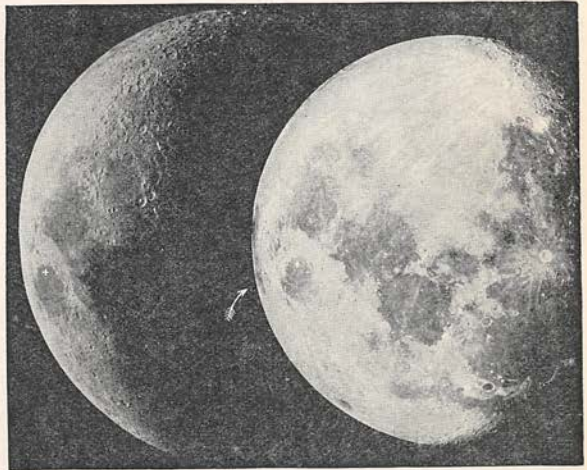
Every part that is brought into view by libration shows exactly those appearances which characterise the face of the moon with which we are familiar—everywhere the same huge volcanoes, many larger in area than an English county, and now for long æons of time inactive; everywhere the same mountain ranges, ravines, and plains. Everywhere the scene is one of utter desolation. It is a dead world that we are looking at—dead as at some future age our own world must be.

Around the south pole the face of the moon is pitted with craters of volcanoes crowded together, their sides piled one against another, showing saucer-like depressions, which throw back a dazzling brilliancy when the sun is shining full upon them. We trace them over and beyond the pole until we can see no farther. Flat, grey plains, once supposed to be seas, and probably dry sea-bottoms, go round the moon east and west until out of sight, and still we find no limit to them. It must be on "the other side" of the moon as on this—a waste of arid rocks, without air, without water, without any of those elements which are essential to life as we know it.

"Absence of winds and currents, absence

of motion everywhere, in the sky as on the surface. At the most, under the influence of alternations of heat and cold, the disintegration of the rocks and the destruction of equilibrium of the heavy bodies, causing the fall of *débris*, break the monotony of the stillness and eternal silence." Silence, because sound cannot be communicated without air. After a night of fourteen days, without twilight the sun blazes up in the sky for a day of equal duration.

In the fierce glare of the sun a temperature never higher than that of frozen water, and in the long lunar night colder than anything we can imagine on earth. What a place to build up a romance in! No wonder that it has fascinated the lively imagination of countless writers, and continues to be a perennial theme for the novelist as well as the



THE MOON WAXING FULL.

scientist. Neither will exhaust its possibilities.

Some years ago there was a curious theory started by an eminent German astronomer, Professor Hansen, which gave a new lease to the speculations as to the possibilities of life on the "other side" of the moon. He thought the hemisphere of the moon turned towards us was in the condition of a high mountain plateau, and that the moon was not a true circular globe. Consequently, we need not be surprised at finding little or no trace of an atmosphere. Round the "other side" the atmosphere had gathered in doubled quantity.

This theory had the advantage of solving an at that time inexplicable problem; but it has since been discounted, though theory requires that the figure of the moon should be slightly greater—peg-top fashion—on the



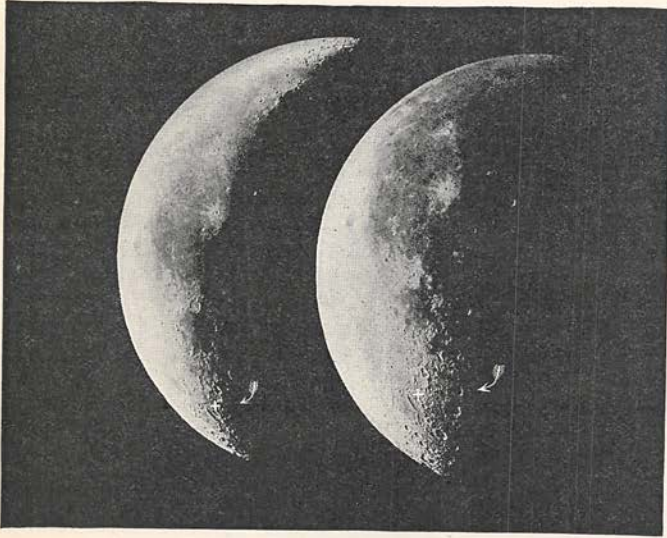
side turned towards us than on the concealed hemisphere. The amount, however, need not be so great as the height of the mountains

beliefs. Quite recently, on lunar photographs taken by the French astronomers at Mendun Observatory have been found marks, not yet satisfactorily explained, which may indicate river beds; while evidence accumulates that some vestiges of an atmosphere on the moon, though exceedingly rare, may yet remain in the deep craters.

