Using Total Axial Angular Momentum to Determine the Age of Exoplanets, or Why Do Planets Spin at Different Energies?

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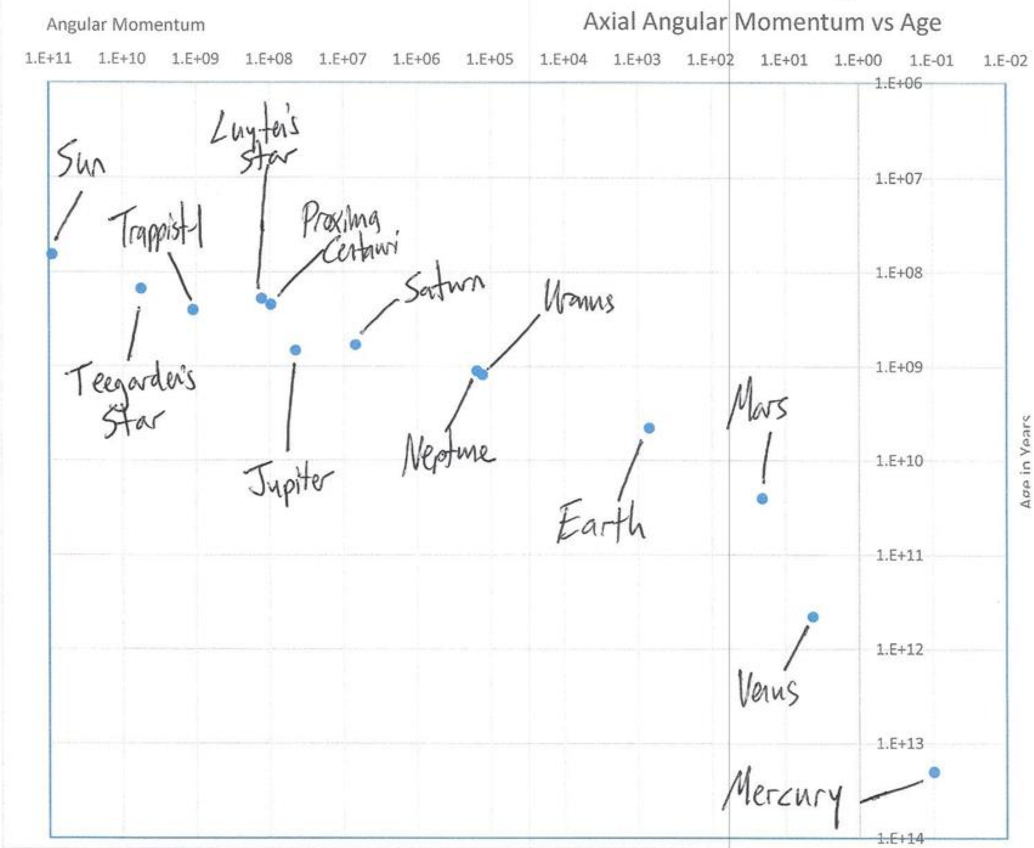
Abstract: Some ideas are presented to try and fit total axial angular momentum into the picture of gyro-chrono-logy, or "spin", "age", "study". The total axial angular momentums are calculated for specific bodies and made into a dimensionless number called William's Number. The William's number cutoff is arbitrarily set at 1 * 10^3. Graphs with explanations are provided, along with a chart with the predicted ages of the old stars in our system and others. The purpose of this paper is to finally give reason as to why some objects in our solar system have more spin energy (a calculated abstraction) than others, and to explain why they spin in the first place. Dimensionless number is total axial angular momentum divided by 1 * 10^31, with the kg *m^2*s^-1 removed. This paper is subject to revision as the new field of gyrochronology is developed.

