APPENDICES

APPENDIX A: BIOGRAPHY OF JOHN FORBES NASH, JR.

John Forbes Nash, Jr. is an American mathematician whose works in game theory, differential geometry, and partial differential equations have provided insight into the factors that govern chance and events inside complex systems in daily life. His theories are used in market economics, computing, evolutionary biology, artificial intelligence, accounting, politics and military theory. Serving as a Senior Research Mathematician at Princeton University during the latter part of his life, he shared the 1994 Nobel Memorial Prize in Economic Sciences with game theorists Reinhard Selten and John Harsanyi. Nash is the subject of the 2001 Hollywood movie “A Beautiful Mind”. The movie, loosely based on the biography of the same name, focuses on Nash's mathematical genius and also his schizophrenia.

Nash was born on June 13, 1928, in Bluefield, West Virginia, United States. His father, after whom he is named, was an electrical engineer for the Appalachian Electric Power Company. His mother, born Margaret Virginia Martin and known as Virginia, had been a schoolteacher before she married. He had a younger sister, Martha, born on November 16, 1930.

Nash attended kindergarten and public school. His parents and grandparents provided books and encyclopedias that he learned from. Nash's grandmother played piano at home, and Nash had positive memories of listening to her when he visited. Nash's parents pursued opportunities to supplement their son's education, and arranged for him to take advanced mathematics courses at a local community college during his final year of high school. Nash attended Carnegie Institute of Technology (now Carnegie Mellon University) with a full scholarship, the George Westinghouse Scholarship, and initially majored in Chemical Engineering. He switched to Chemistry, and eventually to Mathematics. After graduating in 1948 with a B.S. degree in Mathematics and an M.S. degree in Mathematics, he accepted a scholarship to Princeton University where he pursued graduate studies in mathematics. Nash's
adviser and former Carnegie Tech professor R. J. Duffin wrote a letter of recommendation for graduate school consisting of a single sentence: "This man is a genius." Nash was accepted by Harvard University, but the chairman of the mathematics department of Princeton, Solomon Lefschetz, offered him the John S. Kennedy fellowship, which was enough to convince Nash that Princeton valued him more. Nash also considered Princeton more favorably because of its location closer to his family in Bluefield. He went to Princeton where he worked on his equilibrium theory.

Nash began to show signs of extreme paranoia, and his wife later described his behavior as erratic. Nash seemed to believe that all men who wore red ties were part of a communist conspiracy against him. Nash mailed letters to embassies in Washington, D.C., declaring that they were establishing a government. Nash's psychological issues crossed into his professional life when he gave an American Mathematical Society lecture at Columbia University in 1959. Although ostensibly pertaining to a proof of the Riemann hypothesis, the lecture was incomprehensible. Colleagues in the audience immediately realised that something was wrong. ("Dr. Riemann's Zeros", Karl Sabbagh, Atlantic Books 2003).

He was admitted to the McLean Hospital, April–May 1959, where he was diagnosed with paranoid schizophrenia. The clinical picture is dominated by relatively stable, often paranoid, fixed beliefs that are either false, over-imaginative or unrealistic, usually accompanied by experiences of seemingly real perception of something not actually present—particularly auditory and perceptual disturbances, a lack of motivation for life, and mild clinical depression.

In 1961, Nash was admitted to the New Jersey State Hospital at Trenton. Over the next nine years, he spent periods in psychiatric hospitals, where, aside from receiving antipsychotic medications, he was administered insulin shock therapy. Although he sometimes took prescribed medication, Nash later wrote that he only ever did so under pressure. After 1970, he was never committed to a hospital again, and he refused any further medication. According to Nash, the movie “A Beautiful Mind” inaccurately implied that he was taking the new atypical antipsychotics during this period. He attributed the depiction to the screenwriter (whose mother, he notes, was a psychiatrist), who was worried about the film encouraging people with the disorder to
stop taking their medication. R. Whitaker wrote an article suggesting that recovery from problems like Nash's can be hindered by such drugs. Nash has said the psychotropic drugs are overrated and that the adverse effects are not given enough consideration once someone is deemed mentally ill. According to Sylvia Nasar, author of the book “A Beautiful Mind”, on which the movie was based, Nash recovered gradually with the passage of time. Encouraged by his then former wife, de Lardé, Nash worked in a communitarian setting where his eccentricities were accepted. De Lardé said of Nash, "it's just a question of living a quiet life".

