abdominal nerves. The symptoms noted for one bird were "injury or paralysis of the right leg." This one improved and was returned to the laying pen. She was probably injured rather than paralyzed. Another fowl showed symptoms of unsteadiness on legs and jerking head movements. This bird apparently recovered, but one of the controls showing similar symptoms recovered without any treatment and hatched 33 out of 34 eggs in the past breeding season.

Twenty-one hens were fed wheat germ oil, 14 receiving 6 cc or more, and of these fourteen, 8 received 14 cc or more. Of the 21 birds 14 showed at autopsy gross lesions of neurolymphomatosis, one showed lymphomatosis of the liver, another showed tumors of the feet, comb and internal organs. Two others, with typical symptoms, were negative. Of two birds with uncoordinated head movements, one improved and laid 29 eggs in the next 50 days. The other is still affected, showing no improvement.

Of the 10 controls 7 showed gross lesions of neurolymphomatosis on autopsy, one showed lymphomatosis of the liver and ovary, and one which had shown only uncoordinated head movements as symptoms was negative. One bird returned to laying condition for a brief period but eventually died. This hen never regained control of its paralyzed right leg. One bird (mentioned above) recovered completely.

Fowls showing uncoordinated head movements, twisting of neck to one side or over the back, generally eventually die of inanition. In some cases gross and microscopic lesions of neurolymphomatosis have been observed in the eighth or ninth cranial nerves of these birds. In other cases it is doubtful if the condition actually represents true neurolymphomatosis.

The evidence presented, involving 31 paralyzed fowls treated with cold-pressed wheat germ oil in amounts similar to or greater than those suggested by Butler and Warren, does not support their contention that vitamin E or wheat germ oil can bring about quick recovery from true *neurolymphomatosis gallinarum*.

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A PARADOX IN THE SCORING OF COMPETING TEAMS

LET us suppose that a number of teams of three men each are competing in an academic contest and that the best three teams are to be selected on the basis of a special examination. How shall the merits of the several teams be computed?

Two possible methods of scoring suggest themselves: (1) we may list all the contestants in order of rank, and define the rank of each team as the sum of the ranks of its members; or (2) we may consider only the actual examination-grade of each contestant, and define the score of each team as the sum of the scores of its members. The first method we may call the rank method, the second the sum-of-the-grades method.

The rank method is regularly used in scoring intercollegiate cross-country runs. It should be noted, however, that the situation in the case of the cross-country run is not the same as the situation in the case of the academic examination. In the athletic contest, the order of rank in which the men cross the finishing line supplies the only data available (since the individual times are not usually recorded), while in the academic case we have not only the rank of each contestant but also his actual examination-grade, on the basis, say, of 100. The sum-of-the-grades method is used in the popular frog-jumping contests. Here the score for each "team of three" (consisting, to be sure, of three jumps of a single frog) is computed by adding the lengths of the individual jumps recorded for that team.

In many practical cases it will make no difference which method is used. Nevertheless, the question has a certain theoretical interest which seems to be worth discussing.

The purpose of the present paper is to show that

TABLE I

I			II			III			IV			V			VI		
B_1	98	1	B_1	98	1	B_1	98	1	B_1	98	1	B_1	98	1	B_1	98	1
						D_1	97	2	D_1	97	2						
A_1	96	2	A_1	96	2	A_1	96	3	A_1	96	3	A_1	96	2	A_1	96	2
D_1	94	3				D_2	94	4									
C_1	93	4	C_1	93	3	C_1	93	5	C_1	93	4	C_1	93	3	C_1	93	3
A_2	92	5	A_2	92	4	A_2	92	6	A_2	92	5	A_2	92	4	A_2	92	4
D_2	91	6	D_1	91	5												
C_2	89	7	C_2	89	6	C_2	89	7	C_2	89	6	C_2	89	5	C_2	89	5
			D_2	88	7							D_1	88	6			
B_2	87	8	B_2	87	8	B_2	87	8	B_2	87	7	B_2	87	7	B_2	87	6
C_3	84	9	C_3	84	9	C_3	84	9	C_3	84	8	C_2	84	8	C_3	84	7
												D_2	83	9	D_1	83	8
B_3	82	10	B_3	82	10	B_3	82	10	B_3	82	9	B_3	82	10	B_3	82	9
									D_2	81	10				D_2	81	10
A_3	80	11	A_3	80	11	A_3	80	11	A_3	80	11	A_3	80	11	A_3	80	11
D_3	79	12	D_3	79	12	D_3	79	12	D_3	79	12	D_3	79	12	D_3	79	12
A	18		A	17		B	19		B	17		C	16		C	15	
B	19		C	18		A	20		C	18		A	17		B	16	
C	20		B	19		C	21		A	19		B	18		A	17	

