A Word on Temperature

In the United States, we mainly use Fahrenheit degrees, a scale on which water freezes at 32° and boils at 212°, some 180° hotter. In 1742, the Swedish astronomer Andreas Celsius suggested a temperature scale that seemed more rational: Water freezes at 0° and boils at 100°. That scale used to be called centigrade but now is named Celsius.

Kelvin Temperature Scale

The Sun has no freezing or boiling water, though, so neither the Fahrenheit nor the Celsius scale is particularly sensible. We want to use a scale that starts at as low a temperature as possible, which we will call "zero." Just think of "absolute zero" as the lowest temperature that could be conceived of. Astronomers use the kelvin temperature scale, which uses degrees that are the same size as Celsius degrees but that begins at absolute zero. In the current system of units that has been adopted internationally, the intervals are actually called "kelvins" rather than "degrees kelvin" or "°K." In this adopted system, units named after people have capital letters in their symbols. So, the symbol for a kelvin is K. It is named after Lord Kelvin, the English scientist who started out as William Thomson but was named Baron Kelvin. He worked out the kelvin scale in 1848.

Absolute zero has been measured to be −273.16°C. So on the kelvin scale, water freezes at about 273 kelvins. Water boils exactly 100 kelvins higher, at about 373 kelvins. But all these temperatures are much too low to be useful in talking about stars.

The Sun's surface is about 5,800 kelvins. Subtract 273 to find its Celsius temperature. Since we are talking in round numbers, and 273 is about 300, let's say that the Sun's surface is about 5,500°C.

To change from Celsius temperatures to Fahrenheit temperatures, first multiply by ⁹⁄₅, since Celsius degrees are ⁹⁄₅ times greater than Fahrenheit degrees. (180 °F = 100 °C, and ¹⁸⁰⁄₁₀₀ = ¹⁸⁄₁₀ = ⁹⁄₅). Then just add 32 to get the Fahrenheit temperature. (I always test with 0°C to see that I am doing things right: 0° × ⁹⁄₅ = 0°. Then add 32° to get 32°F, which is right for the freezing point of water.)

So to change from the Sun's 5,500°C to Fahrenheit, we multiply 5,500 × ⁹⁄₅ = 1,100 × 9 = 9,900 and then add 32. That gives us about 10,000°F. Don't worry about a lot of digits or extra decimals. When we are talking about 10,000°, what's a few degrees more or fewer among friends?

Celsius to Fahrenheit

What's an easy way to remember how to change from Celsius to Fahrenheit? Remember the rhyming jingle: "Times 2, minus point 2, plus 32." That is, multiply the Celsius temperature by 2. To find "point 2" (0.2) of the original value, just move the decimal place to the left by one notch. (0.2 is 2.0 with the decimal point moved left.) Then add 32. See the following examples:

- **Terrestrial example:** A nice day at home might be 30°C. Times 2 is 60; then subtract 6 to give 54. Finally, add 32 to get 86.

- **Solar example:** The Sun is 5,500°C at its surface. That times 2 is 11,000. Subtract 1,100 to get 9,900. Then add 32 to get 9,932, or almost 10,000°F. That's close enough.