Turing and the Science of Life

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Alan Turing, who is a legendary pioneer of computer science, had also made path-breaking contributions towards understanding several key questions related to the sciences of life. In fact, his most cited paper “Chemical Basis of Morphogenesis” (1952) proposes a general mathematical framework for explaining how biological patterns can develop in a self-organized manner (i.e., without being explicitly coded a priori) through interactions between different molecular populations. This reaction-diffusion scheme has provided an extremely fruitful subject of study for generations of mathematical biologists, and the pattern-forming instability (now known as Turing instability) has been invoked to explain patterns from animal coat markings such as the stripes in zebra or spots in cheetah to symmetry-breaking during development in the hydra. However, it is only very recently that biologists have seen the Turing mechanism at work in real living tissue indicating that, as in other areas, here too Turing’s ideas were far ahead of his times. The talk will focus on this aspect of Turing’s work on biological problems, but will also touch upon his interest in another key topic in biology, viz., the basis of intelligence and consciousness that has been discussed in another of his most cited papers: “Computing Machinery and Intelligence” (1950).