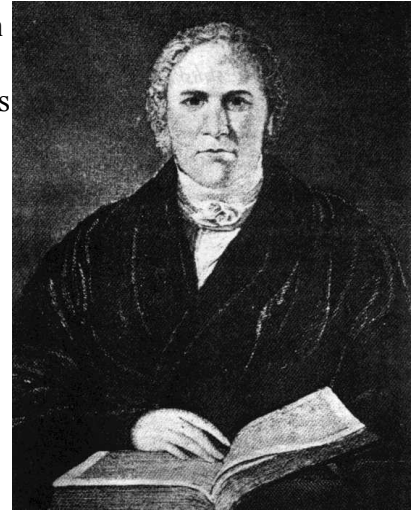


## Robert Adrain

For a man whose formal education ended at age fifteen, **Robert Adrain** (September 30, 1775 – August 10, 1843) made noteworthy contributions to the early progress of mathematics in the United States. Many have called him “the most outstanding mathematician in America in his time.” He published results on the method of least squares in 1808, one year before Gauss. This method is one by which an estimation procedure is determined by minimizing the sum of the squares of



differences between observed and estimated values. Adrain published *Investigation of the figure of the Earth and of the gravity in different latitudes* (1818), in which he gave improved estimates of the earth’s diameter and ellipticity, (the degree of deviation of a spheroid from spherical form). For the latter he gave a figure of  $1/319$ , which was more accurate than the  $1/336$  given by Laplace.

Adrain was born in Carrickfergus, Ireland, a coastal town 10 miles north of Belfast. His ancestors had fled France and settled in Northern Ireland after King Louis XIV revoked the Edict of Nantes, a law granting religious liberty and civil rights to the Protestant Huguenots. When Robert’s father discovered that his son showed early indications of genius, he was determined to give him a good education and prepare him for the ministry. Adrain’s teachers were delighted with his precocity and aptitude for learning, although he was taught no mathematics beyond arithmetic. When he was fifteen both his parents died, forcing him to terminate his own schooling and support himself and his four younger brothers and sisters by opening a school. He happened upon an old arithmetic textbook with a bit of algebra that he did not understand. Curious about it he read widely on the subject, enthusiastically devoting himself to the pursuit of mathematical knowledge. By 1798 Adrain was sufficiently established as a teacher that he was able to afford to marry Ann Pollock. In the United States they

raised seven children with one, Garnett Bowditch Adrain, later becoming a member of the United States Congress.

The Irish Protestants formed a volunteer group to defend the country from the French, who from 1796 to 1798 sent several naval expeditions to the Irish Isles, expecting the support of the Irish Catholics. At the start of the Irish rebellion of 1798, a Mr. Mortimer, an officer of the government, sought out members of the community to take an oath of allegiance. Never imagining that Adrain, who had taught his children, would side with what Mortimer considered degraded rebels, he failed to ask Robert to take the oath. When Mortimer learned that Adrain was the head of a company of Catholic rebels, he offered fifty pounds for the teacher's capture. During the battle of Saintfield, Adrain was seriously wounded when he was accidentally shot in the back by one of his own men.

The rebellion or revolution, depending on whose side one was on, failed. As Adrain was not expected to survive, the rumor spread that he had died, bringing the search to find him to a close. After much suffering he recovered, and by pretending to be a weaver, he and his wife were able to leave the country. At the time they arrived in New York, the city was suffering from a yellow fever epidemic. Adrain was told that the bed in which he was to sleep was one in which a man had died the night before. Hearing that there were teaching positions in New Jersey, Adrain walked to Princeton, where he was appointed a master at Princeton Academy. He remained with the school until 1800 when he moved to York, Pennsylvania to become Principal of York Country Academy.

In 1804 George Baron founded the *Mathematical Correspondent*, an early American journal. Adrain was one of the main contributors to the periodical and became its editor in 1807. Among his articles in the journal were "Disquisition concerning the motion of a ship which is steered on a given point of the compass" and "A view of the Diophantine Algebra," the first attempt to introduce Diophantine analysis

into America. It wasn't a particularly rich time for mathematics in the United States and the audience for mathematical journals was almost non-existent. Despite this Adrain began a second journal, the *Analyst* in 1808. It barely lasted a year. In the preface to the first issue, he wrote:

“It is not necessary at present to enter into a lengthy defense of the practice of publicly proposing and answering new mathematical problems. Every one who has any acquaintance with the history of mathematics knows that many valuable improvements and discoveries have resulted from the profound attention bestowed on the solution of new, curious, useful, or difficult problems. The truly greatest mathematicians ... have not disdained to enter the lists and try their strength of genius in contests of such a nature.”

