■ Chapter One ■

THOU LIVING RAY OF INTELLECTUAL FIRE

The machine is useful, the system in terms of which the machines gain their use is efficient, but what is man?

The artist, the writer, and to a new degree the scientist seek an answer in the nature of their acts. They create or they seek to create, and this in itself endows the process with dignity. There is "creative" writing and "pure" science, each justifying the work of its producer in its own right. It is implied, I think, that the act of a man creating is the act of a whole man, that it is this rather than the product that makes it good and worthy.

Jerome S. Bruner, *On Knowing* (1962, p. 17)

When his parents drove him up to visit Harvard College in the fall of 1954, young Fischer Black refused even to get out of the car. But once they were back home in Bronxville, New York, it was the only college to which he applied. There was never any question that Fischer would get in. He was a math and science geek, and the "number 1 candidate" from the elite Bronxville High School, according to the school's report. But he always liked to tell people that he chose Harvard because of the Freshman Glee Club.

It is true that he liked to sing. But what he wrote on his college application was that choral singing groups "provide social contacts." It was only one of many strategies that Fischer used to compensate for his awkwardness in social situations. At 17 years old, he already stood 6 feet

2 inches but weighed only 150 pounds, his outsized head perched atop an underdeveloped body. The high school's report put the best spin on it: "For one of his ability he is unusually well-balanced, although at times a little shy."

Growing up in Bronxville, young Fischer could not help but be acutely aware of his social deficits. One square mile in area and just north of New York City, Bronxville was populated mostly by people from somewhere else on their way up the corporate ladder. Parents kept busy with sports (golf and tennis) and cocktail parties, and children were expected to do their bit for the family cause, starting with the passing of hors d'oeuvres and drinks. Girls were expected to "come out" in elaborate debutante balls, and boys were assumed to be college bound, on their way to careers in business or one of the more remunerative professions. It goes without saying that the town was lily-white; thanks to an infamous so-called gentlemen's agreement, no Jews or blacks were allowed to own property.[1] Casual racism and anti-Semitism were shared ground for a community whose principle anxiety was about class status.

Given his intellectual gifts, Fischer's parents thought he might become a doctor, and so were pleased when he won acceptance to the prestigious Precollegiate Research Training Program at the Jackson Memorial Laboratory in Bar Harbor, Maine, during the summer before his senior year in high school. But nine weeks of cutting open mice left him unsure whether a career in science was for him. A better clue to his future direction was the discussion group he organized with his high school friends "to try to work out effective methods of true discussion," as he would write on his college application.

He called the group the American Society of Creators, Apostles, and Prophets, and it had four members.[2] George Amis was the Father. He went to Amherst College and became a professor of literature. Robert Helmreich was the Son. He went to Yale and became a professor of psychology. Fischer himself was the Holy Ghost, and Helmreich's girlfriend Eva Augenblick was Virgin Mary pro tempore. She went to Radcliffe and became a research medical doctor. Fischer's high school friends were not math and science geeks, but rather the intellectual leaders of the school, the backbone of the school's theatrical productions, and reliable producers of juvenile poetry for the student newspaper.

It was Amis, then in full flight from his stockbroker stepfather's ambitions for him, who was the closest to being Fischer's best friend at the

time. They built rockets together and blew them up in Fischer's backyard, and they traveled into New York to see the theater. In their junior year they were both in the school production of *Lost Horizons*, Amis as the second male lead and Fischer as the mysterious High Lama. According to the class yearbook, Fischer was "the personification of Oriental mystery." In the student newspaper, alongside a poem by Amis, is one by Fischer titled "Life or Death," which concludes with the stanza: "Death./All dies./Nothing is left./To be good?/No use./Death, death, death. . . ."[3]

Fischer signed Amis' yearbook with a passage from Samuel Taylor Coleridge's *Rime of the Ancient Mariner*: "With my crossbow I shot the albatross." For his own yearbook quotation, he chose a passage from William Falconer's famous poem "The Shipwreck": "Thou living ray of intellectual fire,/Whose voluntary gleams my verse inspire."[4] The poet is invoking his muse, and asking how it can be that heroic sailors venture forth on such a shallow motive as material gain. The passage continues: "Can sons of Neptune, generous, brave and bold,/In pain and hazard toil for sordid gold?/They can. . . ." The poet is preparing the reader to understand the eventual shipwreck as cosmic punishment for human greed. Fischer was signaling his own imminent rebellion against the values of Bronxville, and his determination to find another way.

The Black family came originally from Illinois farming stock. In 1898, however, the farm was sold to pay off mounting debts, and the center of the family shifted to Bryson City in North Carolina, where Amy Black moved after marrying Thad Bryson, son of the town's founder. Amy's older brother Stanley soon joined her and, in partnership with Thad, he built a thriving law practice around the land transfers involved in the growing timber and hydroelectric industries. Stanley Black married Marianna Fischer, a college classmate of Amy's from back in Illinois, and they raised four children in the big house up on Black Hill. There were two girls and two boys, and the youngest of them all was Fischer Sheffey Black, Fischer's father, born January 27, 1911.

Notwithstanding its name, Bryson City was at that time a town of fewer than 500 people, buried deep in the Great Smoky Mountains in the far western part of North Carolina. It was an island of sorts in the sea of southern Appalachian hill culture, a sea populated by rugged but impoverished backwoodsmen, isolated, inbred, and suspicious of

"furriners."[5] Marianna was determined not to drown in that sea, and she set the standard for the rest of the family. Energetic, strong-willed, and optimistic, Marianna's advice to her children was always "Be good and you will be happy." But she also took concrete steps to ensure her children's education as the road to a better life, by founding the local library and teaching in the local school. Following her lead, Stanley became trustee of the Bryson City School District, and served as chairman of the county board of education.

