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NEWTON'S BLIND APOSTLE

BY SISTER M. THOMAS A' KEMPIS, O.S.F.

College of Saint Teresa, Winona, Minnesota

Finis coronat opus. And yet too often a brilliant end overshadows and obscures the struggle of the almost hopeless beginnings. We see astounding accomplishments. These so dazzle our vision that we fail completely to appreciate the labors and painful efforts expended to surmount difficulties which result in realizations only after some friendly and interested hand points the way past these obstacles. Such were the beginnings of Doctor Nicholas Saunderson.

He was born near Penniston in Yorkshire, England, in January, 1682, into a family of moderate circumstances. His father had a place in the Excise for over forty years and possessed a small estate. Vision was granted the child but for twelve short months when smallpox deprived him not only of his sight but even of his eyes. Surely light and color seen for so brief a time could afford him as little idea of them as if he had been born blind. In later years his blindness was partially compensated by the development of a keener sense of touch and of an uncanny intuition of the relative proportions of a room or the distance of objects and persons. He had but to walk into a room to estimate its size or the positions of the objects within it.

During his boyhood he attended the Free School where he applied himself so assiduously to Greek and Latin that he was able to understand Euclid, Archimedes and Diophantes read in the original. His partiality to Horace and Virgil made his recipient mind a veritable storehouse for their most famous pas-

sages, which he quoted freely in the course of conversation. Neither was Tully unfamiliar to him. Besides being able to dictate in Latin fluently he acquired an equally proficient knowledge of French.

After his Grammar School education was completed his father assumed the rôle of instructor of arithmetic. Here his genius readily took root and throve in such favorable soil. In a comparatively short time he was able to do common exercises, perform extended calculations and formulate new rules to simplify complex, perplexing material. His fellow pupils soon discovered his ability and sought his assistance in preference to that of their master.

The next friendly hand was offered him at the age of eighteen years by one Richard West, Esq., of Underbank. He proved a friend indeed, for he possessed two requisites most essential to the ambitious Nicholas. They were wealth and a sincere love of mathematics. This patron appreciated the boy's uncommon capacity and generously instructed him in the elements of algebra and geometry, giving him ample scope for the employments of his talents. Not long after Doctor Nettleton was added to his list of the benefactors who assisted him in his studies. Both undertook to furnish him with the necessary books and gave freely of their time to expound them. It is not surprising then that his thirst for knowledge grew until he outdistanced his instructors.

It became evident that something had to be done to satisfy his eagerness to learn. His father thereupon sent him to a private academy at Attercliff near Sheffield where he began the study of logic and metaphysics. As neither of these subjects were to his liking or taste, he soon withdrew from the school.

At home he pursued his studies in his own way. The need of a good tutor and some one to read to him proved too much of a financial burden to his parents. His ambition centered on entering the University of Cambridge. A university career, however, was far too expensive and the time required for securing the coveted degrees which would qualify him as an instructor and give him the means of self-support was entirely too long. His friends, therefore, resolved to secure for him a mastership in mathematics. If this failed they proposed to open a school for him in London. Accordingly in 1707 Mr. Joshua Dunn received him into his house. He was permitted to assist in the teaching of Philosophy, but was not admitted as a real member of Christ's College where his newest benefactor was a Fellow-Com-

moner. Nevertheless he had the use of the library and every possible privilege accorded him. A Mr. Whiston who held the profesorship of mathematics interested himself in the young man. In his good-natured and generous way he read lectures in a manner proposed by Mr. Saunderson. This interest coupled with Mr. Dunn's untiring advertisement of the character and knowledge of so extraordinary a young man attracted many. Men of learning and others from mere curiosity sought his acquaintance. Lectures given by him were attended by many from other Colleges. The crowd desirous of his instructions grew so much that he did not find the day long enough to divide among them all. Few there were who wished to pursue the more advanced studies, but many who eagerly absorbed the elements of philosophy and mathematics.

Several years before when Newton had left Cambridge, he had already published his *Principia Mathematica*. In this work as well as in his *Optics* and *Arithmetica Universalis* Newton assumed that the readers were well grounded in the fundamentals of mathematics and science. Since, in general, the preparation which would have warranted such an assumption was not adequate these works apparently were destined to take their places among the other learned works which antedated the period in which they would be fully understood and appreciated. Fortunately these became the foundations of Saunderson's lectures, the success of which proved his genius. The enthusiasm with which Newton's works were studied certainly could not escape the notice of the author himself. The master and the disciple met. What must have been Saunderson's satisfaction when on this and subsequent meetings Newton graciously explained many of the more difficult passages.

Henceforth Nicholas Saunderson became an authority in the field of mathematics and science. Halley and De Moivre even regarded his friendship as a real privilege and showed their esteem for him by seeking his advice concerning their plans, ambitions and works.

