A Biographical Note on John Forbes Nash, Jr. (1928- )
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1. General Comment

Mathematician; Awarded The Central Bank of Sweden Prize in Economic Science in Memory of Alfred Nobel in 1994 for work in the theory of games. Biographer, Sylvia Nasar, summarizes her work, Nash's life, as "a story about the mystery of the human mind, in three acts: genius, madness, reawakening" [1, p. 22].

2. Chronology

1928 Birth:

Born on June 13 in the Bluefield Sanitarium in Bluefield, West Virginia. He was the older of two children of John Forbes Nash, Sr. and Margaret Virginia Martin. The father was a Texas A&M trained electrical engineer; worked for the Appalachian Power Company. The mother studied languages at Martha Washington College and University of West Virginia; taught school for ten years before her marriage. Nash's younger sister is Martha Nash Legg.

1928-1945 Childhood and youth:

Attended Bluefield public schools. Read E. T. Bell, *Men of Mathematics*. Took some mathematics and science courses at Bluefield College beginning in 1941 at age 13.

1945-1952 University education:

1945-1948 Undergraduate studies at Carnegie Institute of Technology:

Began studying engineering, moved to chemistry, and finally completed a major in mathematics. Took only one course in economics, an elective course in international economics.

Studied mathematics under John Synge and Richard Duffin. Some of the faculty referred to him as "a young Gauss" [1, pp. 42].

Received both a BA and MA in mathematics in 1948. Gained admission to the top mathematics graduate programs in the country: Chicago, Harvard, Michigan, and Princeton.

1948-1950 Graduate studies at Princeton I:

Princeton at this time was regarded by some as "the mathematical center of the universe" [1, p. 50]. Princeton University had not only strong Departments of Mathematics and Physics, but the independent Institute for Advanced Study was nearby with its Professorate including Albert Einstein, Robert Oppenheimer, and John von Neumann.

The hierarchy of fields of specialization in mathematics, in order from more to less important, were topology, analysis, algebra, logic, and game theory, considered déclassé.

The first edition of John von Neumann and Oskar Morgenstern, *The Theory of Games and Economic Behavior* had come out in 1944 and in a second edition in 1947.

Nash studied game theory under Albert Tucker; Thesis: *Non-Cooperative Games*, May 1950 (27 pages); Received Ph.D. (in mathematics) in 1950.

1950-1952 Graduate studies at Princeton II:

Neither in his judgment nor in that of his mentors was Nash's thesis in game theory a sufficient contribution to establish him as a first-rate pure mathematician. Nash, therefore, continued his studies at Princeton in an attempt to achieve this objective. During this post doctoral period Nash produced a new paper which would secure his hoped for status; this paper was "Real Algebraic Manifolds" which would appear in the *Annals of Mathematics* in 1952.

1952-1959 Career at Massachusetts Institute of Technology:

Faculty member in the MIT Department of Mathematics from 1952-1959. Primary interest and work was in research. He had little interest in teaching, had a comparatively light teaching load by the standards of the day, and was not considered a good teacher.

Nash spent the Summers of 1950, 1952, and 1954 as a Consultant for the RAND Corporation in Santa Monica, California. This classified work, requiring security clearance, involved military strategy analysis using game theory for various units of the U. S. Department of Defense including the Navy and the Air Force. Attended a a mathematics institute at the University of Washington in the Summer of 1956.

Nash spent the 1956-57 academic year at the Courant Institute of Mathematical Sciences at New York University. This Institute was a center for applied mathematical analysis. Nash worked on problems in elliptic partial differential equations.

Marriage to Alicia Larde in February 1957.

Nash was featured as "one of the brightest young stars of mathematics" in George Boehm, "The New Mathematics," *Fortune* (June and July 1958) [1, pp. 224, 415].

Began acting strangely; referred to McLean Hospital on April 9, 1959; diagnosed as paranoid schizophrenic.

Resigned his MIT position in June 1959.

1959-1970 A Delusional Decade:

Nash is in Paris, France and Geneva, Switzerland with Alicia in 1959-60; he is preoccupied with a venture to renounce his U. S. citizenship and become a citizen of the world.

Nash is in Princeton from 1960-65; given appointments at the Institute for Advanced Study in 1961-62 and in 1963-64; in Trenton State Hospital in 1961; repeatedly in Carrier Clinic in 1963-64; Alicia divorces Nash in 1963.

Nash is in Boston from 1965-67; he is doing research at Brandeis University; he is under psychiatric treatment using anti-psychotic drugs and weekly therapy; delusions continued; worked on research papers.

Nash is in Roanoke, Virginia from 1967-70; living with his mother until her death in 1969; delusions continued.

1970-1990 In Princeton with Alicia, Research, and Delusions:

Sylvia Nasar, the biographer, refers to this period as "A Quiet Life" [1, p. 340]:

Nash is living in Princeton with Alicia; Alicia refers to Nash as a "boarder;" Nash played chess and talked mathematics with his son, John Charles Martin.

Nash continued to work at Princeton on his own research.