Perhaps it is rash to say we shall never know more of the "other side" of the moon, so marvellous have been the recent advances in astronomy. Half a century ago, before the utility of the spectroscope was found, it was held that we could never know the constitution of the stars. Now we know their principal chemical elements, their motions towards us or away from us, and have some basis for speculating which are old stars and which are

young. Some day, perhaps, new discoveries after the manner of Röntgen rays may enable us to get a photograph through the moon.

Short of that, we must needs wait for some stray visitor from outer space to come into collision with the moon and turn it round, in order to enable us to satisfy our curiosity; and patience may well be stimulated by the knowledge that the results of

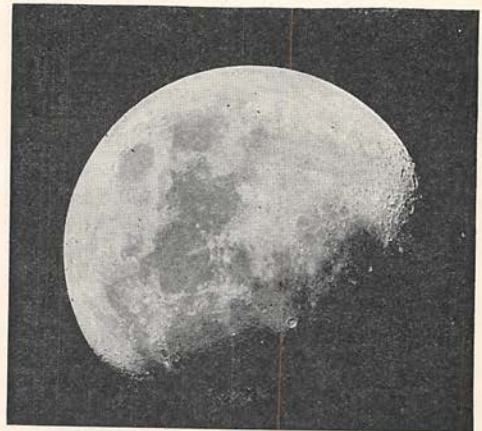


THIN CRESCENT OF THE MOON.

rising from the lunar plains, which are seen in the accompanying photographs.

The great 36-inch telescope of the Lick Observatory at Mount Hamilton, California, with which these photographs were taken, is shown in a drawing on the next page, beneath its huge revolving dome. It was until last autumn the largest telescope in the world, the gift to science of a Californian millionaire, of whom it remains the most splendid monument. Now there is a still larger refractor in the observatory at Lake Geneva, Wisconsin, equipped by Mr. Charles T. Yerkes; but the Lick telescope still maintains its pre-eminence for the purposes of photography. One of the most important tasks to which it has been recently put is to complete a photographic chart of the moon at a scale of several feet to the moon's diameter.

Large charts such as these are invaluable to students of the moon, because they show in greater detail and with absolute exactness features of the moon's surface which astronomers in times gone by spent years of patient toil in drawing. They will settle an old question on which some vague doubt still lingers, whether there is any activity left in the old lunar volcanoes, or subterranean fires in the moon sufficient to break out new vents in the crust. They may also tend to unsettle some established



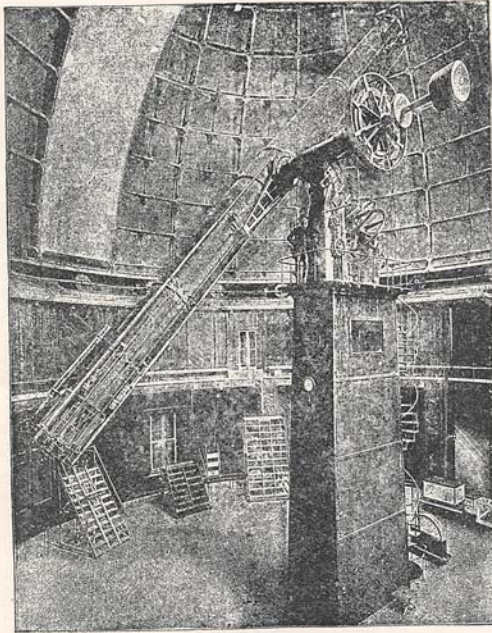
DARK AREAS INDICATING LUNAR PLAINS.

such a collision, should it ever occur, would in all probability be not less disastrous to the earth than to the moon itself.

It is disappointing that our nearest neighbour should always conceal so large a portion of her surface from us. There is no other celestial body, save, possibly, a stray comet, which ever comes within one hundred times our distance from the moon. Most astronomical distances are so vast as to be beyond adequate conception, but this is not the case with the moon. It is merely nine times

that of the circumference of the earth at the Equator. Many of our sailors have travelled as far in their voyages, and our racing trains would easily accomplish the journey within two hundred days.

If out of the realms of romance interplanetary communication is ever established, one of the first objects of our quest should be "the other side" of the moon.



INTERIOR OF THE GREAT DOME, LICK OBSERVATORY.  
(Seventy-five feet in diameter.)