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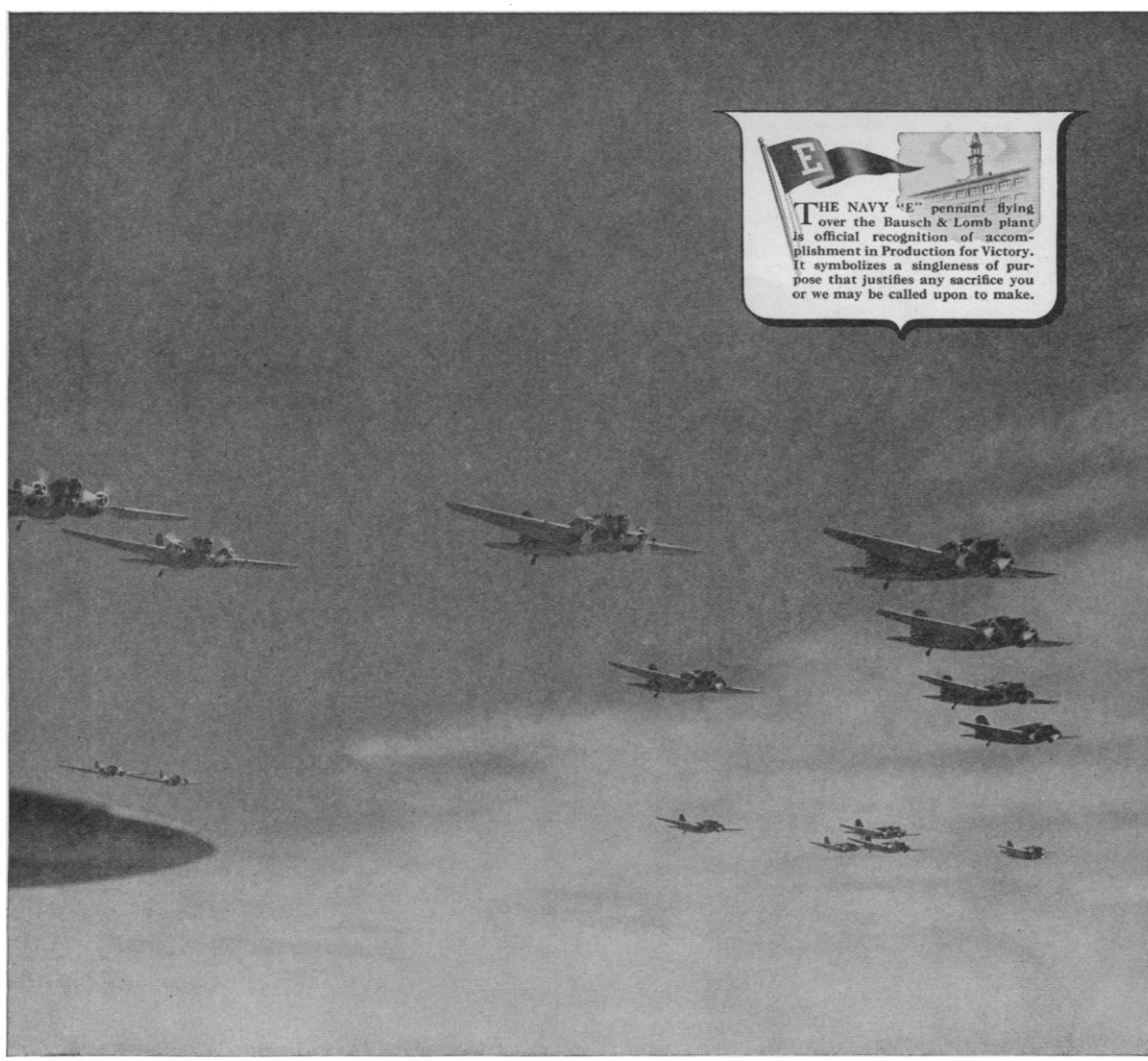

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SCIENCE IN MUSIC

By Professor CARL E. SEASHORE

THE STATE UNIVERSITY OF IOWA

MUSIC draws upon a number of basic sciences, such as mathematics, physics, physiology, anatomy, genetics, anthropology and general psychology, in the light of prevailing musical theory and practice. It has become the function of the new applied science, the psychology of music, to integrate all these contributions and fit them as a unified function into the theory and practice of music and to initiate specifically designed experiments for the solving of musical problems. The initiative has been taken by psychologists; but as knowledge of the scientific aspects becomes a part of artistic creation and skill, this work of integration will be taken over more and more by musicians, and the distinction between the scientist and the artist will tend to disappear.

On the occasion of a football game at the University of Oklahoma in 1939, I saw seventy-seven marching bands on parade. This represented only a section of the state, and the dust bowl state at that. It meant that music is being taught in the public schools of that state on a surprisingly large scale. Out of these popular bands in showy uniform will come a host of musicians of all kinds and degrees. Music is in the public schools to stay on a large scale. Music in America is in the air, literally and figuratively.

