deck, and consist of three rooms on as many levels: the lowest (32) being a storeroom; the central one (21) a general laboratory, or workroom; and the upper one (9) a deck-laboratory for microscopical work and study. These rooms communicate with one another by means of stairways, but are entirely cut off from all the rest of the ship, excepting through the side-doors of the upper laboratory. The two lower rooms are protected fore and aft by water-tight iron bulkheads, reaching to the main deck; and the storeroom, which contains the supply of alcohol, can be made a tight box, and instantly filled with steam, in case of fire.

Light is admitted to the upper laboratory through a skylight, and two windows on each side, and to the general laboratory through three ports on each side, and two deck-lights overhead; but in the storeroom artificial light is necessary. During the day-time, therefore, the working-rooms are sufficiently well lighted for all ordinary purposes; but the system of electric lamps, which pervades the entire ship, reaches its height of development in these quarters, and every few feet of space contains its little glass globe and horseshoe. The effect at night is very brilliant, and work can then go on about as comfortably as in the brightest sunshine.

[*To be continued.*]

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## *SURFACE CONDITIONS ON THE OTHER PLANETS.*

IN the *Popular science monthly* for June appeared an article entitled 'Cost of life,' by John Pratt, upon the habitability of the other planets. To his conclusion that most of the larger planets are probably unsuited for habitation by beings like ourselves, I think few astronomers would take exception; but several of his statements as to their surface conditions are apparently at variance with modern observation, and with the results of the application of the principles of mechanics.

As to the light from the planets, he says, "In the first place, as might have been conjectured even before the revelations of the spectroscope, from their great volume of light as compared with their distances from the sun, all of these great bodies [the four exterior planets] are self-luminous." There is some reason to believe that at certain times portions of the surface of Jupiter do shine by their own light, but it is certainly very faint, as otherwise, when his satellites pass into his shadow, they would still reflect some light to the earth. In point of fact, however, even to the most powerful telescopes, they absolutely disappear. As to the three remaining planets, their light is so faint at the best, that any determinations as to their self-luminosity are entirely out of the question. The spectroscope shows us nothing whatever on this subject with regard to any of these bodies.

We are then told, that "the density of Jupiter being about 1.40, and that of the earth 5.48, it follows that the attraction exerted by Jupiter is roughly 300 times that of the earth. A man who weighs 150 pounds on the earth, if transported to Jupiter, would shake the ground with a ponderous tread of 45,000 pounds, or 22½ tons. His own weight would at once crush him into a mere pulp. A hickory-nut, falling from a bough, would crash through him like a minie-ball. Again: water would weigh fifteen times as much as quicksilver. A moderate wave would shiver to atoms the strongest ironclad, etc." Applying the ordinary formula, $W = \frac{M}{D^2}$, — where $M$, the mass of Jupiter, in terms of the earth, is 313, and $D$, its diameter, is 11, — we find the weight, $W$, of an object on the surface of Jupiter, equals $\frac{313}{121}$, or 2½ times what it would weigh here: hence our 150-pound man would weigh just 375 pounds there, and would not be seriously inconvenienced by a whole battery of hickory-nuts, provided he wore his hat. With reference to Mars, he writes, that "the relative mass of Mars being only about $\frac{1}{60}$ that of the earth [it is $\frac{1}{9}$ approximately] . . . our typical man would only weigh about 2½ pounds. . . . An 80-ton locomotive would not propel a train of empty cars. . . . A rifle-ball might be caught in the hand without harm." According to the law of gravitation, the 'typical man' would weigh 66 pounds. Supposing the 80-ton locomotive reduced in weight in the proportion he states, the cars would be so also: therefore, under any such conditions whatever, the 80-ton locomotive would draw precisely as great a quantity of matter there as it would upon the surface of the earth. As to the rifle-ball, its stored energy is proportional to $MV^2$; that is, it is proportional to its mass, and independent of its weight. But the mass of a body is the same throughout the universe: therefore experiments in catching rifle-balls in the hand on the surface of Mars would be dangerous.

Finally, referring to Mars, he says, "Nothing can be more certain than that there is no liquid in Mars, and no life." As seen through the telescope, the poles of Mars appear of a brilliant white color. When one of the poles is turned towards the sun, the size of the white spot diminishes, and, when it is turned away again, it increases. Some astronomers have imagined these white spots to be snow: in that case, it is difficult to account for the disappearance, unless we suppose that it melts. It therefore seems rather a strong way of expressing it to say that "nothing can be more certain than that there is no liquid in Mars." There are several other points raised by our author which would bear mentioning, one or two on the subject of energy, particularly "a large aspect of the question, which seems to have escaped the attention of thinkers;" but I think the points referred to above will be sufficient for the present occasion. W. H. PICKERING.