By 1711 this confidence in his ability had grown to such an extent that when the chair of Mathematics was vacated by his former benefactor, Mr. Whiston, all attention turned toward Saunderson as the one person best fitted to fill that position.

Upon the removal of Mr. Whiston from his Professorship, Mr. Saunderson's Mathematical Merit was universally allowed so much superior to that of any Competitor in the University, that an extraordinary step was

taken in his Favor, to qualify him with a Degree, which the Statutes require. Upon application made by the heads of the Colleges to the Duke of Summerset, their Chancellor, together with the Intercession of the Honourable Francis Robartes, Esq., a Mandate was readily granted by the Queen, for conferring on him the Degree of Master of Arts. Upon which he was chosen Lucian Professor of Mathematics in November, 1711. During the whole transaction Sir Isaac Newton interested himself very much in his Favour.[1]

In 1723 he married the daughter of Reverend Mr. W. Dickson, Rector of Boxworth in the County of Cambridge. Five years later he received the degree of Doctor of Laws from the hands of King George, the Second, upon the occasion of his royal visit to the University.

Since receiving his first degree he expended so much of his time and energy on the demands of his students that little or no time was left for his friends who felt most keenly the lack of his inspiration. Furthermore such close application proved devitalizing. After occasional complaints about a gradually increasing numbness in his limbs, finally though fruitlessly he sought medical attention. He died on the nineteenth of April, 1739, in the fifty-seventh year of his age.

This fatal illness had not been his first serious indisposition. Sometime before he had suffered from a fever which caused alarm among his friends. They then realized that he might be snatched from their midst without having left a single record of his works, lectures and methods. Their timely importunity resulted in the compilation of his *Elements of Algebra*. This was not published until after his death.

This blind instructor had devised many methods for rapid calculations. One of the boards on which he could perform the fundamental operations more rapidly than any one else could with the pen was deciphered by his successor. It consisted of a smooth, thin board, something more than a foot square raised on a small frame so as to lie hollow, resembling an Abacus. It was divided into a great number of parallel lines equidistant from one another and by as many at right angles to them. Every square inch was divided into one hundred little squares. At every point of the intersection was a small hole capable of receiving a pin. He used two sorts of pins, a larger and a smaller one; at least their heads were different and might be easily distinguished.

A great pin in the center of a square designated a cypher. When two was expressed the cypher remained in place and a smaller pin was put just above it. To express unity the large pin was replaced by a smaller one. The number four brought the small pin descended and followed the cypher. Five was expressed by a little pin in the lower angle to the right. For six

[1] Nicholas Saunderson: *Elements of Algebra*, London, 1740, "Memoirs of the Life and Character of Professor Saunderson," pages vi and vii.

the little pin retreated until just under the cypher. A small pin just before the cypher meant eight and one in the upper left hand corner, nine. (See figures 1 and 2.)[2]

It may be interesting to note that after two was formed by placing the small pin in the hole just above the large pin, each consecutive digit was formed by moving the small pin into each consecutive hole, going in the clockwise direction as is demonstrated in the following figure.

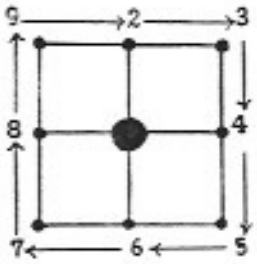

Figure 1 is the key to the numbers and figure 2 represents some of the numbers of more than one digit.[3]

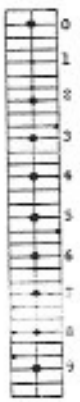

Fig. 1

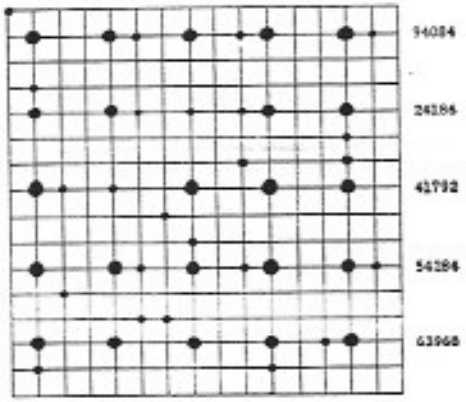

Fig. 2

We find the Author of *The Elements of Algebra* to be very explicit and accurate in his exposition. His one aim was to remove all doubt from the minds of the students, thereby preventing discouragement and even retardation in their progress. Though Saunderson made no notable contribution to the advancement of mathematics, he left a two-fold legacy in the example of his untiring application of the great art of teaching and his unselfish appreciation and admiration of the immortal Newton.

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[2] Ibid., "Nicholas Saunderson's Palpable Arithmetic Decyphered," p. XX.
[3] Ibid., Introduction, fronting page 24.