If You're Going to Ste. Anne, Be Sure to Pack a Sweater

The Urth list — 1 messages, 1 voices, 14 Dec 2000

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Talarican — 14 Dec 2000, 23:51

HARD SCIENCE ALERT! SENSITIVE PERSONS TAKE COVER!

Ste. Croix / Ste. Anne's (hrta "C&A") year is simply not likely to be longer than that of Earth, such as Mantis' 1.23 Earth years. On the contrary, it should be considerably shorter. Given that C&A's sun (hrta "C&AS") is undeniably redder and cooler than Sol, and humans apparently live quite comfortably on the planets without any technological life support, these observations do not fit together within conventional astrophysics.

For C&AS to be noticeably redder than Sol implies that it is of a cooler spectroscopic type such as K or M, as opposed to Sol's G (the Sol of your day, not my Old Sun), which means it must also be either a lower-mass, smaller main sequence star than Sol, or a red giant. I think we can rule out red giant almost immediately. An orbit of period 402 days would put the planets well within the star's radius, or at least very close. Red giants are shortlived and rather unstable, with a lifetime of around a billion years or less. There would not have been time for a previously frozen outer world to evolve complex life in the manner of Earth after the star hit red giant stage. Also, I think someone would have remarked on the fact that the sun filled half the sky, had it been so.

Therefore, C&AS is a main sequence star considerably cooler than Sol. It follows the star must be less massive and somewhat smaller than Sol. While decreasing the mass increases the orbital period (the square of the period is inversely proportional to the star's mass), decreasing the size and temperature of the star drastically reduce its luminousity. Exobiologists write of a star system's "habitable zone", that range of distances within which a terrestrial planet might be expected to have liquid water on its surface. (some have remarked that that is too liberal a range of temperatures) Since luminousity decreases as the square of the diameter and as the temperature to the fourth power, and since the energy reaching an orbiting planet decreases with the square of the distance, the "habitable zone"'s radius and range is quite sensitive to, ultimately, the mass of the main-sequence star. Therefore, a world habitable for life-as-we-know-it must be much closer to a less massive star.

For example: Tau Ceti, still a very sunlike type G star, has about 82 to 90% solar mass. Its luminousity is only 59% that of Sol! Therefore the middle of its "habitable zone" is only 68% as far out as the Earth's orbit from Sol (i.e., the center of Tau Ceti's habitable zone is 0.68 astronomical units or a.u., from the star), and the orbital period of an object in that orbit is about 228 days. And Tau Ceti probably would not be distinguishable from Sol to a casual observer on the hypothetical planet's surface.

Epsilon Eridani, a type K star whose temperature is about 4900K to Sol's 5800K, and whose mass is about 0.8 solar, has been the subject of much speculation about the possibility of planets and life, due to a noticeable dust ring. Its luminousity is about 0.34 Sol's. Its habitable zone is about
0.54 a.u, period 172 days. An observer might notice the sun being somewhat more red-orange.

Robert Borski and Mantis have previously suggested that C&AS might be Wolf 294, a type M star in Gemini. While Cave Canem offers some intriguing reasoning, and the color might be right, a type M star seems far-fetched. I lack statistics on Wolf 294, but Luyten 726-8 AB seems to be a near-twin. Its mass is 0.12 solar, and its luminousity is about (pause, catch breath) sixty one-millionths solar. The habitable zone lies cozily against the gently glowing star at 0.0075 a.u. which I believe is a little over twice the average distance of Lune from Urth? A planet that close would tide-lock; I don't think a pair of co-orbiting planets could be stable.

Conclusion: Given red star, given humans going practically naked, a 1.23 times as long year is quite unlikely. C&S would not be habitable for humans without technological life support. Therefore, some other interpretation of the clues in the text is in order.

I am still awaiting delivery of my used copies of 5HC (1 Scribner's, 1 Ace) from that emporium called, in one of your dead languages, "Lacking Breast". The oddities of your language and culture provide me endless puzzlement and amusement. When I have those tomes, I can search for more evidence.

P.S. Mantis "artificial-seeming age/decay of the buildings on Ste. Croix"
as evidence that clumsy abos incapable of maintaining them are in charge! (I wonder if the Veil Holocaust took place at my alma mater, too?) A worthy argument, I salute you, but I must point out, not quite conclusive; there are other explanations for poor building maintenance, especially in a rather decadent culture. Could the early colonists have wished to create a more homelike atmosphere with a faux European pseudo antiquity?

The Mad Exultant