the rank method, when applied to the academic case here considered, fails to satisfy the following postulate, which may be regarded by many people as a fundamental principle:

Postulate of relevancy. The relative position of any two teams—or the relative position of any three teams among themselves—ought to be determinable on the basis of the actual examination-grades obtained by the members of these teams alone. In other words, in determining the relative standing of any teams among themselves, it ought not to be neecssary to take into account the performance of any contestants who do not belong to these teams.

To show that the rank method fails to satisfy this postulate, we construct the six following examples, each of which is a hypothetical, but entirely possible, case. There are four teams of three men each: "team A" has members A_1, A_2, A_3; "team B" has members B_1, B_2, B_3; and similarly for "team C" and "team D." The actual scores obtained by each of the twelve contestants, in each of the six cases I, II, III, IV, V, VI, and shown in the table; and the question is, how shall we determine the relative merits of teams A, B, C, in each of the six cases?

TABLE II

Case VII			Case VIII		
C_1	99	1	C_1	99	1
A_1	98	2			
			A_1	97	2
			B_1	95	3
B_1	94	3			
A_2	93	4			
			A_2	92	4
			D_1	91	5
			B_2	90	6
B_2	89	5			
D_1	88	6	D_2	88	7
C_2	87	7	C_2	87	8
			B_3	86	9
B_3	85	8			
D_2	84	9			
C_3	81	10	C_3	81	10
A_3	80	11			
			A_3	79	11
D_3	78	12	D_3	78	12
B	16		A	17	
A	17		B	18	

If we accept the postulate above, the relative standing of the teams A, B, C, whatever it may be, must obviously be the same in all six cases, since the actual grades obtained by the members of these teams do not vary from case to case. On the other hand, if we adopt the method of ranks, we see from the table that each of the six possible orders ABC, ACB, BAC, BCA, CAB, CBA, is represented by one of the six cases. The actual scores recorded in the six cases differ only in the scores obtained by two men, D_1 and D_2; and yet the variation in these two supposedly irrelevant items is enough to upset completely the order of merit among the three teams A, B, C.

No such ambiguity arises if the sum-of-the-grades method is employed. This method gives A 268, B 267, C 266, thus determining the order ABC.

As an even more striking illustration of the paradoxes which may result from the rank method, we construct two further examples, VII and VIII, as shown in the second table. Here there are four teams A, B, C, D, and the question raised concerns the order of the two teams A and B. In passing from case VII to case VIII every member of team B has improved his grade, while every member of team A has lowered his grade. Yet if the method of ranks is adopted, B starts out higher than A in case VII and then falls below A in case VIII. The change which has brought about this reversal of order is due entirely to changes in the grades of two men, D_1 and D_2, who do not belong to either of the teams A or B.

This paradoxical situation would not occur if the sum-of-the-grades method were used. According to this method we would have A 271 and B 268 in case VII, and B 271 and A 268 in case VIII, so that the change in the final order of merit in passing from case VII to case VIII would reflect in a natural manner the improvement in B's grade and the deterioration in A's grade.

These examples may suffice to show that if the postulate of relevancy is accepted, some method other than the method of ranks must be adopted.

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