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Education: Madison's Avenue

Oh Hamilton, Poor Hamilton, Madison Wrote 'Em and You're Feeling So Sad. That, in effect, was the title of the story, sketched out last week before a joint-meeting of the American Statistical Association, the Biometric Society and the Institute of Mathematical Statistics.

Plotting the story were two smart mathematicians, Harvard's Frederick Mosteller, and the University of Chicago's David L. Wallace, who have great faith that math can supply answers in what they call "uncertainty situations." To test their faith they took on a classic uncertainty situation: the historically open question of whether Alexander Hamilton or James Madison wrote twelve of the 77 Federalist Papers that appeared in New York newspapers in 1787-88 under the byline "Publius" (the authorship of the others is known). They got funds from the Ford, Rockefeller and National Science foundations, the Office of Naval Research and Harvard's Laboratory of Social Relations, and went to work.

Problem: Hamilton and Madison were such similar masters of the ornate Spectator style that the mean sentence lengths in their known Federalist Papers are 34.55 words for Hamilton, 34.59 for Madison. Which twin gets the credit? Procedure: Determine how often each man used 30 key words—"function" words such as an, on, to, by, of, this, also, and "markers" such as vigor, direction, whilst, upon. In his known writings, for example, it turns out that Hamilton used upon at a rate of three per 1,000 words—or 18 times more often than Madison. The next step was to compile statistical profiles of the authors' known styles and the disputed Papers. To compare the profiles, Mathematicians Mosteller and Wallace then used Bayes' theorem (1763): "If $q_1 q_2 \dots q_n$ are a set of mutually exclusive events, the probability of q_r , conditional on prior information H and on some further event p , varies as the probability of q_r on H alone times the probability of p given q_r and H , namely, $P(q_r p | H) \propto P(q_r | H) P(p | q_r H)$."

Solution: Having fed all this into a high-speed IBM 7090 computer at M.I.T., Mosteller and Wallace report that Madison wrote eleven of the disputed Papers; odds are 80 to 11, they say, that he also wrote the twelfth. New score card: 26 Papers for Madison, 43 for Hamilton (they co-authored three; John Jay wrote five). All of which took three years to prove, and may be quite satisfactory to an IBM 7090,—but will still

leave any professional writer with a nagging question: What if Hamilton really wrote the papers and Madison later edited them, dourly scratching out upon whenever he came upon it?

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