

most exclusively to motion and mass, and but little to volume. The absolute distance of a satellite from its central body is greatest in the case of the outermost or seventh satellite of Saturn, its distance from the body round which it revolves amounting to more than two millions of miles, or ten times as great a distance as that of our moon from the Earth. In the case of Jupiter we find that the outermost or fourth attendant moon is only 1,040,000 miles from that planet, while the distance between Uranus and its sixth satellite (if the latter really exist) amounts to as much as 1,360,000 miles. If we compare, in each of these subordinate systems, the volume of the main planet with the distance of the orbit of its most remote satellite, we discover the existence of entirely new numerical relations. The distances of the outermost satellites of Uranus, Saturn, and Jupiter are, when expressed in semi-diameters of the main planets, as 91, 64, and 27. The outermost satellite of Saturn appears, therefore, to be removed only about one fifteenth further from the center of that planet than our moon is from the Earth. The first or innermost of Saturn's satellites is nearer to its central body than any other of the secondary planets, and presents, moreover, the only instance of a period of revolution of less than twenty-four hours. Its distance from the center of Saturn may, according to Mädler and Wilhelm Beer, be expressed as 2.47 semi-diameters of that planet, or as 80,088 miles. Its distance from the surface of the main planet is therefore 47,480 miles, and from the outermost edge of the ring only 4916 miles. The traveler may form to himself an estimate of the smallness of this amount by remembering the statement of an enterprising navigator, Captain Beechey, that he had in three years passed over 72,800 miles. If, instead of absolute distances, we take the semi-diameters of the principal planets, we shall find that even the first or nearest of the moons of Jupiter (which is 26,000 miles further removed from the center of that planet than our moon is from that of the Earth) is only six semi-diameters of Jupiter from its center, while our moon is removed from us fully $60\frac{1}{3}$ semi-diameters of the Earth.

In the subordinate systems of satellites, we find that the same laws of gravitation which regulate the revolutions of the principal planets round the Sun likewise govern the mutual relations existing between these planets among one another and with reference to their attendant satellites. The twelve moons of Saturn, Jupiter, and the Earth all move like the primary planets from west to east, and in elliptic orbits, de-