

SCIENCE

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CONTENTS

<i>Liebig's Law of the Minimum in relation to General Biological Problems:</i> PROFESSOR HENRY D. HOOKER, JR.	197
<i>The Peck Testimonial Exhibit of Mushroom Models:</i> H. D. HOUSE	204
<i>Scientific Events:—</i>	
<i>Farm Colonies for Tuberculous Soldiers; Research Work of the Red Cross in France; War Demonstration Hospital of the Rockefeller Institute; The Mathematical Association of America; John Oren Reed and Karl E. Guthe.....</i>	205
<i>Scientific Notes and News</i>	208
<i>University and Educational News</i>	210
<i>Discussion and Correspondence:—</i>	
<i>The Interpretation of the Results of Field Experiments with Different Phosphates:</i> PROFESSOR C. A. MOOERS. <i>A Method for obtaining Amœba:</i> C. E. GORDON. <i>Crossing over in the Sex Chromosome of the Male Fowl:</i> DR. H. D. GOODALE. <i>The Equal Parallax Curve for Frontal and Lateral Vision:</i> PAUL R. RIDER. <i>A Predecessor of Priestley:</i> DR. W. W. KEEN	210
<i>Scientific Books:—</i>	
<i>Kelsey on the Physical Basis of Society:</i> PROFESSOR F. STUART CHAPIN. <i>Licks on Recreations in Mathematics:</i> PROFESSOR LOUIS C. KARPINSKI	215
<i>Special Articles:—</i>	
<i>The Effects of Thyroid Removal upon the Development of the Gonads in the Larvæ of Rana Pipiens:</i> PROFESSOR BENNET M. ALLEN. <i>The Stansiphon:</i> PROFESSOR P. B. PERKINS	216
<i>The American Philosophical Society:</i> PROFESSOR ARTHUR W. GOODSPEED	219

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LIEBIG'S LAW OF THE MINIMUM IN RELATION TO GENERAL BIOLOGICAL PROBLEMS¹

THE Law of the Minimum has never been accurately defined, although the idea that it involves is relatively simple. Professor B. E. Livingston says in a recent paper² that "this principle is still quite incomplete logically and its statement will assuredly become much more complex as our science advances." In order to get a clear understanding of the law so that it may be stated accurately, we will begin with a simple application to chemical reactions.

One molecule of KOH reacts with one molecule of HCl to form one molecule of KCl and one of H₂O. If only one molecule of KOH is present, only one molecule of KCl can be formed, no matter how many molecules of HCl are present; and likewise if only one molecule of HCl is present, only one molecule of KCl can be formed, no matter how many molecules of KOH are present. By considering the weights of the reacting substances, the situation is somewhat complicated: 56.1 grams of KOH react with 36.5 grams of HCl to form 74.6 grams of KCl and 18 grams of H₂O. In round numbers 3 parts by weight of KOH and two of HCl give 4 parts by weight of KCl and one of H₂O: 3/4 gr. of KOH and 1/2 gr. of HCl are necessary to form a gram of KCl. Let us call these fractions, 3/4 and 1/2, the specific reactive weights of KOH and HCl in respect to the formation of a unit quantity of KCl. Suppose x amount of KOH and y of HCl are given. If x and

¹ Paper read before the Biological Club of Yale University, April 19, 1917.

² *Plant World*, 20: 1-15, 1917.