In the last ten years, the State University of Iowa, as one of the American universities which have taken cognizance of this problem, has conferred twelve doctor of philosophy degrees and one hundred ninety-seven master of arts degrees in music. The master of arts is coming to be required of all high-school music teachers. From kindergarten up to the graduate

per cent. saline to one fifth of the original volume. The final preparation contained a heavy suspension of Rickettsiae.

The antigen was titrated with a known guinea pig serum as well as with two known human sera. A 4 plus fixation was obtained with dilutions of the antigen up to 1:6. The antigen was found to be anti-complementary in a dilution of 1:2. An antigen dilution of 1:4 was used in all tests.

The usual hemolytic system, consisting of sheep cells, guinea pig complement and rabbit anti-sheep cell amboceptor was employed. The amboceptor was diluted to contain 3 M.H.D. in 0.25 cc. Equal amounts of amboceptor dilution and a 3 per cent. suspension of sheep cells were mixed together. The fresh complement was titrated on the day of the test.

Sera were inactivated at 56° C. for 30 minutes. Serum dilutions were made ranging from 1:3 to 1:192 using 0.25 cc amounts of each dilution in the test. Complement was diluted to contain 2 full units in 0.5 cc. A suitable antigen dilution was added in 0.25 cc amounts. Fixation was carried out for 20 hours in the ice box (4° C.) following which 0.5 cc of sensitized sheep cells were added to each tube and incubated for 30 minutes at 37° C. One and two units of complement in the presence of 0.25 cc of antigen dilution were also set up to indicate the validity of the results by showing the actual amount of free complement at the time the hemolytic system was added. The results of the tests are shown in Table 1.

TABLE 1

Human sera	Date of illness	Disease	1:3	1:6	1:12	1:24	1:48	1:96	1:192	Serum control
RO	1941	R.S.F.	4	4	4	4	4	2	1	0
WE	1938	R.S.F.	4	4	4	3	2	0	0	0
PA	1940	R.S.F.	4	4	3	2	1	0	0	0
SH	1941	R.S.F.	4	4	4	4	4	3	2	0
SM	1940	R.S.F.	4	4	4	4	3	2	1	0
RA	1941	R.S.F.	4	4	4	4	4	2	1	0
HO	1941	R.S.F.	4	4	4	4	4	4	2	0
HU	1937	R.S.F.	4	4	3	2	–	–	–	0
LO	1941	R.S.F.	4	4	4	4	3	2	–	0
2 cases		Brill's	0	0	0	0	–	–	–	0
11 sera		Various febrile cases	0	0	0	0	–	–	–	0
8 sera		Wassermann positive	0	0	0	0	–	–	–	0
2 sera		"Q" fever	0	0	0	0	–	–	–	0
11 sera		Normal	0	0	0	0	–	–	–	0

We have examined the sera from nine cases of Rocky Mountain spotted fever and obtained positive complement fixation reactions in all. The oldest case (HU) had the disease 4½ years prior to the examination of the serum, while the most recent serum (LO) examined was obtained on the 12th day of illness. This latter finding is significant, for if in subsequent cases it can be shown that antibodies can be demonstrated so early in the disease the complement fixation test may prove to be a real aid in diagnosis. In three cases, (PA), (SH) and (SM), several specimens of serum were examined over a period of three and six months and no significant change in titre was noted.

There were two cases where the possible diagnosis of typhus fever was made. The subsequent course of the disease, a negative fixation test for typhus fever and a positive test for Rocky Mountain spotted fever indicated that we were dealing with the latter disease.

TABLE 2

Guinea pig sera	Disease	1:3	1:6	1:12	1:24	1:48	1:96	1:192	Serum control
No. 761	6 days after drop Temp.	0	0	0	0	–	–	–	0
" 743	12 days after drop Temp.	4	4	3	3	2	0	0	0
" 379	R.S.F.	4	4	4	4	3	1	0	0
" 489	R.S.F.	4	3	3	2	1	–	–	0
" 277	R.S.F.	3	3	2	1	1	–	–	0
" 220	R.S.F.	4	4	4	4	3	1	0	0
" 486	R.S.F.	4	4	4	4	3	2	0	0
" 498	R.S.F.	4	4	4	3	1	0	0	0
" 490	R.S.F.	3	2	2	1	–	–	–	0
7 sera	Endemic	0	0	0	0				0
6 sera	Epidemic	0	0	0	0				0
3 sera	"Q" fever	0	0	0	0				0
15 sera	Normal	0	0	0	0				0

In guinea pigs (Table 2), fixation was obtained with eight sera. It is of interest to note that one guinea pig gave a negative reaction six days after the return of temperature to normal, while another gave a positive test after twelve days. The occurrence of fixing antibodies during the course of the illness in guinea pigs and monkeys is now being studied. No fixation was obtained with sera from endemic typhus, epidemic typhus or "Q" fever.

The results obtained in the tests described indicate that the complement fixation test may be employed in diagnosing Rocky Mountain spotted fever.

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