

has no cause for complaint. He ought to know that interest is a function of two variables.

(3) In reply to Mr. Lock's request for other slight inaccuracies I might ask, without leaving the subject of interest, what under the sun "inverse interest" is; but though inaccuracies of language are not desirable in a school-book, I prefer to draw his attention to more important matters. Every arithmetician knows that the practical questions which come under such headings as Simple and Compound Interest, Exchange, Discount, Stocks, &c., are not questions of a different kind *arithmetically*, being all so-called "proportion" questions, and that no more important fact can be taught to the student of arithmetic regarding them. Now here is Mr. Lock's treatment. Simple and compound proportion questions are put under the headings "Problems" and "Complex Problems"—names, by the way, quite illogically chosen and not consistently adhered to. Exchange is tacked on to Complex Problems by the words, "examples in Exchange can be worked by the above method"—indeed, these words and a worked example constitute the sum total of information given in the book on this subject. No one could object to the union here indicated, but surely the same is equally true of several of the other subjects. After Exchange comes a section headed "On Problems concerning Time: I., Time and Distance." These are not problems in the sense previously specified, but belong to the genus of examination questions which concern bodies moving in the same path with different speeds. A like remark applies to the section which follows, headed "II., Time and Work." Late in the day, after Interest, Discount, &c., there appears a chapter "On the Use of the Term *Per Cent.*" So far as it is on anything (for it consists of seven or eight lines of introduction, three worked and forty-five unworked examples), it is on the calculation of rates of gain and loss. Now all this, one is bound to affirm, is strangely illogical, and tends to give a most erroneous conception of arithmetic as applied to practical affairs. I used the expression "slight inaccuracies of thought" in referring to such a mode of treatment, because it was impossible to be more severe without going into detail, and because it seemed imperative to say something against a practice, which our examination system fosters, of forming text-books by collecting all the kinds of exercises met with in examination papers and separating them into carelessly ticketed groups prefaced by a definition or two. The purely arithmetical, and larger, part of Mr. Lock's book is not of this character, and is, especially as regards the definitions, very carefully prepared; he would considerably enhance the value of the whole by wisely modifying the rest in the second edition.

THE REVIEWER

I THANK you for your courtesy in permitting me to see the reply of your reviewer to my letter which appeared in NATURE of June 3 (p. 100). That my letter was written under very exceptional circumstances will be clear to any one who will take the trouble of comparing your reviewer's defence of his criticism with the book itself. I will, however, with your permission, make one or two comments on his reply.

(1) That a wrong inference was suggested by the words of the reviewer is, no doubt, of little consequence, except that it afforded me a ground for an appeal to you for further information.

(2) Your reviewer did not quote in his review, as he now does, my definition of rate of interest; he asked whether rate of interest is totally independent of the time, implying that I stated that it was so, and ignoring the fact that the manner in which time is involved in Interest (not in *rate* of interest, on which point your reviewer seems a little confused) is gradually explained in the next few pages. Might I ask your reviewer whether in Compound Interest the Interest varies simply as the Time?

(3) In his third paragraph your reviewer gives his answer to my request that he should quote *verbatim* the other instances on which he based his unfavourable criticism. There is little or nothing here for me to answer, except that I am compelled, in justice to myself, to point out the reviewer's own mistakes. (i.) He suggests that Exchange ought logically to be placed between Compound Interest and Discount. It would seem necessary to remind him that in questions on Exchange there is no reference to *time*, and that it is the peculiar manner in which time is involved, which distinguishes Interest and Discount from other Problems involving money. (ii.) He states that questions

which I have called "Problems concerning Time" are improperly so-called. It will be clear to any one who reads the chapter on "Problems" that a Problem is a question on Variation; so that problems concerning time are exactly what their name indicates. But (even supposing your reviewer were right on these two points) in charging me with being strangely illogical as regards the order of my chapters, he must have overlooked the fact that in the preface I expressly state that "novelty in arrangement has been avoided as much as possible," but that "the order in which his chapters are taken may be varied at the discretion of the teacher." For my part I think that the established order of subjects is not to be lightly upset, certainly not without more sound and weighty reasons than those adduced by your reviewer.

But besides this your reviewer draws an unfair inference, due I suppose, to mere carelessness. The words "Inverse Interest" appear only as the heading of pp. 187, 188, and are obviously an abbreviation for convenience of printing of the words on p. 186, "Inverse questions on Interest." As far, however, as I can understand the general effect of your reviewer's explanation, his objection to my book seems to be this—that it fails to bring into sufficient prominence the fact that the Practical Applications of Arithmetic (which, in accordance with established custom, I have collected under the heads of Exchange, Problems concerning Time, Interest, Proportional Part, &c.), really present the same idea under different circumstances, expressed in different language. I entirely agree with him as to the importance of this fact, and endeavoured, as far as the scope and object of my book would allow, to give it due prominence. For example, for this reason, it seemed unnecessary in Exchange and in the chapter on Profit and Loss to give more than a few words of explanation in addition to the examples worked out.

JOHN B. LOCK

Gonville and Caius College, June 14

PASTEUR'S RESEARCHES

IN the current number of the Royal Agricultural Society's *Journal* (vol. xxi. part 1) is a full and able account of the work of the great French experimenter from an agricultural and veterinary point of view, by Dr. George Fleming. The development of Pasteur's genius is traced from his early chemical researches on dextro- and lævo-tartrates to fermentations in milk and in malt. The combination of microscopic with chemical modes of investigation led him to the definite determination of the part played by living organisms in acetic, butyric, and alcoholic fermentations. In these inquiries his own labours were almost entirely original, but it must not be forgotten that a few microscopists in England and many in Germany were working on the same lines, and contributed to the establishment of the modern doctrine that fermentation and putrefaction are both processes dependent on the presence and growth of minute parasitic plants. Pasteur's experimental investigations led him in two directions—in one to the establishment of the now accepted theory of biogenesis; that every living thing is the product of a living parent; in the other to the practical application of the facts ascertained to the manufacture of vinegar and the process of brewing.

Ingenuity in devising experiments and patience in carrying them to a successful issue belong more or less to every successful investigator, but the union in addition of clear theoretical conceptions with skill in the useful application of results is characteristic of Pasteur as it was of Faraday and a few other of the highest intellects.

His investigation into the cause of *pebrine*, or silkworm disease, was undertaken against his will, in deference to the urgency of the eminent chemist Dumas. Pasteur wished to return to his original department of chemistry, and it is remarkable that having once left it he has been drawn further and further into biological researches, while Dumas, who began with valuable work on the development of the ovum, was diverted to chemistry and there made his enduring reputation. Perhaps no instance more remarkable than Pasteur's work on the *pebrine* can