In 1805 Adrain was on the move again, this time to Reading, Pennsylvania where he was appointed Principal of the local Academy. From 1809 to 1813 he was Professor of Mathematics at Queens College, the first person to be accorded the title of professor at the institution. Prior to that time the instructors were all known as tutors. The college organized a public lottery to pay Adrain's salary and at the same time awarded him the first degree he ever received, an honorary master's degree. He taught all of the upper level subjects at Queens except Moral Philosophy and Composition. In 1812 Adrain was elected a member of the American Philosophical Society, in the following year a member of the American Academy of Arts and Sciences, and subsequently a member of several European philosophical societies. In 1826 Queens College was renamed Rutgers College in honor of a wealthy Colonel Henry Rutgers, known for his philanthropy. A war hero and prominent member of the Dutch Church, Rutgers did very little to deserve the distinction. He donated a bell and the interest on a \$5000 bond. When he died he left a third of his estate to charity, but nothing to Rutgers College.

In 1818 Adrain was lured to Columbia College in New York, where he was awarded the degree of

Doctor of Laws and was appointed to the Chair of Mathematics and Natural Philosophy. In New York City, Adrain was the shining light of a newly established mathematical club, looked upon as a man of great genius and vast scientific learning. In a French work published about this time, Adrain and Nathaniel Bowditch were classified as the first mathematicians in America. Bowditch, president of the Essex Fire and Marine Insurance Company in Salem Massachusetts, like Adrain, was a self-taught mathematician. In 1825 Adrain once again tried to establish a mathematics journal, which he called the *Mathematical Diary*.

Due to the delicate state of his wife's health, it was necessary to quit the city for the clean air of the country, so he returned to Rutgers as Professor of Mathematics. He stayed only one year, when he was induced to accept the Professorship of Mathematics at the University of Pennsylvania (1827). The next year he was given the added duties of vice-provost of the University. At Penn he was expected to teach the entire mathematics curriculum, from remedial arithmetic through calculus. In 1834 he was asked to resign because he was unable to maintain discipline with his students. The problem seems to have been the result of his lack of respect for his pupils' mathematical abilities.

Adrain returned to New Jersey and earned his living by giving private mathematical lessons. From 1836 until he retired in 1840 he taught at the Grammar School associated with Columbia College. He then returned to his home in New Brunswick to spend the last three years of his life. It wasn't long before his memory and other faculties of the mind began to fail him. He greatly lamented his intellectual decline. Once, a friend called on him, finding him sitting with a volume by Laplace in his lap. Adrain sighed and said, "Ah, this is a dead language to me now; once I could read Laplace, but the time has gone by." He died, content in the belief of an afterlife, on August 10, 1843. Since 1984, there has been an *Adrain Chair of Mathematics* at Rutgers, currently held by the well-known mathematician François Trèves.

The interest in mathematics education and mathematical research in the American colonies and the early United States was minimal. The only mathematical entrance requirement of Yale College from 1745 to 1845 was arithmetic. At Yale students studied mathematics by reading and recitation. To get into Columbia University, all the mathematical preparation necessary was the four fundamental operations of arithmetic and the rule of three. Typical mathematics instruction at Columbia consisted of the study of vulgar (common) and decimal fractions, extraction of roots, and algebra as far as quadratic equations. Later students would study a bit of Euclid's *Elements*, spherical trigonometry, conic sections and the "Higher branches of algebra." Throughout the United States in this period, the reason for teaching mathematics was mostly practical. There was little interest in pure mathematics.

**Quotation of the Day:** "...the immortal Newton, whose name I am not worthy to write or to pronounce, was led to the discovery of the grand law of universal gravitation by his attempting to solve the new and curious problem proposed by Dr. Hook (Robert Hooke)." – Robert Adrain