Nash dates the start of what he terms "mental disturbances" to the early months of 1959 when his wife was pregnant. He has described a process of change "from scientific rationality of thinking into the delusional thinking characteristic of persons who are psychiatrally diagnosed as 'schizophrenic' or 'paranoid schizophrenic' including seeing himself as a messenger or having a special function in some way, and with supporters and opponents and hidden schemers, and a feeling of being persecuted, and looking for signs representing divine revelation. Nash has suggested his delusional thinking was related to his unhappiness and his striving to feel important and be recognized, and to his characteristic way of thinking, saying, "I wouldn't have had good scientific ideas if I had thought more normally." He has also said, "If I felt completely pressureless I don't think I would have gone in this pattern".

He does not see a categorical distinction between terms such as schizophrenia and bipolar disorder. Nash reports that he did not hear voices until around 1964, and later engaged in a process of consciously rejecting them. He reports that he was always taken to hospitals against his will. He only temporarily renounced his "dream-like delusional hypotheses" after being in a hospital long enough to decide to superficially conform – to behave normally or to experience "enforced rationality". Only gradually on his own did he "intellectually reject" some of the "delusionally influenced" and "politically oriented" thinking as a waste of effort. However, by 1995, although he was "thinking rationally again in the style that is characteristic of scientists," he says he also felt more limited.
APPENDIX B: SUMMARY OF “A BEAUTIFUL MIND” MOVIE

John Nash arrives at Princeton University as a new graduate student. He is a recipient of the prestigious Carnegie Prize for mathematics. Though he was promised a single room, his roommate Charles, a literature student, greets him as he moves in and soon becomes his best friend. Nash also meets a group of other promising math and science graduate students, Martin Hansen, Sol, Ainsley, and Bender, with whom he strikes up an awkward friendship. Nash admits to Charles that he is better with numbers than people, which comes as no surprise to them after watching his largely unsuccessful attempts at conversation with the women at the local bar.

Nash is seeking a truly original idea for his thesis paper, and he is under increasing pressure to develop his thesis so he can begin work. A particularly harsh rejection from a woman at the bar is what ultimately inspires his fruitful work in the concept of governing dynamics, a theory in mathematical economics. After the conclusion of Nash's studies as a student at Princeton, he accepts a prestigious appointment at the Massachusetts Institute of Technology (MIT), along with his friends Sol and Bender. Russell Crowe as John Nash. Russell Crowe as John Nash.

Five years later while teaching a class on Calculus at MIT, he places a particularly interesting problem on the chalkboard that he dares his students to solve. When his student Alicia Larde comes to his office to discuss the problem, the two fall in love and eventually marry. On a return visit to Princeton, Nash runs into his former roommate Charles and meets Charles young niece Marcee, whom he adores. He also encounters a mysterious Department of Defense agent, William Parcher. Nash is invited to a secret United States Department of Defense facility in the Pentagon to crack a complex encryption of an enemy telecommunication. Nash is able to decipher the code mentally to the astonishment of other codebreakers.

Parcher observes Nash's performance from above, while partially concealed behind a screen. Parcher gives Nash a new assignment to look for patterns in magazines and newspapers, ostensibly to thwart a Soviet plot. He must write a report of his findings and place them in a specified mailbox. After being chased by the Russians and an exchange of gunfire, Nash becomes increasingly paranoid and begins
to behave erratically. After observing this erratic behavior, Alicia informs a psychiatric hospital. Later, while delivering a guest lecture at Harvard University, Nash realizes that he is being watched by a hostile group of people. Although he attempts to flee, he is forcibly sedated and sent to a psychiatric facility. Nash's internment seemingly confirms his belief that the Soviets were trying to extract information from him. He views the officials of the psychiatric facility as Soviet kidnappers. Alicia, desperate to help her husband, visits the mailbox and retrieves the never-opened "top secret" documents that Nash had delivered there. When confronted with this evidence, Nash is finally convinced that he has been hallucinating. The Department of Defense agent William Parcher and Nash's secret assignment to decode Soviet messages was in fact all a delusion. Even more surprisingly, Nash's friend Charles and his niece Marcee are also only products of Nash's mind.

After a painful series of insulin shock therapy sessions, Nash is released on the condition that he agrees to take antipsychotic medication. However, the drugs create negative side-effects that affect his relationship with his wife and, most dramatically, his intellectual capacity. Frustrated, Nash secretly stops taking his medication and hoards his pills, triggering a relapse of his psychosis. While bathing his infant son, Nash becomes distracted and wanders off. Alicia is hanging laundry in the backyard and observes that the back gate is open. She discovers that Nash has turned an abandoned shed in a nearby grove of trees into an office for his work for Parcher. Upon realizing what has happened, Alicia runs into the house to confront Nash and barely saves their child from drowning in the bathtub. When she confronts him, Nash claims that his friend Charles was watching their son. Alicia runs to the phone to call the psychiatric hospital for emergency assistance.

