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Dear Editor:

Both Ron Fagin and Larry Stockmeyer wrote me about my article, Randomized Algorithms in "Primitive" Cultures, *SIGACT News* **23** (4) (Fall 1992), 77–80. In this article, I discussed the "oracle" of the Azande, which the Azande believe speaks through poison. The poison is administered to a chicken, and then a question is asked. The answer given by the oracle depends on whether the chicken lives or dies.

I quoted from [2, pp. 299–302] as follows:

There are two tests, the *bambata sima*, or first test, and the *gingo*, or second test. If a fowl dies in the first test, then another fowl must survive the second test, and if a fowl survives the first test another fowl must die in the second test for the judgement to be accepted as valid. Generally the question is so framed that the oracle will have to kill a fowl in the first test and spare another fowl in the corroborative test to give a negative reply; but this is not invariably the case, and questions are sometimes framed in an opposite manner . . .

In the two tests one fowl must die and the other must live if the verdict is to be accepted as valid. If both live or both die the verdict is invalid and the oracle must be consulted on the matter a second time on another occasion . . .

In my article, I tried to interpret this as amplifying confidence in a result by using repeated trials.

Fagin and Stockmeyer propose an alternative interpretation of this practice; I believe their explanation has great merit. They observe that this practice of the Azande is nothing more than the trick of John von Neumann [3] for extracting unbiased random bits from repeated trials of an event that occurs with some unknown probability p. Von Neumann wrote:

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To cite a human example, for simplicity, in tossing a coin it is probably easier to make two consecutive tosses independent than to toss heads with probability exactly one-half. If independence of successive tosses is assumed, we can reconstruct a 50-50 chance out of even a badly biased coin by tossing twice. If we get heads-heads or tails-tails, we reject the tosses and try again. If we get heads-tails (or tails-heads) we accept the result as heads (or tails). The resulting process is rigorously unbiased...

Thus, when the Azande stick to this procedure rigorously, they are ensuring that whatever question is asked, the answer will be "yes" with probability 1/2. I leave the sociological implications of this observation to the reader.

Yours sincerely,

Jeffrey Shallit

References

[1] E. E. Evans-Pritchard, *Witchcraft, Oracles and Magic Among the Azande*, Oxford Univ. Press, London, 1937.

[2] J. von Neumann, Various techniques used in connection with random digits, *J. Res. Nat. Bur. Stand. Appl. Math. Series* **3** (1951), 36–38. (Summary written by George E. Forsythe.) Reprinted in A. H. Taub, ed., *John von Neumann: Collected Works*, Volume V: Design of Computers, Theory of Automata and Numerical Analysis, Pergamon Press, 1963, pp. 768–770.