Author's Commentary: The Outstanding Helix Intersections Papers

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The problem of computing all the intersections of a plane and a helix in general positions in space arose at a small company in the western U.S. that designs medical technology. The problem came in the design of a helicoidal part of a device that doctors and technicians together will have to manufacture to fit the particular measurements of each patient. With x-ray data from the patient loaded in a computer with numerical and three-dimensional graphics capabilities, and with a program to compute the requested intersections, doctors and technicians can quickly vary the parameters of the helix, view the helicoidal part superimposed in space with a model of the patient, and examine critical locations by sweeping a plane section through them.

The mathematically accurate yet medically vague description given in the problem statement typifies a common situation of real applications of mathematics: The small start-up company does not want anyone else to know the object of its current research and development. Even the company's name must remain secret, lest anyone else conduct a computed search of the publications of the company's staff and thence piece together a good guess of the objective. Such a situation explains, in part, the dearth of real applications of mathematics in textbooks.

Nevertheless, because the mathematical problem fits in most undergraduate curricula in the mathematical sciences, one solution is scheduled to appear in 1995 in *SIAM Review*, published by the Society for Industrial and Applied Mathematics. The solution was developed in part with support from the National Science Foundation's grant DUE–9255539.

Instructors interested in designing similar material for their own classes are encouraged to contact the author to participate in either of two workshops: 17–21 June 1996 in Spokane, WA, or 26–30 August 1996 in Seattle, WA. Through grant DUE–9455061, the National Science Foundation will pay for participants' room, board, and academic credit, and some summer stipends will be available for participants who would like to submit their material for publication.

About the Author

Yves Nievergelt graduated in mathematics from the École Polytechnique Fédérale de Lausanne (Switzerland) in 1976, with concentrations in functional and numerical analysis of PDEs. He obtained a Ph.D. from the University of Washington in 1984, with a dissertation in several complex variables under the guidance of James R. King. He now teaches complex and numerical analysis at Eastern Washington University.

Prof. Nievergelt is an associate editor of *The UMAP Journal*. He is the author of several UMAP Modules, a bibliography of case studies of applications of lower-division mathematics (*The UMAP Journal* 6 (2) (1985): 37–56) (in which the Brain-Drug Problem was discussed explicitly), and *Mathematics in Business Administration* (Irwin, 1989).

Prof. Nievergelt was also the author of previous MCM problems: the Water Tank Problem (1989), the Brain Drug Problem (1990), and the Optimal Composting Problem (1993).