THE LIFE OF A STAR

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All of us at one time or another have wondered how close we were to the stars. Haydn the composer once put together a little tune for which we have the words; "Twinkle, twinkle, little star, how I wonder what you are." And, in the past there have been priests who started a cult now called "Astrology" by which they decreed how men must serve the relative positions of the stars and planets in order to lead successful lives. But, there were many others going back just as far as the astrologers who tried to find the reasons behind all of the stars in the skies. Until the science of optics had been developed to the point where men could aid their naked eye with a telescope and a prism, stars and even the nearest one, our sun were quite mysterious and they basked only in the mathematical glory of possessing the perfect figure. Then Isaac Newton and later other famous names like Bunsen, Fraunhofer and the Jesuit Secchi studied the sun and the stars through their spectra.

Father Secchi, especially, was intrigued by the spectra of stars and he began to classify them according to spectral types. His work was taken up at Harvard in the late 1880's and the number of classes increased according to the letters of the alphabet. When several thousand stars had been sorted from A to Z, the classes were simplified down to nine letters from A to S. Then as more about the temperature of spectra and chemical elements was learned, the letters were arranged in a temperature sequence that went O, B, A, F, G, K, M, N. S. The O stars were called the early type because the evolutionary minded thought they began very hot, about 30, 000 degrees absolute on the surface, and the M, N and S were the late type, almost as cool as the tip of a cigarette. We are not so sure of all that any longer, but we still describe O and B stars as early types.

In the first slide we see how Father Secchi saw the spectra and drew them by hand at his telescope in the 1870's. He settled on four basic groups or types of which the one with the least detail in its spectrum was the coolest because it was continuous like a hot solid. But it was soon found out that when a star was very hot its chemical elements were almost entirely ionized and could not show any absorption lines like other cooler stars. The O's moved into the first place.

Then along came the first astrophysicists who studied stars as huge spheres of incandescent gas. With the helping hands of the astronomers who measured the exact positions of stars they found out that two stars with the exact same spectrum had to differ tremendously in size. This too was news that all stars were not of the same size. Now we began matching stars not only with temperature but with dimension and we ended up with supergiants, giants, normal, dwarfs and subdwarfs. Taking the sun as unity, which astronomers like to do, a giant would be ten times and a supergiant one hundred times the sun's radius, while the dwarf would be one tenth and the subdwarf one hundredth of the sun's radius.