Stars spin with less energy because they are more evolved than others. Earth spins because it is a 4.5 billion year old star. Younger stars spin with more axial angular momentum, older stars spin with less axial angular momentum. A "planet's" or "exoplanet's" spin energy is a direct result of losing energy and mass over its long, long life. Values below the Williams Number of 1 * 10^3 can be expected to be subject to more tidal interactions, thus the tidal interactions make the age more variable, therefore are more scatter shot than the younger stars. Using D/H ratios can help alleviate discrepancies and make the measurements more accurate. Another note, in order to calculate the age, it is best to use the closest William's Number to the star. This new concept gives us a much better estimate of the huge variance in age of highly evolved stars, as opposed to the dogma, which has no method for determining the age of exoplanets. Their belief is that evolved stars are the same ages as their hosts, which is outdated.

	angular	age in years
	momentum	
	Dimensionless William's Number	
Sun	90,237,000,000	65,000,000
Jupiter	44,900,000	680,000,000
Saturn	6,910,000	590,000,000
Neptune	154,660	1,120,000,000

Uranus	130,000	1,230,000,000
Earth	706	4,500,000,000
Mars	20.82	25,000,000,000
Venus	4.267	450,000,000,000
Proxima Centauri	97,000,000	220,000,000
Luyten's Star	129,600,000	190,000,000
Trappist-1	1,106,000,000	250,000,000
Teegarden's Star	5,610,000,000	150,000,000
Mercury	0.0971	19,770,000,000,000-32,750,000,000,000
Beta Pictoris b	3,481,600,000	242,000,000

