snow itself looked blue-white, like paper or sugar "blued" with ultra marine. Evidently the snow, because of its structure, reflected a larger proportion of the short wave-lengths of blue; and we have here another illustration of a structural blue color, which, according to Wilder D. Bancroft "may be obtained when we have finely divided particles of liquid or solid suspended in a gaseous medium (blue of the sky) or a liquid medium (blue of the eye or of the tree-toad); or when we have finally divided air-bubbles suspended in a liquid or solid medium (blue feathers).[1]

Incidentally there is some justification for the somewhat brilliant blues used by the artists in painting snow scenes, especially in the shadows; and we recall the story told of Whistler, who, when a lady visitor at his exhibition remarked, "I've never seen a sunset like that, Mr. Whistler," promptly replied, "Well don't you wish you could?"

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[1] See "The Colors of Colloids," VII., *J. Phys. Chem.*, Vol. 23, pp. 365–414.

SCIENTIFIC BOOKS

How to Make and Use Graphic Charts. By Allan C. Haskell, B.S., with an introduction by Richard T. Dana. 539 pages. First edition. Price $5.00.

The last years have seen a tremendous progress in the application of graphic methods and while these methods must be regarded as means rather than as ends they nevertheless play a most important part of scientific analysis.

To most persons except the trained engineer, biologist or statistician the principles of analytic geometry which are the basis of most graphic methods appear too difficult and intricate as that they would be used for practical problems of every-day life.

Mr. Haskell's book fills therefore a distinct demand when it contributes to a clear understanding and wider application and recognition of the graphic method. The treatment is written from the standpoint of the practical engineer who comes daily in contact with such problems which will lend themselves to the application of this form of analysis.

The 539 pages of the richly illustrated book are divided into 18 chapters which go exhaustively into every phase and detail of the possibilities and applications of graphic analysis. Special consideration is given to the current engineering problems of to-day. One whole chapter is devoted to the nomographic or alignment chart. This subject is treated in Chapter VIII. and taken up again in Chapter XVI., "Computation, arithmetical and geometrical" which devotes some thirty pages to this interesting subject.

The author deserves much praise for faithfully collecting the manifold material on this subject. On page 348 however I think it would be worth while to mention the graphic calculation of the polytropic curve based on the equation

$$(1 + tg\beta) = (1 + tg\alpha)^n.$$

The lack of space prevents a longer explanation but for the rapid design of isothermal and adiabatic curves in connection with combustion engine design, this method[1] is extremely valuable on account of its accuracy, rapidity and range covering all exponents $n = 1.10$ (isothermal) to 1.41 (adiabatic).

Chapter VII. would have had room for the smelting diagrams of Stead and Saklatwalla[2] and of Shepherd.

Chapter XVII. is devoted to the graphic methods of designing and estimating. The civil engineer will find much of value and interest here. I think however the chapter could be extended to the advantage of the mechanical engineer and his problems.

The wealth of references relating to the graphic methods which are given at the end of each chapter and which have been collected by Mr. Haskell make the book valuable as a source of information, in short the author has responded to a vital demand for a practical book, "How to make and use graphic charts." The practical man will find much material ready for use and easily understandable and

[1] E. Braner, *Z. d. v. d.*, I., 1885, p. 433.

[2] *Journal of the Iron and Steel Institute*, 1908, No. 11, p. 92.

the scientist much inspiration for further research and investigation. R. VON HUHN

NEW YORK

SPECIAL ARTICLES

THE HEREDITY OF SUSCEPTIBILITY TO A TRANSPLANTABLE SARCOMA (J. W. B.) OF THE JAPANESE WALTZING MOUSE

IN 1916[1] the writer in collaboration with Tyzzer reported on the inheritance of susceptibility to a transplantable carcinoma (J. W. A.) of the Japanese waltzing mouse. This tumor grew in one hundred per cent. of the Japanese waltzing mice inoculated and in zero per cent. of the common non-waltzing mice. When these two races were crossed, the F_1 generation hybrids showed sixty-one out of sixty-two mice to be susceptible. In these mice growth was as rapid if not more so than in the Japanese waltzing mice themselves. The one exception may well have been due to faulty technique for a reinoculation test was not made.

The F_2 generation gave a very interesting result—only three out of 183 mice grew the tumor. At that time the results were explained on the basis of multiple Mendelizing factors[2] whose number was estimated at from twelve to fourteen. *Simultaneous presence* of these factors, themselves introduced by the Japanese waltzing race, was considered necessary for progressive growth of the tumor. The analogy between this case and that of coat color in wild mice, dependent upon the simultaneous presence of at least five known Mendelizing factors was at that time pointed out.

Later[3] while working with a transplantable sarcoma (J. W. B.) of the Japanese waltzing mouse, results were obtained which showed what semed to be a somewhat simpler quantitative condition of the same process. In this case, the parent races and F_1 hybrids behaved as before, but the F_2 hybrids gave a total of twenty-three susceptible, to sixty-six non-susceptible animals. It was previously estimated that from five to seven factors were involved. In order to determine more closely the number of factors, new experiments were devised as follows: F_1 hybrid mice themselves susceptible were crossed back with the non-susceptible parent race. This has recently given a back cross generation whose susceptibility would depend upon the factors introduced through the gametes received from their F_1 parent. If one factor was involved, the ratio of gametes containing it formed by the F_1 animal, to those lacking it would be 1:1, if two factors, 1:3; if three factors 1:7; if four factors, 1:15; if five factors, 1:31; if six factors, 1:63; and if seven factors, 1:127. Susceptible and non-susceptible *individuals* would occur in the back cross generation in similar proportions.

The actual numbers obtained were twenty one susceptible to 208 non-susceptible. This result may be compared with expectations on three, four, five, and seven factor hypotheses, as follows:

	Susceptible	Non-susceptible	Ratio
Expected 3 factor....	28	201	1:7
Observed	21	208	1:90
Expected 4 factor....	14	215	1:15
Expected 5 factor....	7	222	1:31
Expected 7 factor....	1.8	227.2	1:127

The observed figures fall between the three and four factor hypothesis. The numbers are not large enough to give a definite test, but the F_2 generation already mentioned is interesting as a supporting line of evidence. If we compare this with the expectation, we find that the observed figures lie between the

	Susceptible	Non-susceptible	Ratio
Expected 3 factor....	39	50	1:1.3
Expected 4 factor....	29	60	1:2.1
Observed	23	66	1:2.8
Expected 5 factor....	21	68	1:3.2

four and five factor hypothesis. In both cases the four factor hypothesis figures are close and the three and five factor hypothesis

[1] Little, C. C., and Tyzzer, E. E., 1916, *Jour. Med. Research*, 33: 393.

[2] Little, C. C., SCIENCE, N. S., 1914, 40, 904.

[3] Tyzzer, E. E., and Little, C. C., 1916, *Jour. Cancer Research*, 1: 387, 388.