INSIGHT

THE JOURNAL OF THE TITAN SOCIETY

(Issue #9, December 1986)

EDITORIAL

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New Member: Karl G. Wikman of Sweden has qualified for membership in the Titan Society. His letter of acceptance is presented on the following page. Mr. Wikman is our 14th member, not counting myself. My status is merely founder, not member.

Format for Insight: Now that we have an overseas member, I plan to produce this journal in reduced size to save on overseas airmail postage. I hope that it will be sufficiently legible. Due to an error by the printer, the last issue was twice as bulky as it should have been, incidentally.

Additional Members: Omni magazine's puzzle editor, Scot Morris, has expressed enthusiasm for my offer to produce a new test for him. If and when my next test actually appears in Omni, it should increase our membership to 20 or 25 at least. I hope to have a new test ready for Omni by the end of 1987, and Omni will (I hope) make use of it early in 1988. Meanwhile, our membership is unlikely to grow much further and may actually drop slightly when we start to ask for dues, although I suspect that we can offer free memberships to those who wish to continue their memberships but cannot afford the dues, if there be any such.

Questionnaire Responses: So far I've received three complete and one partial response to the questionnaire in issue #8, which included a poll on a name change for our group. I hope that more of you will respond. It is also not too late to submit responses to the questionnaire in issue #7. I now have received a total of six responses to that questionnaire, five of which were published in issue #8. I will try to remember to include the sixth one in the next issue. It needs the company of one or two additional responses.

"Ask Marilyn": Member Marilyn vos Savant now has a column in Parade magazine, which has a circulation of about 24 million and is published in Sunday newspapers throughout the United States. The title of the column is "Ask Marilyn." Questions that Marilyn has offered answers to include the following two: "All my life I've believed if men refused to fight there would be no wars. All my life I've been told it's not that simple. Why not?" and "If an alien visitor were to land in the Sahara and find an old watch, would he be able to know if it was made by an intelligent being?"

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Dear Mr Hoeflin

I must aplogize for my delay in answering your letter of July 22nd. My time has been very split due to various travels, conferences etc, and your letter ended unfortunately up (or was rather buried) in one of my piles of paper.
Yes, it would be interesting to join your association.
As for problem solving activities, my former indiscriminate interest has somewhat faded away. I think that there must be some extra challenge or significance to a problem to get my full attention.
My general sphere of interest is more resonant with philosophical and foundational questions in natural science and psychology. I will give some examples below. If you would feel that something of this nature could be of interest to the other people in the group I would be happy to write some lines.
When writing this it occurs to me that it would be interesting to have some "reviews" of books which have been of particular interest to the members of the group.
Now, I will give you some examples of questions which have been occupying me lately.

Biology: Within the framework of general system theory an organism is seen as a complex of various hierarchial control levels, each level consisting of an ensemble of subunits. An example: an organ being built up by its specific cells. One problem is: By what mechanism(s) is the behaviour of the subunits at a certain level controlled by a higher level, giving rise to both a detailed control and at the same time giving enough freedom in order not to "freeze" the system. This is a situation very different from a mechanical control system such as a clockwork.

Physics: The question of process or flow of time. What is the status of this concept within physics which is mainly devoted to the study of various changes, ie processes in different physical systems. This notion (the flow of time) seems to be a quite neglected issue.

Mathematics: To what an extent is the study of physical processes limited by the mathematical formalism which is being applied to the study of physical systems. Is it possible to say anything about what the intrinsic limitations in mathematical formalisms will mean in the understanding of the physical world?

These are examples of some of the questions I am currently interested in. I leave it to you to determine whether it could be of interest.

Best regards

K. G. Wikman

Karl G. Wikman

Playing with Fibonacci

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I am always intrigued by unexpected occurrences of familiar series. In trying to find the expected value of the number of coin tosses needed to get three successive identical outcomes, I came across the Fibonacci series.

