RANDOM STAR GENERATOR

For the World of Gaianar Roleplaying System

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V. 1.0

Overview

The purpose of this document is to provide a series of tables to allow a table-top RPG gamer, such as a GM of a space-based role-playing game, the ability to create star systems at a respectable rate through dice rolls. Note that not all details of each planet and star system are considered – that could take weeks to roll up a single system – but enough detail is included to give players and the GM enough to work with in a given star system and give it a unique feel.

Step 1: Determine the number of stars in the system and it characteristics. Rolling a 10-sided die, also known as a d10, is needed for this step.

Roll of d10 result	Number of stars in the system and its general characteristics
1—4	Single star system. Bonus to number of planets equal to +1
5—6	Close double. Only contains 1 system of planets with –1 penalty to number of planets.
7— 8	Medium to wide double. 2 systems of planets would exist, but with a penalty of -1 to –4 on the number of planets depending upon how close the two stars are to each other. Roll 1d4 for the distance (4 is closest) and the penalty.
9	Triple star system. Assumed to have two closer stars, which could contain 1 system of planets, and a second system of planets around the third star. Penalties on the number of planets per system range from –1 to –4, depending upon how close the single star is to the pair. Roll 1d4 for the distance (4 is closest) and the penalty. Note that any other configuration of three stars, while possible, is probably unstable in the long term and would thus lack most planets
10	Double-double. Two close doubles orbit around each other, resulting in 2 planetary systems, each with a –1 to a –4 penalty depending upon how far away the two pairs of stars are from each other. Roll 1d4 for the distance (4 is closest) and apply that penalty.

Other Types of Systems

Other types of systems: Note that other fantastic configurations of stars are possible, such as the bright star Castor in Gemini, which actually consists of three pairs of stars – 6 stars total – that rotate around each other, two close in, and one pair far away. Similarly, the Trapezium in the heart of the Orion Nebula also has 6 stars, if not more, and is more of a small star cluster than a single star system. However, such systems are relatively rare and should be generated on a case-by-case basis, not randomly, unless one wanted to get into far greater detail regarding possible stellar configurations. Also, such systems would probably be rather hostile to planets because of the complex gravity fields, mak-

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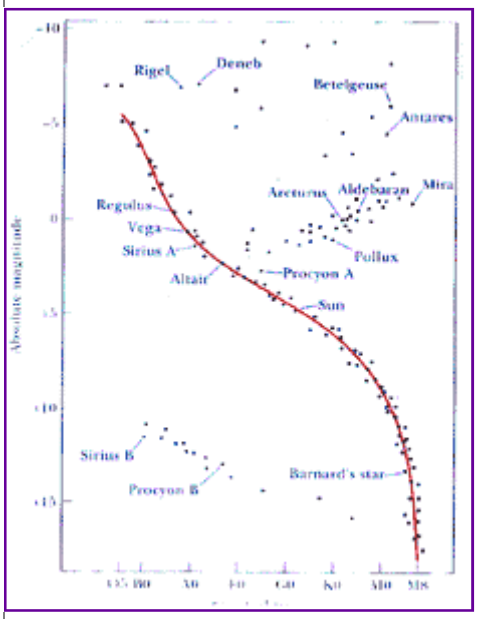

HR Diagram for Stellar Bodies. The red line indicates the color/mass for Main Sequence stars.

Other Types of Systems

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ing them little more than fascinating, if not empty, showpieces on the road among the stars.

Another type of life-hostile star system is the T-Tauri cluster. This consists of a very young cluster of extremely luminous stars. This type of system still retains its stellar nebula and has not yet aged to the point that planets have condensed out of the nebula. These are hot, bright, and highly radioactive places.

Finally, there are "star" systems that actually consist of a brown dwarf or gas supergiant. While these bodies may have planets that revolve around them, they are not stars, per se, and thus do not qualify as star systems. That isn't so say that the three examples mentioned here could not be used in a space-based exploration campaign; these stellar systems are simply ill-suited to carbon-based life, and are fairly rare in occurrence.

Spectral Class for Stellar Bodies

Step 2: Determine the spectral type of each star in the star system. Roll percentile dice for this step

All stars in a given spectral class have a sub-type ranging from 0 to 9, with 9 being the dimmest. This can be rolled for using 1d10, but it does not affect the results in this system.

