conditions) to transmit the abnormal abdomen. This is best demonstrated by linking the factor for abnormal abdomen *A* with another sex-linked factor, such as the *b* factor in the yellow mutant, or the *c* factor in the white mutant, or to both together as in the two examples given below.

YRA ♂ × *GRA* ♀ / *GWN* ♀ × *GWN* ♂ =	*GRA* ♀	95	56	3
	GRN ♀	0	4	32
	GWN ♀	88	49	34
	GWN ♂	98	49	19
	YRA ♂	81	47	7
	YRN ♂	1	2	25

YRN ♀ × *GRN* ♀ / *GWA* ♂ × *YRN* ♂ =	*GWA* ♂	50	21	9
	GWN ♂	1	24	24
	GRA ♀	76	3	0
	GRN ♀	5	49	60
	YRN ♀	45	93	61
	YRN ♂	49	29	30

The tables show that in the expected classes for abnormal abdomen *A* this character at first appears but later is replaced by the normal character *N*. When the normal flies (of the last sort) were tested they were found to transmit abnormality. The other classes that are genotypically normal remain so in the next generation. Cultures that had produced only abnormal flies for nine generations under wet conditions were allowed to dry out when all the later-hatched flies became normal. These were then placed under moist conditions, and all of their offspring were as abnormal as their ancestors had been.

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Sources of error in serological work.

By **WILFRED H. MANWARING.**

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I have been engaged for some time in attempts to determine the approximate chemical nature of certain bactericidal substances obtained from horse leucocytes. My earlier attempts to isolate and identify these substances were characterized by inconstant and inconsistent results. This led to an examination of the

experimental method, with the discovery of certain sources of error not usually taken into account in serological work.

The first source of error is the possibility of there being marked changes in the chemical composition of serological substances as a result of changes in concentration. The bactericidal substance with which I was working is fairly stable. It can be heated to 60° C. for an hour without loss of bactericidal power and can be stored in the ice chest for weeks with but slight deterioration. The substance can be passed through a series of chemical manipulations, involving such processes as salting-out, dialyzing, evaporating to dryness, and redissolving, and can be recovered quantitatively from the final product of such manipulations, provided the volume of fluid in which it is dissolved is at no time allowed to increase much above the original volume from which the substance was obtained. If the volume is allowed at any stage to materially increase, there is brought about a rapid deterioration of the bactericidal substance at that stage, giving a final product without bactericidal action.

The second source of error is the possibility of there being marked changes in the specific properties of serological substances as a result of variations in the amount of sodium chloride with which they are mixed. The purified bactericidal substance from horse leucocytes, dissolved in distilled water, has about half the bactericidal power of the initial crude product. If dissolved in physiological saline solution, instead of in distilled water, it is without bactericidal power.

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The relation of the virulence of the tubercle bacillus to its persistence in the circulation.

By **ALFRED F. HESS.**

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It seems as if the tubercle bacillus offered an exceptional opportunity to study the question presented in the title of this study. As is well known, one type of the bacillus, namely, the human type, is non virulent for the rabbit, whereas the bovine type causes