



# Tracing Your Routes

The *Traveling Salesman Problem* entails finding the shortest route that passes through each assigned town exactly once. (The route below visits over 13,000 towns.) The problem is noteworthy for its complexity, which grows exponentially with the number of towns, and for its applications, which range from wiring a chip to scheduling airline crews. Researchers use graph theory and linear programming to solve the problem when feasible and to find near-optimal solutions in other instances, saving industry time and money.

There may never be a workable general solution to the *Traveling Salesman Problem*. Yet even without knowing the best answer, mathematicians still can estimate how close to optimal a given route is. Perhaps even more surprising: Operating on a map of 25,000 towns, current algorithms design paths whose lengths are within 0.01% of that of a shortest path.

**For More Information:** *The Traveling Salesman Problem: A Guided Tour of Combinatorial Optimization*, Lawler, Lenstra, Rinnooy Kan, and Shmoys.



Image courtesy of D. Applegate, R. Bixby, V. Chvátal, and W. Cook;  
[www.math.princeton.edu/tsp](http://www.math.princeton.edu/tsp).



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