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THE GREEN FIELDS OF THE MOON.

When the moon is at the full, the unassisted eye readily distinguishes on her face certain dark gray spots more or less sharply separated from the brighter portions. Through the telescope these spots appear as broad level spaces, resembling terrestrial seas. Indeed the earlier observers mistook them for seas, and by that name (Latin, *mare*) they are known to this day. They are not seas, however, but ancient sea beds, now probably nearly, if not quite, destitute of water: vast arid basins like the Sahara, or the great interior Utah basin of our own continent.

Examined more closely, these dried-up sea beds—to which Neison applies the irregular but convenient plural *mares*—are seen to have a rolling surface like some of our western prairies, or to be traversed by numerous long ridges, resembling the wave-like sand hills which give so marked and peculiar an appearance to the deserts of Western Australia, the leveler portions being dotted with low mounds interspersed with small crater pits. In many places formations of an apparently alluvial character abound, while the ancient coast lines show distinct traces of water action. Two of these lunar plains—*Mare Humorum* and *Mare Chrisium*—are walled in completely by lofty mountains, presenting stupendous precipices to the vanished sea. The larger mares are more like ocean beds. They run together as terrestrial oceans do, and sometimes merge into the brighter continental regions, without a distinct line of demarkation. In other places they show a rugged coast line, rising into cliffs and peaks, and pierced at times by valleys and ravines.

One of the most conspicuous of these lunar ocean beds, also one of the deepest, is known as the *Mare Serenitatis*. Its area is nearly 125,000 square miles. Within its dark gray border, from thirty to eighty miles wide, is an extensive inner plain which at times presents a fine clear light green tint with a central streak of pure white, the green area lying lower apparently than the gray exterior. The green tint is difficult to catch, except under favorable conditions, and is much weakened by the effect of numerous small white round spots and gray ridges.

Another of the moon's green plains was discovered by Mädler in the *Mare Humorum*, already mentioned. This is one of the smallest as well as most distinctly bordered of the dark gray plains. Its area is 50,000 square miles. The greater portion of its interior is distinctly tinged a dusky green, sometimes very marked, affording a strong contrast with the pure gray of the borders and high enclosing ridges. On the west the green area extends nearly to the edge of the *mare*, but elsewhere, as in the *Mare Serenitatis*, it is separated from the border by a narrow darker gray fringe, except on the northwest, where the gray and green areas merge insensibly into each other.

Still another area of green is observed in the *Mare Chrisium*, one of the most conspicuous of the moon's dark plains. It is completely enclosed and is, perhaps, the deepest of the lunar *mares*. Its area is 78,000 square miles. Its general tint is a gray mixed with an unmistakable tinge of green, especially under high illumination. This verdant hue is seen to best advantage for several days before and after the moon is full.

These and other color changes on the face of the moon—as, for instance, the darkening of the great ring plain of Plato with increasing light, and like changes in certain long winding lunar valleys—led Beer and Mädler to suggest that they would indicate vegetation, were vegetation possible on the surface of the moon. But having accepted Bessel's conclusion that there could be neither air nor water on the lunar surface, and consequently no life, those much respected selenographers could not entertain the hypothesis of lunar vegetation, however strong the evidence might seem.

But Bessel's opinion, as our readers already know, is inconsistent not only with the conditions on which he based his calculations, but also with the results of more recent studies of the state of the moon's surface. So far from being an airless, waterless, unalterable desert, a changeless mass of dead matter, like so much volcanic scoria, the moon is now known to have an atmosphere of considerable volume and density, to present abundant evidence of physical activity and change, and to have in all probability water enough to make life easily possible on its surface.

The moon is dying, but very far from dead. Being so much smaller than the earth, it has run its course more rapidly, but is still a good way off from that goal of ultimate deadness to which so many astronomers have theoretically assigned it. There is not the slightest adequate evidence, Neison says, of the popular view, and "its truth would be admitted by no astronomer who had devoted sufficient attention to selenography to enable him to thoroughly realize the probable present condition of the moon."

Such being the case, the hypothesis that the moon's green plains derive their color from vegetation ceases to be impossible or absurd. The evidence is not of a character to justify a positive assertion that the mythical man in the moon may have abundant pasturage for his cattle; but his case ceases to be absolutely hopeless when a thorough-going selenographer can say, as Neison does, that the moon may possess an atmosphere that must be regarded as fully capable of sustaining various forms of vegetation of even an advanced type; that it does not appear how it can justly be questioned that the lunar surface in favorable positions may yet retain a sufficiency of moisture to support vegetation of many kinds; and that in a very considerable portion of the entire surface of the moon, the temperature would not vary sufficiently to materially affect the existence of vegetable life.

