

1.7: Green Science

As shown in Figure 1.7.1, science, engineering, and technology are closely interrelated. Science refers to a set of rigorously organized bodies of knowledge and their acquisition based upon several criteria. Dealing with the discovery, explanation, and development of theories pertaining to interrelated natural phenomena of energy, matter, time, and space, science consists of an organized body of facts consistent with a number of general laws that are verifiable by rigorously defined systematic experimental processes composing the **scientific method**. Although science seeks to avoid value judgements, scientific methods are used for worthy goals, such as development of genetically based cures for disease, as well as for more sinister purposes, such as the synthesis of more deadly military poisons. **Pure science** is conducted to extend knowledge without defined practical goals and **applied science** is directed toward practical, usually commercial, objectives; these two aspects of science are commonly applied together. Especially with the explosive growth of the internet, which allows dissemination of both information and misinformation, it is important to beware of “junk science” often used to attempt to support political, economic, or theological agendas in areas such as climate change and evolution.

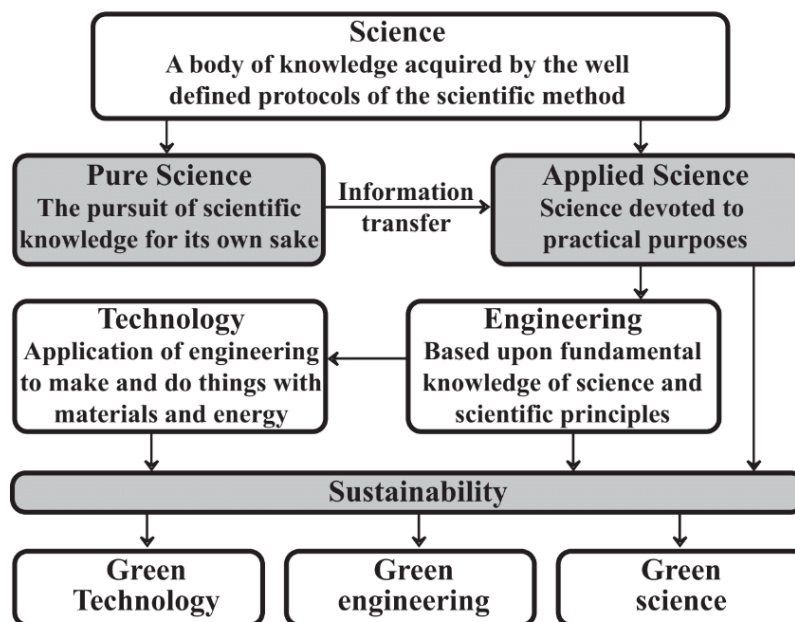


Figure 1.7.1, . Scientific principles are the basis of engineering which guides the development of technologies to make and do things with materials and energy. As Earth’s natural capital becomes more limiting, green technology, green engineering, and green science have become crucial to maintaining the planet’s environment in a livable state.

The practice of science dedicated to sustainability including the maintenance of environmental quality, the reduction of hazards, the efficient use of environmentally benign sources of energy, and the minimization of consumption of non-renewable resources is the basis of **green science**, which is one of the main themes of this book. Chemical science, the science of matter, has great accomplishments to its credit in improving human welfare but it has also led to environmental pollution, exposure to hazardous substances, consumption of resources such as petroleum feedstocks, and other unpleasant aspects of modern industrialized societies. These problems can be mitigated by the constructive application of chemical science known as **green chemistry** defined as the *practice of chemistry in a manner that maximizes its benefits while eliminating or at least greatly reducing its adverse impacts*.⁸ Based upon “twelve principles of green chemistry,”⁹ since the mid-1990s the science of green chemistry has spawned a number of books, journal articles, and symposia as well as journals devoted to the topic and centers and societies of green chemistry. This book is primarily about green chemistry and how it relates to sustainability, green science, and green technology.

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