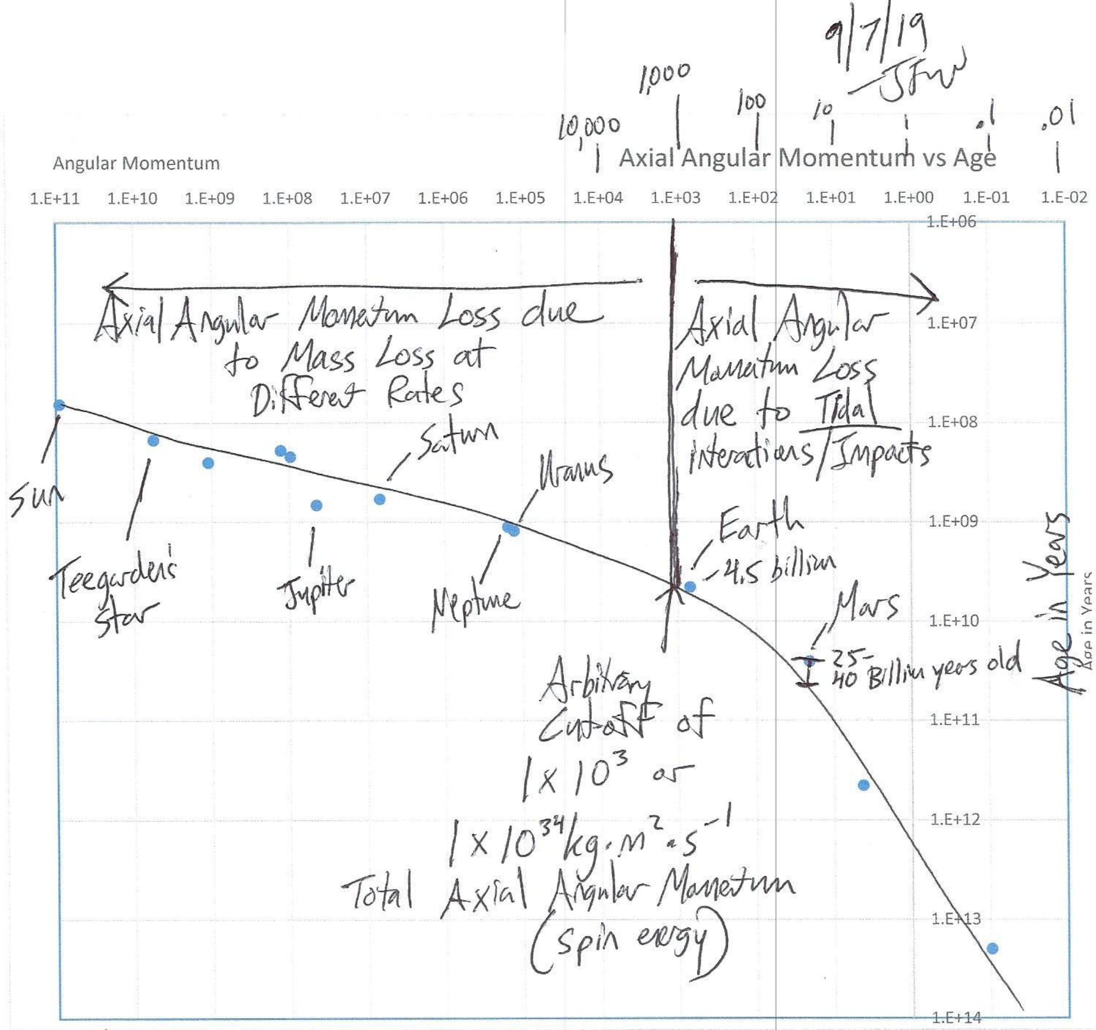
9/7/19 JSW



★ Angular momentum is dimensionless (on this graph) removes 31 zeros!

so $2 \times 10^{40} kg \cdot m^2 \cdot s^{-1} =$

2×10^{9}



Line of Best Fit!

☆ Notice gas type and young, hot, large stars on the left hand side are most subject to angular momentum (spin energy) loss due to mass loss, both are conserved quantities

Mass loss = Axial angular momentum loss

☆ Notice ~~ete~~ once the inflection point is reached then the star can age ~~signifit~~ significantly with very little comparable mass loss (but still loses spin energy)

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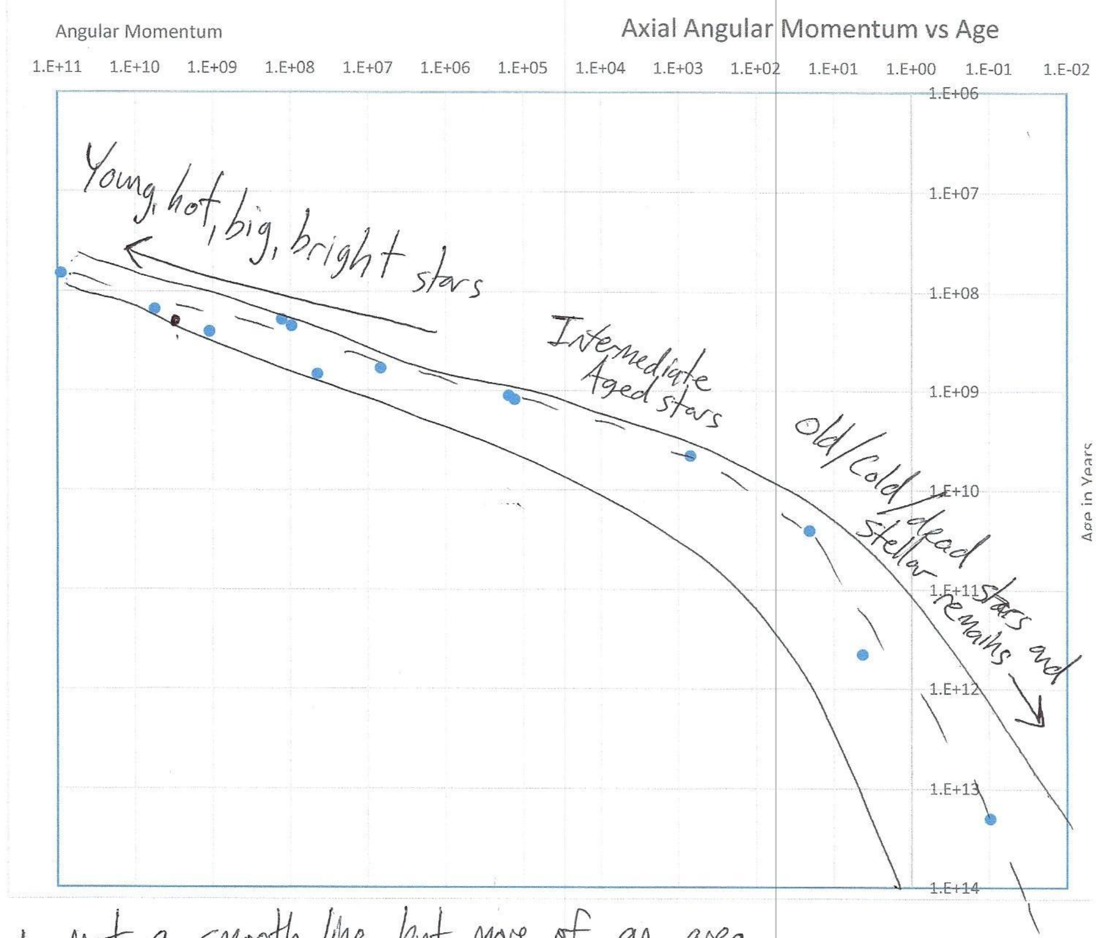
-JJW



