An introductory astronomy course offers a terrific opportunity for “Stealth Physics” – the exposure to important physical concepts to a class expecting to learn only about astronomy.

Many elementary astronomy textbooks contain a third or fourth chapter entitled “Light and Atoms”, in which a wide range of physics ideas are introduced so that they can be alluded to in later chapters on planets, stars and galaxies. I always found it very hard to make these 2-3 lectures really interesting to students, some of whom thought that they already knew this material.

A few years ago I started experimenting with a different approach in which I dropped this part of the course and moved straight into a discussion of the Sun, bypassing the planets. I found that by focusing on a few very basic questions about the Sun I could introduce the majority of the topics in a typical “Light and Atoms” gradually and as needed to provide scientific answers to the questions I had phrased.

The questions I now use, and the concepts I introduce in answering them, are approximately as follow:

**How big is the Sun?** Discuss distance measurements by parallax (Venus transit) and radar (Mercury orbit). Combine with angular size to get distance and volume. Get the mass from Newton’s orbital theory and then introduce the idea of and calculate the value of the Sun’s density. Interesting result is that the density of the Sun is less than that of the Earth, we deduce that the Sun cannot be rocky.

**How much power do we get from the Sun?** Since most of the power is in the form of light we introduce light, waves, speed of light, wavelength, color (frequency is not really necessary). Expand this idea to electromagnetic spectrum. Introduce inverse square law and use it to estimate power from the Sun. Broaden understanding of energy and power by discussing direct and indirect solar energy.

**How hot is the Sun?** Introduce temperature, molecular motions, absolute zero, heat and energy, solids liquids and gases, continuous radiation, Wien’s law. Use Wien’s law to estimate temperature of the Sun. We find it is hotter than the boiling point of any solids or liquids, so we deduce the Sun is a hot ball of gas.

**What is the Sun made of?** Introduce atoms, protons, electrons, elements, ions, molecules. Then bring in photons, energy levels, emission line spectra, absorption lines.
Finally, how we use absorption lines to determine the composition of the Sun. Emphasize that the Sun’s composition is “normal”. The Earth’s is unusual

**What is inside the Sun?** Gas pressure, balance with gravity, equilibrium, idea of a scientific “model”. Use of computer calculations in astronomy. Deduced conditions in the Sun’s center.

**How is the Sun’s power produced?** Isotopes, neutrons, deuterium, electrostatics (nuclei repel) $E=mc^2$, nuclear reaction, thermonuclear fusion, photon scattering, concept of photosphere.

By this time we have covered most of the phenomena in a typical “Light and Atoms” chapter, but we are still left with one important solar question:

**What can we see on the surface of the Sun?** I confess I have never found a satisfactory way to teach this topic at the 101 level, since almost every interesting phenomenon is crucially dependent on the magnetic field and the reaction of ions and electrons to that field. I decided a few years ago that my efforts to get across the relationships between magnetism and plasma were not leading to any real physical understanding in my students, so I have dropped essentially all mention of magnetic fields from my astronomy class. I am afraid that my treatment of sunspots, flares and the solar wind is almost entirely descriptive.

**Conclusions** If you don’t enjoy teaching “Light and Atoms” as a part of your astronomy course, there are ways of spreading most of those physics ideas among other lectures mainly devoted to astronomy. I have discussed one way of doing this, but doubtless one could get the same effect in a number of different ways.