Like plants these bacteria then convert this sugar into the other compounds needed for their growth. Some animals living at the "hydrothermal vents" survive by filtering free living bacteria of this type out of the water and eating them. Others however have developed closer relationships with the bacteria called symbiosis. In these cases the bacteria live inside or right on top of the animal's tissues. The animals harvest the hydrogen sulfide needed as fuel by the bacteria from the water and produce carbon dioxide by their own respiration (breathing) and deliver both of these to the bacteria. In return the bacteria provides the animal with the sugars and other compounds that they need to grow and reproduce. In this system bacteria are analogous to plants, the animals that eat them or live in symbiosis with them are the "herbivores" and animals that eat them are "carnivores". The result is a very diverse community of animals living in complete darkness at the bottom of the ocean and in some deep lakes, such as Lake Baikal in Russia.

Once it was realized that any kind of energy, not just sunlight, might be used to convert carbon dioxide to sugar, scientists began to look for other communities that use different chemical compounds as energy sources. In 1988 in the Gulf of Mexico the found another type of community - the "methane seep" community. Methane is another energy rich chemical. When it is mixed with oxygen-rich compounds, a great deal of energy is formed - a fact we use when cooking and heating our homes. Bacteria are able to utilize this energy release by reacting methane and carbon dioxide under controlled conditions within their cells. The energy released takes the place of sunlight in providing the power needed to "stick" carbon dioxide molecules together to form sugar. Again, these bacteria form the basis for quite rich food chains in the areas where they are found. For example, rich communities of clams that live in symbiosis with these types of bacteria have been found above the natural gas deposits off Sable Island, as well as on the slopes of the Grand Banks of Newfoundland.

Many other chemical compounds that are energy rich, such as petroleum, and many nitrogen and sulfur compounds have also been found to support populations of bacteria, which in turn form food sources for larger marine animals. These alternatives, though, appear to be much less important than the hydrogen sulfide and methane type communities described above. Moreover, all of these "chemical energy" mechanisms for making sugar are less efficient than is photosynthesis (the mechanism by which plants make sugar). Thus on land, where light is plentiful, these types of communities are often absent, or of very low importance. However, in the oceans and in some fresh water lakes and swamps, the use of chemical energy to make sugar can be the most important if not the entire basis of the food chains found there.

Much remains to be learned about these "chemosynthetic" food chains. Many new types of animal have been found in these communities and the ways that their metabolisms work are often strange and new. Scientists are very excited about these processes and they hope that we may be able to learn much from these organisms that will increase our ability to understand our environment. Moreover, answers to certain medical problems may lie in better understanding of these unique organisms. Finally, some theories suggest that life itself may have had its beginnings in systems similar to hydrothermal vents. Investigations of the systems and the animals that live there may even help to answer the burning question of "where did we come from?".

Editor's Note: This article is a followup on Louise's January talk to the Society in which she used slides to explain and show how life survives near underwater high temperature vents. As there is no light at this depth and she