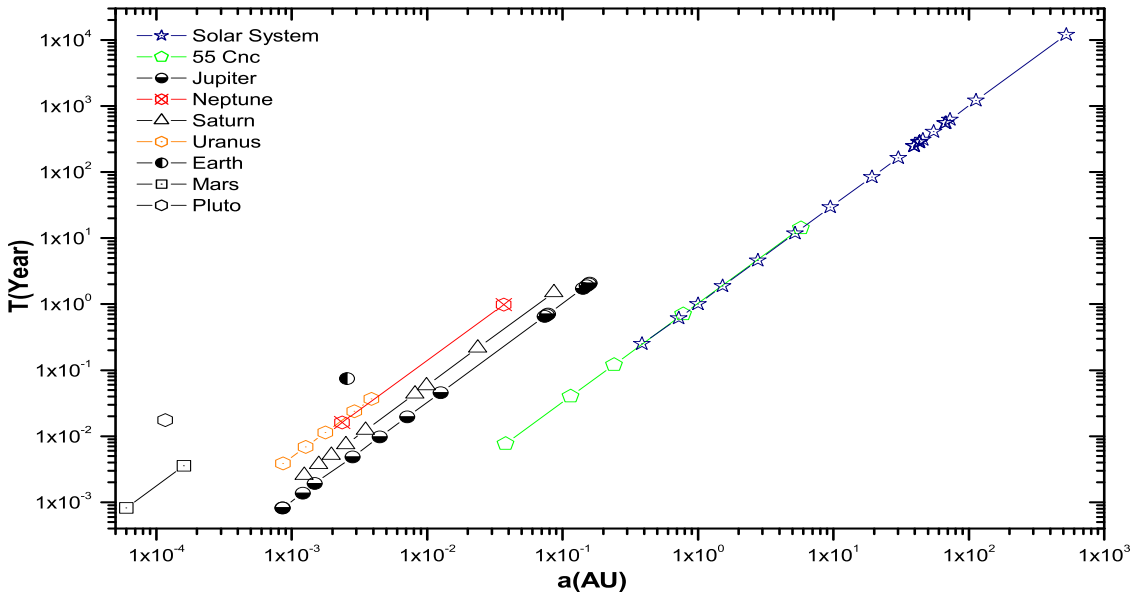


Fig. 5. Classification of planets and satellites. It shows the ranking of the Solar System and 55 Cnc, and satellite systems of planets. It is easy to see that 55Cnc and the Solar System are coincident because the masses of the central body are similar, but they differ clearly for the satellites. The color figure can be viewed online.

## 4. SYSTEMS OF SATELLITES AND EXOPLANETS

In the interpretation of the Titius-Bode Law a perennial concern has existed about its application to satellite systems that orbit the planets of our Solar System and, more recently, to planetary systems orbiting other stars such as $\upsilon$ And, 55 Cnc, 61 Vir, HD69830, HD181433, Glise 876 and G1581 (data from Schneider 2010[3]). Of course, we must recognize the importance of characterizing the orbital period of the planetary objects under study by applying Kepler's Third Law $a^3/T^2 = K$, where $K = \pi^2 G(M + m)$ is called the Proportionality Kepler Parameter (Tables 3 and 4); we must have a clear idea that a self-gravitating system is characterized by means of its central mass and that this acts like a main factor of classification. This way, we observe in the fifth column that the values of $K[\mathrm{m^3\ s^{-2}}]$ are different for every self-gravitating system. Certainly this behavior is also estimated in the sixth column; the values of the ratio $a^3/T^2 = [\mathrm{AU^3\ yr^{-2}}]$ are of the order of one for our self-gravitating Solar System and 55Cnc, since both satisfy Kepler's proportionality. Finally, we must say that if the dimensionless ratio $(a^2/T^3)/K$ has fluctuations close to one, then the parameters $T$, $a$, $M$ and $m$ are well-established.

Thus, also the systems of satellites of the planets are characterized in a unique way, although the constants of proportionality they obey have very small values (Figure 5); the extrasolar planets system possesses specific values of the above mentioned constant that differ or not from that of our Solar System, so much as mass of the star differs from the mass of the sun (Figure 6).

Now assume that the planetary systems 61 Vir and 55 Cnc obey our TBmod model. To reproduce the values of their semi-major axes, it is necessary to take the negative part of the integer numbers. We chose the values $-2$, $-1$, 0, 1 therefore obtaining TBmod values 0.01, 0.1, 0.2 and 0.3 respectively, among which it is easy to find the values of the semi-major axes of the planets of 55 Cnc and 61 Vir (Figure 7). Note that the objects 55Cnc(f) and 55Cnc(d) correspond to the planets Venus and Jupiter, respectively, and 61Vir(d) to a place between Mercury and Venus. This leads us to reassess the general functions proposed here for the Solar System, since the two equations do not allow us to calculate semi-major axes of less than 0.4. In order to avoid this problem we note that with the equation (4) we can determine these small values, and the remaining ones by means of

[3]http://exoplanet.eu/catalog-all.php.