Who can tell but that the aforementioned man in the moon may not follow the plan of the African tribe which Livingstone tells of, and keep himself and his cattle in extensive lunar caverns, where the temperature is uniform and water abundant; driving them forth upon these great green fields for a fortnightly feed when the sun is up for its long days and the grass in good condition? Jules Verne ought not to neglect so inviting a field of exploration.

WORKMEN AND THEIR TEACHERS.

For examples of the lack of definite knowledge upon simple practical subjects, by those who act as judges of workmanship, we need not look far. For instance, if we find in a mechanical newspaper a discussion on the proper manner of putting wheels upon axles, we shall perhaps read as follows: "Make them parallel and bore the hole parallel." "We have tried that, and we had more wheels come loose than we do now when we put them in taper," says another. The truth is that "make them parallel" is correct for good workmanship, and "make them taper" is suitable for inferior workmanship. Who ever heard of a properly designed and constructed parallel axle becoming loose in its wheel, unless from a fracture of the one or the other? If the boring and turning were either out of parallel or out of round, if the tool marks were left too deep, or if the sizes had not allowed the proper amount for shrinkage or the hydraulic pressure, as the case may be, the parallel shaft will come loose; but these defects have no business to exist, and can only exist from a lack of either surveillance or practical knowledge on the part of those in charge of the work.

Another cause for the common ignorance of certain and accurate methods is the unwillingness of a great many of our expert mechanics to impart their knowledge to others. This undoubtedly exists to a deplorable extent, and we have heard it defended upon the plea that business men are not in the habit of bruiting to the world any advantages they may happen to possess in their business facilities; and why should mechanics do so in their business? This is indeed a difficult question to answer upon a business basis, and brings us to the main question, which is how to utilize the knowledge possessed by our most expert artisans, and, by imparting it to our apprentices for their guidance, make superiority and rapid workmanship the rule and not the exception. Much effort has been expended in this direction by various publications, but we regret to say that we very rarely find a book in a machine shop; and need we look far for the reason, which lies not in the backwardness of the press in utilizing the materials at hand, but in the quality of the materials themselves, which do not as a rule commend themselves to those they are intended to benefit? The reasons for this are that, as we have before remarked in these pages, we must look for the science of practice to those who are known from their practical skill; and this course we have endeavored to take in the SCIENTIFIC AMERICAN and the SCIENTIFIC AMERICAN SUPPLEMENT, which have drafted into their service the best known talent in each branch of practical education upon which they have treated. That our efforts have been appreciated is attested by the freedom with which the scientific newspapers of both the United States and of England have drawn upon our columns.

Of the importance of imparting to others the results of the experience of the skilled workman, we will cite the following: Some four years ago there was introduced, from England, a special tool steel, possessing the peculiarity that it did not require any hardening. It was however difficult to forge, since it would crumble to pieces if heated to more than a bright red, and also if hammered at a very low red heat. The writer was one of the first men in this country to try it, and found no noteworthy advantage possessed by it for light lathe or other work. It had no advantages, in fact, as a finishing tool, and but very few for such roughing purposes as the shop in which it was tried afforded. Its cost, too, being sometimes as great as that of ordinary tool steel, its use was not considered advisable. A year afterwards it became known that a certain printing press manufactory had adopted this steel, and had speeded up its machinery faster in consequence of the superiority of the new steel. A visit to the establishment failed to elicit from its manager any data or opinion; but first the speed and feed of some of the tools, communicated to the writer by workmen, disclosed that there was "nothing in it," as mechanics say, and a tool made of that steel and at the manufactory in question, lent by one of the artisans to the writer, showed upon experiment that its superiority was confined to heavy cuts on hard metal, circumstances sufficiently unusual to show that the steel was suitable for special purposes only; and hence it was no surprise to learn that its general use had at that factory been discontinued at a subsequent date. However, it was tried, at the suggestion of the writer, upon pulleys, by Messrs. Laffan and Edgar, of New York, who, finding it served excellently well, applied it to turning shafting, and they were so well pleased with its adaptability to their purposes as to adopt it and recommend it to others. On another occasion, the writer was requested to visit one of the United States navy yards to see the excellent results obtained from a certain brand of American tool steel, for which universal merits were claimed; but on inspection, he found the cutting speed on small work to be only about 25 feet per minute, and that on larger work to range between 9 and 12 feet per minute; so that in neither case was the duty obtained from the tools sufficient to form any criterion of their cutting value.

If we turn to written instructions, we shall find tha for no kind of iron work is a speed of more than 25 feet per minute recommended, while in most cases 23 feet per minute is not exceeded. On small work, however, 35 feet per minute is easily attainable, and is by far the most economical. Two