PHILOSOPHY AND FUN OF ALGEBRA

CHAPTER 2: THE MAKING OF ALGEBRAS

The Arabs had some cousins who lived not far off from Arabia and who called themselves Hebrews. A taste for Algebra seems to have run in the family. Three Algebras grew up among the Hebrews; I should think they are the grandest and most useful that ever were heard of or dreamed of on earth.

One of them has been worked into the roots of all our science; the second is much discussed among persons who have leisure to be very learned. The third has hardly yet begun to be used or understood in Europe; learned men are only just beginning to think about what it really means. All children ought to know about at least the first of these.

But, before we begin to talk about the Hebrew Algebras, there are two or three things that we must be quite clear about.

Many people think that it is impossible to make Algebra about anything except number. This is a complete mistake. We make an Algebra whenever we arrange facts that we know round a centre which is a statement of what it is that we want to know and do not know; and then proceed to deal logically with all the statements, including the statement of our own ignorance.

Algebra can be made about anything which any human being wants to know about. Everybody ought to be able to make Algebras; and the sooner we begin the better. It is best to begin before we can talk; because, until we can talk, no one can get us into illogical habits; and it is advisable that good logic should get the start of bad.

If you have a baby brother, it would be a nice amusement for you to teach him to make Algebra when he is about ten months or a year old. And now I will tell you how to do it.

Sometimes a baby, when it sees a bright metal tea-pot, laughs and crows and wants to play with the baby reflected in the metal. It has learned, by what is called "empirical experience," that tea-pots are nice cool things to handle. Another baby, when it sees a bright tea-pot, turns its head away and screams, and will not be pacified while the tea-pot is near. It has learned, by empirical experience, that tea-pots are nasty boiling hot things which burn one's fingers. Now you will observe that both these babies have learnt by experience. Some people say that experience is the mother of Wisdom; but you see that both babies cannot be right; and, as a matter of fact, both are wrong. If they could talk, they might argue and quarrel for years; and vote; and write in the

newspapers; and waste their own time and other people's money; each trying to prove he was right. But there is no wisdom to be got in that way. What a wise baby knows is that he cannot tel l, by the mere look of a tea-pot, whether it is hot or cold. The fact that is most prominent in his mind when he sees a tea-pot is the fact that he does not know whether it is hot or cold. He puts that fact along with the other fact:—that he would very much like to play with the picture in the tea-pot supposing it would not burn his fingers; and he deals logically with both these facts; and comes to the wise conclusion that it would be best to go very cautiously and find out whether the tea-pot is hot, by putting his fingers near, but not too near. That baby has begun his mathematical studies; and begun them at the right end. He has made an Algebra for himself. And the best wish one can make for his future is that he will go on doing the same for the rest of his life.

Perhaps the best way of teaching a baby Algebra would be to get him thoroughly accustomed to playing with a bright vessel of some kind when cold; then put it and another just like it on the table in front of him, one being filled with hot water. Let him play with the cold one; and show him that you do not wish him to play with the other. When he persists, as he probably will, let him find out for himself that the two things which look so alike have not exactly the same properties. Of course, you must take care that he does not hurt himself seriously.