Percentile dice roll	Spectral Class of star
00	Special category for rare stars and non-main sequence stars. Roll on second table below.
01 to 09	White Dwarves. Burnt out remains of low to mid mass stars. Not main sequence. Penalty to number of planets is –4 because of death of star.
10	Spectral Class A. Bright, blue-white star (about 3 to 6 solar masses)
11 to 13	Spectral Class F. White star of several solar masses (around 2 or 3)
14 to 20	Spectral Class G. Yellow star of about the Sun's mass.
21 to 33	Spectral Class K. Orange star of somewhat less mass than the Sun (around 0.8)
34 and above	Spectral Class M. Cool, red dwarves (at least 0.1 solar mass). If a single star, penalty to the number of planets is –1 since these systems have such low mass.

d10	Special Star Result Table
1 to 5	Giant star, Class K or M. most likely red or orange in color. Non-main sequence low to mid mass star that has exhausted its hydrogen and has grown into a large, bright red giant. Penalty to the number of planets is –2 because of its size.
6	Super giant star, Class M. generally glows dull red. End-stage, non-main sequence star that results from a high mass star exhausting its hydrogen fuel. Large enough to fill much of the solar system, these monsters are rare and short-lived. Penalty to the number of planets is –4 because of the extreme size of these stars.
7 or 8	Spectral Class B. Large, bright blue star with a dozen or more solar masses. Penalty to the number of planets is –2 because strong stellar winds.
9	Spectral Class O. Huge, bright blue star that can contain 60 or more solar masses, even up to 100, though such stars often break down to around 60 before dying. Penalty to the number of planets is –2 because of strong stellar winds.
10	Neutron star or black hole, the former far more common than the later. Penalty to the number of planets is –4 because of supernova.

Hostile Star System Types

Brown dwarves: These very-low mass bodies lie somewhere between a large gas giant and a red dwarf. They lack the mass needed to begin fusion in their cores, so they spend their lives as dulling glowing cinders. They may be even more common than red dwarves, but they are not included here since they are not stars – they have no fusion – and thus are closer to planets, and though they could have systems of planets around them, they would probably be small and definitely be lifeless and frozen.

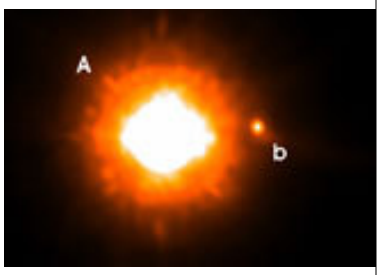
Open star clusters and high mass stars: In general, very high mass stars, such as O and B spectral type stars, are not distributed randomly throughout the galaxy, but instead form in large, dense, open clusters of stars. These individual clusters of stars often make up parts of larger regions of active star formation known as "OB Associations," named for the relatively large number of O and B stars in them. Stars of that high mass generally die very fast, but they are present in relatively large numbers in young clusters.

If a region of space is designed as part of an Open Cluster or OB Association, add an additional 1d4 – 1 O type stars, d6 – 2 B type stars and 1d6 – 1 A type stars. Also, add 1d4 – 1 super giants and 1d6 – 1 giants, which represent dying high mass stars. Because of the high mass of these stars, they will die out within about 100 million years, long before terrestrial worlds even begin to have life.

Old regions of stars: Old regions of space (also called Population II regions), such as galactic cores and globular star clusters generally have no O, B, A, or F stars. Instead, replace all O and B star rolls with super giants and all A and F star rolls with giants. At this point in the evolution of a very old region of space, even the sun-like stars are reaching the end of their life.

Stellar stability: Generally speaking, most stars that are on the main sequence are relatively stable, though all vary in brightness to some limited degree. Old giants and super giants are, by definition, unstable. Also, blazing hot, short-lived, blue spectral type O and B stars should be considered unstable as well. As for stars on the main sequence, they have a 1 in 10 chance of being unstable. In nearly all cases, unstable usually means either long-period variability (either on a regular or irregular pattern) or flaring, which is sudden outbursts of energy (50 percent chance of each.) Note that the likelihood of a starship being in a system when it randomly flares (or when an old star dies and goes supernova) is extremely low. Unless the ship was sent to that system to observe such an event, it is easiest to say such things generally don't happen. Variable stars tend to preclude the existence of any complex life in a star system. Such star systems do NOT have any large terrestrial worlds comparable to Earth.

In a globular cluster, there are no young stars. Also, the shortage of heavy metals in Population II areas make the formation of large, terrestrial planets rare and unlucky. The largest Main Sequence star in a Population II region is a G4 .



I Dim, cool class M stars make up the bulk of Population II systems. These star systems may only have one or two small rocky planets in orbit. Gas giants are even more rare.

Step 3: Determining planetary systems. First, roll 1d10 to determine the base number of planets in a star system, and then apply the appropriate modifiers. Note that modifiers do NOT stack since the aspects that influence orbital stability do not care about the source. Just apply the largest bonus and penalty to the rolled number. The star system is considered to have no major planetary bodies if the resulting number of planets is 0 or less. Note that such systems still have a 50% chance of having a large debris field (an asteroid belt) composed of smaller, broken up rocks that may be worth exploring.