Parcher urges Nash to kill his wife, but Nash angrily refuses to do such a thing. After arguing with Parcher, Nash accidentally knocks Alicia to the ground. Afterwards, Alicia flees the house in fear with their child, but Nash steps in front of her car to prevent her from leaving. After a moment, Nash realizes that Marcee is a figment of his hallucinations because she has remained the same age since the day he met her. He tells Alicia, "She never gets old." Only then does he accept that all three people are, in fact, part of his hallucinations. (It is important to note that in real life,
Nash suffered from auditory hallucinations and possible delusions, instead of visual hallucinations.

Caught between the intellectual paralysis of the antipsychotic drugs and his delusions, Nash and Alicia decide to try to live with his abnormal condition. Nash consciously says goodbye to the three of them forever in his attempts to ignore his hallucinations and not feed his demons. However, he thanks Charles for being his best friend over the years, and says a tearful goodbye to Marcee, stroking her hair and calling her "baby girl", telling them both he wouldn't speak to them anymore. Nash grows older and approaches his old friend and intellectual rival Martin Hansen, now head of the Princeton mathematics department, who grants him permission to work out of the library and audit classes, though the university will not provide him with his own office.

Though Nash still suffers from hallucinations and mentions taking newer medications, he is ultimately able to live with and largely ignore his psychotic episodes. He takes his situation in stride and humorously checks to ensure that any new acquaintances are in fact real people, not hallucinations. Nash eventually earns the privilege of teaching again. He is honored by his fellow professors for his achievement in mathematics, and goes on to win the Nobel Memorial Prize in Economics for his revolutionary work on game theory. Nash and Alicia are about to leave the auditorium in Stockholm, when John sees Charles, Marcee and Parcher standing and smiling. Alicia asks John, "What's wrong?" John replies, "Nothing." With that, they both leave the auditorium.
Off Milnor. He's still watching Nash go.

EXT.-PRINCETON-FRESHMAN DORM-SUNSET

The sun is low in the sky. Nash heads into the tall dormitory.

INT.-FRESHMAN DORM ROOM-SUNSET

Nash ENTERS. Small but well furnished. His clothes are still packed in trunks. Nash pulls off his tie, goes to the window.

Couples and LAUGHING groups move across the sun-drenched field. Nash rests his forehead against the glass. Alone.

The door swings open behind him. Unruly hair and a tuxedo that looks slept in whirl into the room. Meet CHARLES HERMAN.

CHARLES

The prodigal roommate arrives.

Charles begins stripping as he speaks. Nash stares in wonder as off come his jacket and bow-tie.

NASH

Roommate?

CHARLES

Did you know that a hangover is not having enough water in your body to run your Kreoss cycle?

Charles pulls off his pants, and hopping, both shoes.

CHARLES

Which is exactly what happens when you die of thirst.

Now finally his shirt, which he throws on the couch.

CHARLES

So dying of thirst would feel like the hangover that finally kills you.

He grabs a towel and heads for the door.

CHARLES

Nash, right? Happy to meet you.

NASH-CLOSE. Speechless.

CUT TO:
Nash CRACKS his head, hard, on the glass, spiderwebbing the window.

CHARLES (OVER)

Jesus.

WIDER. Charles is sitting up on his bed, looking sleepy, sheet around his shoulders. He puts his feet on the floor. Smiles grimly.

CHARLES

What did that window ever do to you?

John turns to him now, the despair on his face palpable.

NASH

I can't fail. Do you understand?

John turns back to look back out the window. When his VOICE comes again there is a defeat that is chilling.

NASH

This is all I am.

John SLAMS his head into the glass again, hard.

CHARLES

John, stop-

John spins, pleading eyes full of rage and anguish.

NASH

I can't fail. There's no reason for me then. Do you understand? Do you?!

Charles stares at him a long beat. Finally...

CHARLES

...Yes.

This seems to give Nash some small comfort. A long beat. Then he walks to the desk, begins to pull it backwards from the window.

NASH

No more staring out. Face the wall. Read their books. Attend their classes...

Charles stares at him a beat. He nods slowly.

CHARLES

You're bleeding.