**1.2.1 Relationship to Other Disciplines**

AI is a very young discipline. Other disciplines as diverse as philosophy, neurobiology, evolutionary biology, psychology, economics, political science, sociology, anthropology, control engineering, and many more have been studying intelligence much longer.

The science of AI could be described as "synthetic psychology," "experimental philosophy," or "computational epistemology"- **epistemology** is the study of knowledge. AI can be seen as a way to study the old problem of the nature of knowledge and intelligence, but with a more powerful experimental tool than was previously available. Instead of being able to observe only the external behavior of intelligent systems, as philosophy, psychology, economics, and sociology have traditionally been able to do, AI researchers experiment with executable models of intelligent behavior. Most important, such models are open to inspection, redesign, and experiment in a complete and rigorous way. Modern computers provide a way to construct the models about which philosophers have only been able to theorize. AI researchers can experiment with these models as opposed to just discussing their abstract properties. AI theories can be empirically grounded in implementation. Moreover, we are often surprised when simple agents exhibit complex behavior. We would not have known this without implementing the agents.

It is instructive to consider an analogy between the development of flying machines over the past few centuries and the development of thinking machines over the past few decades. There are several ways to understand flying. One is to dissect known flying animals and hypothesize their common structural features as necessary fundamental characteristics of any flying agent. With this method, an examination of birds, bats, and insects would suggest that flying involves the flapping of wings made of some structure covered with feathers or a membrane. Furthermore, the hypothesis could be tested by strapping feathers to one's arms, flapping, and jumping into the air, as Icarus did. An alternate methodology is to try to understand the principles of flying without restricting oneself to the natural occurrences of flying. This typically involves the construction of artifacts that embody the hypothesized principles, even if they do not behave like flying animals in any way except flying. This second method has provided both useful tools - airplanes - and a better understanding of the principles underlying flying, namely *aerodynamics*.

AI takes an approach analogous to that of aerodynamics. AI researchers are interested in testing general hypotheses about the nature of intelligence by building machines that are intelligent and that do not necessarily mimic humans or organizations. This also offers an approach to the question, "Can computers really think?" by considering the analogous question, "Can airplanes really fly?"

AI is intimately linked with the discipline of computer science. Although there are many non-computer scientists who are doing AI research, much, if not most, AI research is done within computer science departments. This is appropriate because the study of computation is central to AI. It is essential to understand algorithms, data structures, and combinatorial complexity to build intelligent machines. It is also surprising how much of computer science started as a spinoff from AI, from timesharing to computer algebra systems.

Finally, AI can be seen as coming under the umbrella of *cognitive science*. Cognitive science links various disciplines that study cognition and reasoning, from psychology to linguistics to anthropology to neuroscience. AI distinguishes itself within cognitive science by providing tools to build intelligence rather than just studying the external behavior of intelligent agents or dissecting the inner workings of intelligent systems.