Each coin toss can be the same as (S) or different from (D) the previous toss. After three tosses, the possible outcomes are SS, DS, SD and DD. The last two can be combined into XD, where X = don't care. On future tosses, DS can branch to SS or XD, and XD can branch to DS or XD. SS is a favorable outcome, and therefore terminal. Outcomes of successive tosses are summarized in the following table:

	SS	DS	XD	
after 3 tosses	1	1	2	
after 4 tosses	1	2	3	
after 5 tosses	2	3	5	
after 6 tosses	3	5	8	
after 7 tosses	5	8	13	etc.

Since each XD is the sum of the previous XD and DS, these are clearly Fibonacci numbers.

This problem can be expanded to four successive identical outcomes, and can be summarized in the following table:

	SSS	DSS	XDS	XXD	
after 4 tosses	1	1	2	4	
after 5 tosses	1	2	4	7	
after 6 tosses	2	4	7	13	
after 7 tosses	4	7	13	24	etc.

Here, each XXD is the sum of the previous XXD, XDS and DSS. This can be called a Fibonacci3 series, as opposed to the normal Fibonacci2 series. In general, the expected value of the number of coin tosses needed to get N successive identical outcomes (for N > 1) is

$$\sum_{i=N-1}^{\infty} \frac{(i+1)\,F_{N-1}(i)}{2^{i}} \qquad \text{which} = 2^{N}-1$$

This is based on a FibonacciN series starting with N-1 0's followed by a 1. In trying to show the above relationship, I noticed the following property of FN series:

$$\sum_{i=1}^{\infty} \frac{F_{N}(i)}{2^{i}} = 1 \qquad \text{For all } N > 0$$

If we let $X = \sum_{i=1}^{\infty} \frac{F_N(i)}{2^i}$, dividing X by 2 shifts the FN series to the next higher power of 2. Performing this division N times results in FN(k-1) through FN(k-N) being associated with the kth power of 2. Since these terms, by definition of the FibonacciN series, sum to FN(k), the ith term of the expression $X - \sum_{i=1}^{N} \frac{x}{2^i}$ is 0, except when i=N, since all preceeding terms of FN are 0. This can be expressed by

$$X - \sum_{i=1}^{N} \frac{X}{2^i} = \frac{F_N(N)}{2^N} \quad or \quad \frac{X}{2^N} = \frac{1}{2^N} \quad or \quad X = 1$$

This was an interesting detour from the original coin tossing problem, but the same method can be used to find the closed-form expression for the expected value of coin tosses.

If we let $X = \sum_{i=N-1}^{\infty} \frac{(i+1)\, F_{N-1}(i)}{2^i}$, dividing X by 2 shifts the FN-1 series to the next higher power of 2. Performing this division N-1 times results in k*FN-1(k-1) through (k-N+2)*FN-1(k-(N-1)) being associated with the kth power of 2. Since the kth power of 2 in the original expression X has (k+1)*FN-1(k) associated with it, we need to make all the other coefficients also equal to k+1. This can be done by incorporating terms of $1 \cdot \sum_{i=1}^{\infty} \frac{F_{N-1}(i)}{2^{i+1}}$ through $(N-1) \cdot \sum_{i=1}^{\infty} \frac{F_{N-1}(i)}{2^{i+N-1}}$

(equal to $\frac{1}{2}$ through $\frac{N-1}{2^{N-1}}$, as shown earlier.)

Subtracting all these terms from X, the ith term of the expression

$$X - \sum_{i=1}^{N-1} \frac{X}{2^i} - \sum_{i=1}^{N-1} \frac{i}{2^i}$$

is 0, except when i=N-1. This can be expressed by

$$\frac{X}{2^{N-1}} - \sum_{i=1}^{N-1} \frac{i}{2^i} = \frac{N}{2^{N-1}}$$

Since the summation term can be shown equal to $\frac{2^N - N - 1}{2^{N-1}}$,

$$X = 2^N - 1$$

The last property of FN series that I would like to mention here is that, just as the ratio of successive terms in the F2 series approaches the "Golden Section" (1.618), the ratio of successive terms in the FN series approaches 2 as N approaches infinity.

If anyone has comments, questions, or suggested applications, please feel free to contact me.