Delusions continued: He apparently wrote the following on a Princeton hallway blackboard: "Mao Tse-Tung's Bar Mitzvah was 13 years, 13 months and 13 days after Brezhnev's circumcision" [1, p. 332]. At Princeton he was variously referred to as "the Phantom of Fine Hall," "the library crazy man," and "the mad genius of Firestone [Library]."

1990-date Remission, the Prize, and More Work:

Nash has undergone something of a remission of his illness in recent years. He has told various people in recent years "that he is still plagued by paranoid thoughts, even voices, although, in comparison to the past, the noise level has been turned way down. Nash has compared rationality to dieting, implying a constant, conscious struggle. It is a matter of policing one's thoughts, he has said, trying to recognize paranoid ideas and rejecting them, just the way somebody who wants to lose weight has to decide consciously to avoid fats or sweets [1, p. 351]."

Nash was notified that he would be awarded the Nobel Prize jointly with John Harsanyi and Reinhard Selten on or about October 10, 1994 and was awarded the Prize on December 10, 1994.

"On the afternoon of the Nobel announcement, after the press conference, a small champagne party was in progress in Fine Hall. Nash made a short speech. He was not inclined to give speeches, he said, but he had three things to say. First, he hoped that getting the Nobel would improve his credit rating because he really wanted a credit card. Second, he said that one is supposed to say that one is really glad he is sharing the prize, but he wished he had won the whole thing because he really needed the money badly. Third, Nash said that he had won for game theory and that he felt that game theory was like string theory, a subject of great intrinsic intellectual interest that the world wishes to imagine can be of some utility. He said it with enough skepticism in his voice to make it funny" [1, p. 379].

On June 13, 2002 Nash will be 74 years old.

3. Other Elements of Interest

1. His character:

In his childhood he was regarded as being bright, different, odd. That he did not cultivate close or lasting friends suggests a rather strong thread of independence in his character. He had something of a passion for experimentation. He was noted as being an outstanding problem solver; "He was always looking for different ways to do things" [1, p. 34]. He had a streak of arrogance, rudeness. Others were often working on things he thought "trivial." He was obsessed about a search for "the truly original idea." Jealously guarded his autonomy to pursue his own research. He was considered eccentric.

2. Personal relationships:

Gay relationships: "In the five short years, between the ages of twenty-four and twenty-nine, Nash became emotionally involved with at least three other men" [1, p. 167]: A Harvard graduate student; a mathematician working for Douglas Aircraft in 1952; and an MIT graduate student. Then in the Summer of 1954, Nash was arrested for "indecent exposure." He was caught in a police sting looking for gays in Palisades Park. He was fired by RAND because of this episode.

Affair with Elinore Stier: This affair with Elinore, a Boston nurse, began in the Fall of 1952 and lasted four years. The affair produced a son, John David Stier, who was born on June 19, 1953. John David following in his mother's tracks also became nurse.

Marriage to Alicia Larde: Alicia was a physics student at MIT. Romance started in July 1955, and the marriage occurred in February 1957 in Washington, D. C. at St. John's Episcopal Church. The marriage produced one son, John Charles Martin Nash, born on May 20, 1959. Nash's illness led Alecia to file for divorce which was granted in May 1963. Nash and Alicia have lived together, unremarried, since 1970. John Charles Martin Nash earned a PhD in

mathematics from Rutgers University, and, alas, suffers also from paranoid schizophrenia.

3. Mental illness:

Nash went through a "strange and horrible metamorphosis" in early 1959 [1, pp. 239-247]:

Nash indicated to some colleagues in the Math Department common room that either powers from outer space or foreign governments were communicating with him through selected articles in *The New York Times*. The messages were in code which only he could decipher.

In a bridge game with friends Nash's bidding appeared bizarre; in one instance he bid 6 hearts even though he held no hearts in his hand.

Claude Berge, a French mathematician, received a letter from Nash; it was "written in four colors of ink" and complained "that his career was being ruined by aliens from outer space."

In another letter, Nash thanked the Chairman of the Department of Mathematics at the University of Chicago for the offer of a position, but "said he would have to decline because he was scheduled to become Emperor of Antarctica."

Observation, diagnosis and treatment:

McLean Hospital (Belmont, Massachusetts) April 9 to May 28, 1959: Referred by MIT administration; his illness was diagnosed as paranoid schizophrenia; treatment consisted of Thorazine injections, group social therapy, and psychoanalysis five days per week; his condition improved in that the acute psychosis diminished; was released with the recommendation that he continue on psychiatric treatment.

Trenton State Hospital (Trenton, New Jersey) January to July 15, 1961: Committed by wife, mother, and sister; insulin coma treatment was given five days a week for six weeks followed by group rehabilitation therapy.

Carrier Clinic (Belle Meade, New Jersey) April 1963 to July 1964: Committed by Alicia, mother, and sister again; treatment was individual and group therapy under the supervision of a personable psychiatrist, Howard S. Mele. Released to an appointment at the Institute for Advanced Study and continued therapy under Mele.

