

the photogenic organ, by which the two layers are formed. About this time the tracheal and nerve connections become fully established. At the age of twenty-two days the organ begins to emit light.

In this connection it may be stated that my observations confirm Dahlgren's recent announcement that the adult organs in the pupa arise from the hypodermis.

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TO THE EDITOR OF SCIENCE: In my paper in memory of Joseph Young Bergen, which appeared in SCIENCE, January 4, 1918, I stated that he was the son of a clergyman. I am now informed by Mrs. Bergen that this statement is incorrect.

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CAMBRIDGE, MASS.,
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SCIENTIFIC BOOKS

The Casting-Counter and the Counting-Board. A Chapter in the History of Numismatics and Early Arithmetic. By FRANCIS PIERREPONT BARNARD. Oxford. At the Clarendon Press. 1916. 357 pp. + LXIII. plates. Price £3 3s.

When we consider the rôle played by the abacus in the history of calculation, first as the primitive and probably prehistoric dust board and finally in the form of the elaborate reckoning machines of the present day, we can see that the history of mechanical computation is closely tied up with the history of the race. It is true that for long periods we have no reference to such a device as the abacus, but for equally long periods we have no reference to many of the common customs of life and to the everyday implements used in the home. It is probable that one would have to search long in the written records of the early periods to find any reference to such homely words as button or shoestring, or to such common actions as the combing of the hair, the milking of a cow or a goat, the cooking of a piece of beef, or the making of a

sandal or a shoe, and yet all these words and actions have been commonplaces for thousands of years. The recording of the use of common devices is generally inversely proportional to the frequency of their use, and this is probably one reason why the abacus, in one form or another, is not more frequently mentioned in the chronicles of various peoples.

There were three standard forms of the abacus in ancient times, the dust board, which was the forerunner of the wax tablet as the latter was of the slate; the board on which counters or small disks were moved about, these counters appearing in Rome as pebbles or marbles (*calculi*); and the bead abacus, the counters running in grooves or on wires, a form still found in schools in our country and familiar as the Chinese *suanpan*, the Japanese *soroban*, and the Russian *tschotü* or the Armenian *choreb*.

Of these various forms, the most interesting for the general reader of the Western World is the board on which *calculi* were moved, since these counters are so often mentioned in our literature. Adelhard of Bath (c.1120) speaks of such a table, saying that "*quidem mensam pithogoream ob magistri sui reuerentiam. sed postü tamē abacum dixerunt*," having probably in mind a passage from Boethius: "*Pythagorici vero . . . mensam Pythagoream nominabant . . . a posteribus appellabatur abacus*." We find the name of *abacisti* given to those who were skilled in computation with the counters, and even the verb "to abacus" is occasionally found, as in a certain manuscript of the eleventh century—"Hoc si abacizando probaveris." In later times the references to counters become very numerous. So we have in English such expressions as "Sitte down and take countures rounde," "A nest of cowntouris," "The kitchin clarke . . . jangling his counters," "A counter caster," "Any that can but cast with Counters," and "I shall reken it syxe tymes by aulgorisme or you can caste it ones by counters." From the use of the word as representing a disk we also find it employed to represent the person, as in the expression, "Ther is no countere nor clerke con hem reckon alle," and also to repre-