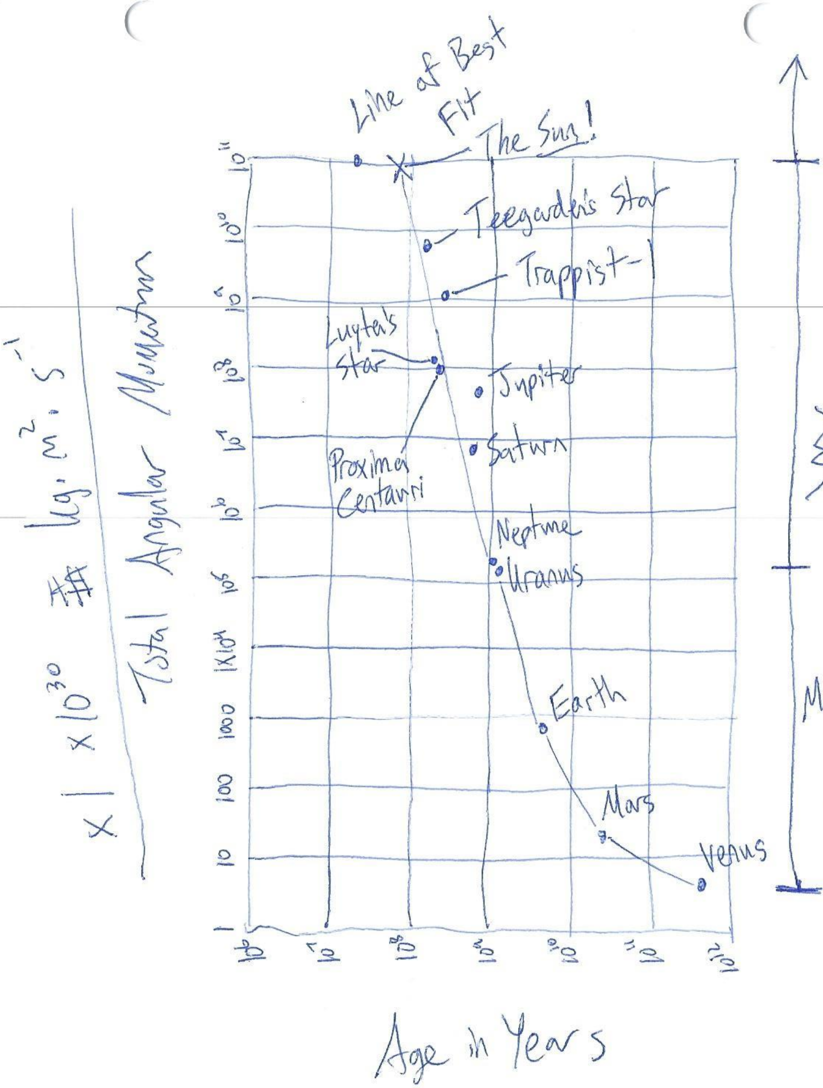
☆ Not a smooth line but more of an area

☆ dotted line is line of best fit but...

☆ smooth lines give margin of error (subject to revision)

☆ It is important to know this is why the "planets" spin. They are old stars that have lost most of their mass, thus most of their angular momentum

☆ some stars spin with more axial angular momentum because they are younger



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Sheet #35 on Excel

still more to work out

Most stable diminishing total axial angular momentum for ancient stars not tidally locked.

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Mercury's age vs venus

1.977×10^{13}