Condition continued intermittently through the 1960s, 1970s, and 1980s. The condition was considered to be in remission in the 1990s.

4. On prizes:

Nash appears to have had something of an obsession about prizes:

The William Lowell Putnam Mathematical Competition: This was a competition for undergraduate students of mathematics to establish a rank in the world of mathematics. Nash entered this competition twice while a student at Carnegie Institute of Technology; he finished in the top ten on his second try; he was disappointed at not having finished in the top five in this competition.

The Fields Medal: This is the equivalent of a Nobel Prize for contributions in mathematics. It is awarded by the International Mathematical Union every four years usually to two recipients under the age of forty. Nash was perhaps qualified for consideration in 1958, 1962, and 1966. However, he never was awarded the Medal.

The Bôcher Prize: This Prize is awarded by the American Mathematical Society once every five years for distinguished contributions to mathematics. Nash was perhaps considered for the 1959 Prize. Yet, he did not receive this Prize either.

John von Neumann Theory Prize: This mathematics prize is awarded by the Operations Research Society and the Institute for Management Science. This Prize was awarded jointly to Nash and Carl Lemke, a mathematician at the Rensselaer Polytechnic Institute, in 1978. "Nash won for his invention of non-cooperative equilibrium; Lemke for his work in computing Nash equilibria" [1, p. 339]. Lloyd Shapley, a friend from graduate school and RAND days, forwarded and supported Nash's candidacy for this Prize.

Fellow of the Econometric Society: Elected Fellow in 1990.

The Central Bank of Sweden Prize in Economic Science in Memory of Alfred Nobel: This Prize is awarded by the Royal Swedish Academy of Sciences. This Prize was awarded jointly to John Harsanyi, Nash, and Reinhard Selten in 1994 for their contributions to game theory. Nash's contribution centered on the introduction of the distinction between cooperative and non-cooperative games and the concept of Nash equilibrium. Nash claimed that this award was given for his "most trivial work" [3, p. 2]. For an article on Nash equilibrium see David M. Kreps, "Nash equilibrium," in John Eatwell, Murray Milgate, and Peter Newman (Eds.), *The New Palgrave: A Dictionary of Economics* (New York: Stockton Press, 1987), vol. 3, pp. 584-588. And a useful treatment of game theory as well as Nash equilibrium appears in David A. Besanko and Ronald R. Braeutigam, *Microeconomics: An Integrated Approach* (New York: John Wiley & Sons, 2002), pp. 594-626.

Nash was awarded the Leroy P. Steele Prize for a Seminal Contribution to Research by the American Mathematical Society in 1999. This award was for his paper, "The embedding problem for Riemannian manifolds," *Annals of Mathematics* (1956) [2, p. 5].

5. On being a graduate student in mathematics at Princeton in 1948:

On one of his first days at Princeton, Nash attended an orientation session at which Solomon Lefschetz, the Chairman of the Mathematics Department, spoke to the new graduate students. He said something along the lines of the following, according to Sylvia Nasar: "They [the students] could go to class or not go to class. He didn't give a damn. Grades meant nothing. They were only recorded to please the 'goddamn deans.' Only the 'generals' [qualifying examinations] counted."

Nasar continues, "Lefschetz was not exaggerating when he said that the department had no course requirements. The department offered courses, true, but enrollment was a fiction, as were grades. Some professors put down all *A*s, others all *C*s, on their grade reports, but both were completely arbitrary. You didn't have to show up a single time to earn them and students' transcripts were, more often than not, works of fiction 'to satisfy the Philistines.' There were no course examinations. In the language examinations, given by members of the mathematics department, a student was asked to translate a passage of French or German mathematical text. But they were a joke. If you could make neither heads nor tails of the passage -- unlikely, since the passages typically contained many mathematical symbols and precious few words -- you could get a passing grade merely by promising to learn the passage later. The only test that counted was the general examination, a qualifying examination on five topics, three determined by the department, two by the candidate, at the end of the first, or at latest, second year. However, even the generals were sometimes tailored to the strengths and weaknesses of a student. If, for example, it was known that a student really knew one article well, but only one, the examiners, if they were so moved, might restrict themselves to that paper. The only other hurdle, before beginning the all-important thesis, was to find a senior member of the faculty to sponsor it" [1, pp. 59, 60].

4. Selected Works

1. "Equilibrium Points in N-Person Games," (1950) *Proceedings of the National Academy of Sciences.*

2. "The Bargaining Problem," (1950) *Econometrica.*

3. "Non-Cooperative Games," (1951) *Annals of Mathematics.*

5. Sources

1. Sylvia Nasar, *A Beautiful Mind* (New York: Simon & Schuster, 1998).

2. "John Forbes Nash." A biography of the Mac Tutor History of Mathematics Archive, School of Mathematical and Computational Sciences, University of St. Andrews.

3. "John F. Nash." History of Economic Thought Web Site, New School for Social Research.

4. "Nash, John Forbes, Jr." *Who's Who in America* (New Providence, N.J.: Marquis Who's Who, 2001).

5. http://www.abeautifulmind.com