

Solar Evolution

By Trevor Helwig for the Southern Sun Times

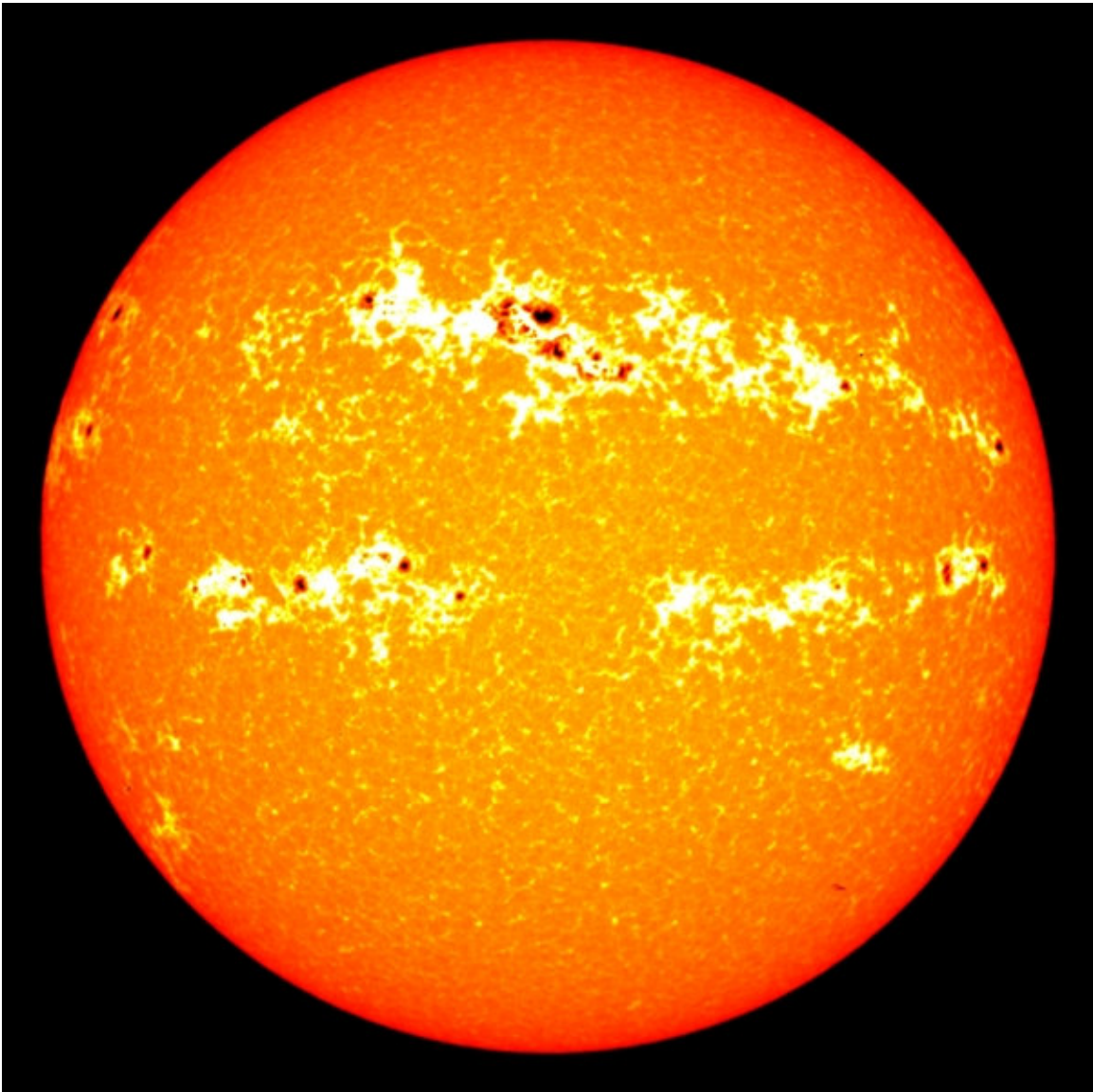
Young children will at some point ask their parents very basic astronomy questions about the world around them. For example, “Why does the sun shine?” or “What is a star?” Simple questions but also very profound! As adults, how many of us take such questions for granted?

Our Sun is a star and probably one of the most interesting astronomical objects that amateur astronomers can view. The Sun is of course too bright to view with the naked eye and extreme caution should be taken when attempting any sort of visual observation. The Sun can be viewed in a number of safe ways: (1) Welder’s # 14 plate goggles can be used for viewing. Take care to ensure that the grade of glass is #14 and note that the Sun will appear green! (2) Indirect viewing can be done, for example, by projecting the image of the Sun through a pinhole on one piece of paper onto a separate piece. (3) Special protective lenses can also be purchased to view the Sun telescopically or with binoculars. (The Lethbridge Astronomy Society has a special solar scope that is used solely for this purpose.) The level of detail that can be achieved visually through these methods is not as good as the attached photograph but still, interesting features, such as sun spots and prominences (flares at the edge of the sun) can be observed, as well as some textural detail. Again, great caution should be taken for any observing. The intensity of sunlight through a telescope or a pair of binoculars can cause blindness in a fraction of a second! For more information on solar observing, most beginner’s astronomy references will describe this in more detail. Check out ‘Nightwatch’, by Terence Dickinson – an excellent astronomy text by a Canadian author, available at most Chapters bookstores.

Looking at the night sky, it is sometimes difficult to grasp that all of the visible stars in the night sky are Suns in their own right. So, we know that our Sun is a star, but getting back to the child’s question, “What is a star?” The quick answer that most people would reply is that a star is a big ball of burning gas; although this is not really a correct answer! Stars may indeed be gigantic spheres of glowing, ionized gas (made up mostly of hydrogen and helium), but they do not burn the way a campfire does! Our current understanding leads us to believe that it is the sheer massiveness that makes a star ‘happen’. Stars are thought to form in molecular clouds of hydrogen and helium. As the young star (protostar) attracts sufficient mass it becomes so large and dense/heavy that two things occur: (1) Gravitational contraction starts to occur and implosive forces start to pull the star in on itself. (2) At the same time, the temperatures and pressures at the core of the star become so intense that they trigger thermo-nuclear processes that fuse helium nuclei to form hydrogen – not unlike the process in a thermo-nuclear bomb. This releases huge amounts of energy and light and amazingly these implosive and explosive processes balance against one another in a sort of equilibrium for a period of time (in the case of our Sun, for billions of years). The evolution of a star and the time that it remains stable depends upon its initial mass.

When the hydrogen fuel starts to get used up, the supernova process begins. When a star starts to go supernova, it initially collapses in on itself under gravitational contraction, but as it does so, again huge pressures are created at the core which triggers the release of huge amounts of energy. The star will expand in size and eventually explode as a supernova, shedding much of its mass before living out retirement either as a black hole or as a neutron star.

Trevor Helwig is a member of the Lethbridge Astronomy Society, which holds a public observing session on the last Saturday of the month at 7:30 PM at the Oldman River Observatory in Popson Park from September to April.



Caption: A photo of the sun taken during a period of high sunspot activity - March 28, 2001 (courtesy NASA).