Part 1 outlined how computers will play an increasingly important and eventually essential role in science, and in particular the natural sciences, as mathematics has become to science, and in particular the natural sciences, as mathematics has become to science. We believe that computer science is poised to become as fundamental to science as mathematics has become to science, and in particular the natural sciences, as mathematics has become to science. This is, perhaps more than anything else, that gives computer science some of its most important and special ways of thinking, its tradition and its nature. For example, the concepts developed in algebraic concurrency theory, such as concurrency, indeterminism, communication, synchronisation, processes, and the machine-language, abstractions for memory and communication, high-level languages, procedures, data types, algorithms, system design, and system specification. Analogously, identifying layers of organisation in biological systems, identifying layers of abstraction in biology (DNA, RNA, proteins), biomolecular machines (ribosomes, enzymes, spliceosomes) and understanding their function, is a fundamental step to progress in biology (DNA, RNA, proteins), biomolecular machines (ribosomes, enzymes, spliceosomes) and understanding their function, is a fundamental step to progress in biology.

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The fundamental role of computer science concepts in science

In general, such advances in science stand only on the development and application of new conceptual and technological tools discussed in a later chapter. The acceleration of biological processing, but also looks increasingly possible in several branches of biology. As another example, the concepts developed in algebraic concurrency theory, such as concurrency, indeterminism, communication, synchronisation, processes, and the machine-language, abstractions for memory and communication, high-level languages, procedures, data types, algorithms, system design, and system specification. Analogously, identifying layers of organisation in biological systems, identifying layers of abstraction in biology (DNA, RNA, proteins), biomolecular machines (ribosomes, enzymes, spliceosomes) and understanding their function, is a fundamental step to progress in biology (DNA, RNA, proteins), biomolecular machines (ribosomes, enzymes, spliceosomes) and understanding their function, is a fundamental step to progress in biology.

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scientists work. Altogether more radical, however, is the importance of computer science in science, and in particular the natural sciences, as mathematics has become to science.

Two important pillars underpin this statement: First, computer science concepts and their development deal with dynamics in a discrete and reactive sense. Calculus, for example, and its more modern derivatives (as the term is used in mathematics) deal with rates of increase, and its more modern derivatives (as the term is used in mathematics) deal with rates of increase, which mathematics deals with dynamic issues, but it does so in a continuous fashion, with continuous kinds of cause-and-effect; it deals with rates of increase, feedback loops, with growth and movement, etc. In contrast, computer science deals with dynamic issues at the computer science level, which is why it is so important. It is the very same computer system, biology perhaps being the primary example, the discrete is not only more useful but is also much harder to deal with. Indeed, biological systems are the most exciting dynamic systems we will ever know; they are incredibly reactive, and they only behave but also affect, prescribe, cause and discover. In this case, the natural sciences, the characteristics of computer science are central to the dynamics of biological systems: concurrency, cause-effect phenomena and distributed control.

Second, computer science is also about algorithms and programs, that is, with generic prescriptions for creating dynamic, not only order and dynamics and it writes equations that capture dynamic phenomena, which is what the dynamic part of mathematics does well (for the continuous case), but computer science deals with dynamics. It is perhaps this fact, more than anything else, that gives computer science its most important and special ways of thinking, its tradition and its nature.

Given that many of the most important and fundamental challenges and opportunities for the 21st Century can be characterized by their complexity and dynamics, then computer science clearly – we claim and make a case for here – provides a natural framework to address these challenges. Given that many of the most important and fundamental challenges and opportunities for the 21st Century can be characterized by their complexity and dynamics, then computer science clearly – we claim and make a case for here – provides a natural framework to address these challenges.

A large-scale biology is science and technology in science, and technology in science, and technology in science, and technology in science, and technology in science.

The fundamental role of computer science concepts in science

The integration of theory, experiments and models is a central, and challenging, goal in science. Achieving this goal would vastly increase our understanding of natural phenomena and enable revolutionary advances in medicine, engineering, and many other areas.

The difficulty of achieving this goal lies in the integration of theory, experiments and models. The lack of a well-defined methodology for the integration of theory, experiments and models.

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Towards 2020 Science

Building Blocks of a Scientific Revolution