About the Cover

Alan Turing's Morphogenesis Plots

The cover displays two remarkable pictures drawn by Alan Turing (who was born 100 years ago), presumably derived from computer output based on the earliest known computations of pattern generation, sometime between 1952 and 1954, following his theory of morphogenesis. The only publications I am aware of that discuss these are by Jonathan Swinton:

"Watching the daisies grow: Turing and Fibonacci phyllotaxis" in the book *Alan Turing: Life and Legacy of a Great Thinker*, available at

`http://www.swintons.net`

"Turing, morphogenesis, and Fibonacci phyllotaxis: Life in pictures" to appear soon in a book edited by S. Barry Cooper.

The numbers laid out on the grid are expressed in "digits" 0–31 of the teleprinter code, in which / is 0 and \ is 32, used on the Mark 1 computer, explained at

`http://www.computer50.org/kgill/mark1/RobertTau/node4.html`

Swinton tells us: "In general each square contains two digits from the base 32 code, most significant digit on the right. It's clear that the contouring is based on that most significant digit… The exact algorithm is unknown. Almost certainly they are reaction-diffusion systems, mathematically similar or probably identical to those described in the manuscript *Outline of the Development of the Daisy*. Turing always thought of these systems in Fourier space, where the cylindrical geometry restricts wavevectors to being on a set of parallel lines. Being near to to a given symmetry restricts to discrete points on those lines, and being near to a Turing instability makes only the points near the critical wavenumber circle be important. It's likely that the code that generated these Figures computed the evolution of the magnitude of a small number of these Fourier coefficients, and also computed the resulting pattern in real space. There are code fragments I think were used to do this, but I can't tie them definitively to the Figures."

We obtained the photographs from King's College Library, Cambridge, where they are catalogued as AMT/K/3/7-8. You can see these and others in the series at

`http://www.turingarchive.org/browse.php/K/3`

We wish to thank the archivist at King's College, Patricia McGuire, for her great help.

—Bill Casselman
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(`notices-covers@ams.`