Spectral type vs. number of stable orbits per habitat zone: Determines how many stable orbits can fit into a given habitat zone. This is just an estimate, but is important for game purposes of matching planets to what orbit they inhabit. Note that the third zone, the Outer Zone (or Cold Zone) is not covered here since it has no easily defined upper limit to the number of planet that can dwell in the frozen parts of space far from their home star.

Spectral Type	Inner Zone (Hot Zone)	Habitable Zone
Giant, Super Giant	Orbits 1 through 5	Orbits 6 and 7 (no terrestrial worlds in system)
O and B	Orbits 1 through 5	Orbits 6 and 7 (no terrestrial worlds in system)
A	Orbits 1 through 4	Orbits 5 and 6 (no terrestrial worlds in system)
F	Orbits 1 through 3	Orbits 4 and 5
G	Orbits 1 through 2	Orbits 3 and 4
K	Orbits 1 through 2	Orbit 3
M	Orbit 1	Orbit 2
All stellar remains	None	None

Step 4: Determining individual planets: Now that the upper limits on the number of planets per zone have been defined as needed, roll on the following table for each planet in the star system. Use 1d10 for this roll and reroll as needed based upon the above table so that the number of planets per zone is correct.

Result of 1d10	Habitant Zone	Planet Type
1	Hot	Airless or nearly airless low-mass, hot rock
2	Hot	Venus-like world with thick atmosphere
3	Hot	Hot gas giant
4	Habitable	Terrestrial world (roll percentile dice to determine percent water coverage. Min is 10% and max is 90%)
5	Habitable	Sub-terrestrial world (not quite habitable on its own. Terrestrial worlds with too little or too much water are an example of this type of world)
6	Habitable	Gas giant (10% each of having a terrestrial or sub-terrestrial large moon)
7	Cold	Frozen, icy rock that is nearly airless
8	Cold	Gas dwarf – cold rock with thick atmosphere
9	Cold	Gas giant
10	Cold	Europa – Ice covered, but with liquid water oceans. Life may be possible.

Step 5: Adding planetary details: Note that the table in the previous step only provides the basic classification of the world – the details are left up to the imagination of the person creating the star system. There is no chart that can randomly determine all the ways two planets of the same class can differ, but some ideas for unusual planetary features are offered below. For the sake of consistency, several more common attributes are given so one can roll for a usual characteristic if desired. A planet has, on average, a 50% chance of having an unusual characteristic.

1d10	Unusual planetary characteristic
1 or 2	Has a moderately to highly eccentric orbit. (Not useful for terrestrial worlds)
3	Has a significant axial tilt and thus extreme seasons. (Generally not useful for terrestrial worlds)
4	Rotates very slowly (planets in the Hot Zone may be tidal locked) or in a retrograde direction (Generally not useful for terrestrial worlds)
5	Revolves around its star in a retrograde direction
6	Has an orbit significantly inclined to the plane of the star system
7	Has a thicker or thinner than average atmosphere
8	Is more or less massive than average
9	Is very active geologically or is nearly dead geologically
10	Has an unusually large moon or an unusually high number of moons

Step 6: Making the star system fit: At this point, one may change a few randomly rolled characteristics, or use the system as-is. The final step is to figure out how it fits into the game or story (is there an alien race in this system? are there worlds full of resources to explore?) and to give the star system and the planet a name. Bright stars that can be seen for vast distances tend to have names specific to a culture that can date back for thousands of years. Stars of middle magnitude may be known by which constellation there are in, often proceeded by a Greek letter (such as Alpha Libra.) Finally, dim stars tend to be known by a number in a catalog. Of course, one is free to do whatever one wants in a fictional game!

Example Star System: This is written from the viewpoint of an explorer arriving at this star system from another world.

System Name: Hannum 473 (from made-up catalog named after myself)

Type: Close Double (1 planetary system)
Star 1: Orange Dwarf (Spectral Type K7)
Star 2: Red Dwarf (Spectral Type M8)
Number of Planets: 5
- Planet 1: Hot gas giant (inclined orbit)
- Planet 2: Terrestrial world
  - (32% water, has ecosystem and 1 intelligent species)
- Planet 3: Cold gas giant
- Planet 4: Cold gas giant (more massive than average)
- Planet 5: Frozen rock

Summary: Binary star system composed of long-lived, though dim and cool, type K and M stars. These ruddy stars have a terrestrial world orbiting them that is composed mostly of plains, rocks, and deserts. Despite the relative lack of water on this world, it has a respectable ecosystem and is inhabited by one intelligent species of avian creatures that are nearing the ability to achieve primitive space flight. The rest of the star system is lifeless, though it has a higher than expected number of gas giants. The close-in one orbits in a particularly unusual inclined orbit.