The two girls followed the example that Marianna set, continuing their education at Converse College in South Carolina. The eldest, Ellen Engleman Black, went on for her PhD in Sociology at the University of Chicago, became Commissioner of Public Welfare for North Carolina in 1944, and subsequently served as the first U.S. Commissioner of Welfare in the Department of Health, Education, and Welfare from 1963 to 1969.[6] The second daughter, Louise Bryson Black, known as the pioneer of the family, sought her fortune in New York City in the middle of the Depression, where she became a model, a dance partner of Fred Astaire, and chief buyer for a major department store. There she met and married Oscar Cox, an up-and-coming lawyer working for Mayor Fiorello LaGuardia. He would subsequently go on to the Treasury Department in Washington where, working under Henry Morgenthau Jr. during the war, he wrote the lend-lease agreement with Russia.

The two boys took more after their father. In addition to his law practice, Stanley was also involved in real estate dealings on his own account, and was a founder of the local Bryson City Bank, of which he became president in the singularly inauspicious year of 1929. (The bank survived the Depression thanks to an infusion of capital from Marianna's brother, Louis E. Fischer, an engineer and businessman in Chicago, and thanks to the stratagem of paying off depositors with preferred stock.) The eldest son, Stanley Warren Black Jr., carried on the Black banking tradition, rising in the ranks of the American Trust Company to become executive vice president of the successor North Carolina National Bank, which would become NationsBank in 1991, only to merge with Bank of America in 1998.

The youngest son, Fischer Sheffey Black, inherited his father's sense of the main chance, moving from one thing to another as the opportunity arose. An electrical engineer by training, Fischer got his start at the Potomac Electric Power Company, in Washington, D.C., through family

connections (Uncle Louis again). But soon he migrated to the business side of the company, while acquiring a law degree on the side. After the war, when the opportunity arose to try his hand as editor of the trade journal *Electrical World* in New York City, he jumped at the chance and subsequently became publisher as well. When that position began to seem shaky,[7] he moved back onto the business side as executive vice president of Tampa Electric in Florida, while acquiring a broker's license and starting a brokerage business on the side. The constant through all these career changes, he would say, is that he was "never out of top management." Like his father before him, Fischer Sheffey attributed much of his business success to his fortunate choice of a mate, Elizabeth Zemp, called Libby. She made all the big decisions, and that was fine with him.

On the Zemp side, the family home was in Camden, the oldest inland town in South Carolina.[8] Libby's mother, Albertus "Bertie" Moore Lenoir Zemp, traced her ancestry to pre–Revolutionary War days, and even earlier to the minister who officiated at the marriage of Pocahontas to John Rolfe. Libby's father's family were more recent arrivals, but nonetheless Libby remembers her father, James Blakeney Zemp, as the "most loved man in Camden." Bertie ran a local private school, while James was a jack-of-all-trades, operating a trucking business and a small vegetable farm, but also dabbling in real estate and serving as partner in the local bank. In the latter capacity, he was obliged to put up money of his own to save the bank during the Depression. The parental models in the Zemp family were thus quite similar to those in the Black family.

An only child, Libby led a charmed childhood full of afternoon horse rides with myriad cousins, Saturday tennis and picnics, parties, and even occasional circuses put on for self-amusement. It was a childhood without much money, but always there was enough for a cook and a maid. Great grandmother Elizabeth Peay Clark kept alive memories of pre–Civil War days when the family had owned a plantation, illustrating her stories about General William Tecumseh Sherman's march with a silver pitcher that had been punctured by a Union sword probing the ground where it was buried. As Libby put it, there were no famous people in her family, but they were people of strong character and self-discipline, with a reputation for honesty and loyalty, and that was plenty of which to be proud. She grew up identifying with Mary Chesnut, author of the famous *Diary from Dixie* about her

life at Mulberry Plantation in Camden during the Civil War. Libby graduated as valedictorian from the local public school and went on to Converse College on scholarship with a major in mathematics and a minor in English. "Math is like a puzzle to me," she would say.

During the Depression, both Fischer and Libby came to Washington to find more economic opportunity, as well as a wider selection of potential mates. In September 1935, Libby was working for the Works Progress Administration (WPA) and the Federal Housing Administration (FHA), and Fischer was working for Potomac Electric, when they met at a party; they fell in love, and married in June 1936. Fischer recognized in Libby the qualities he had known and admired in his mother and his accomplished older sisters. And Libby recognized in Fischer the qualities she admired in her father, but also the opportunity to live out something of the life Mary Chesnut had led when she moved to Washington after her husband was elected to the Senate. Thanks to the social connections of Fischer's sister Louise, Fischer and Libby traveled in a "semifast set" on the edges of the Washington social scene. As newlyweds, they lived in Georgetown at 2530 Q Street.

The marriage was bound to succeed, Libby reflects, because she and Fischer had so much in common. "We were both Presbyterians, both bridge players, and both Southern." In fact, she was more genuinely Southern than he, and more genuinely Presbyterian as well since he was never very religious. But both were genuinely bridge players, and more generally both took pleasure in a rich social life filled with parties and dances, cocktails before dinner and sometimes after as well. Like her mother, Libby would always have a maid to take care of the house and the cooking. But she would also insist on putting aside at least $50 a week, which was half of their joint income at the time they married. As a consequence, there was always plenty of money in reserve. As children of the Depression, they always thought of themselves as savers even as they lived a country club life.

Fischer Sheffey Black Jr. was born January 11, 1938, the first of three children, "a love child if ever there was one" according to Libby—albeit a legitimate one. They called him Fish for short. Soon thereafter the family moved from the apartment in Georgetown to a small house on four acres of land on Old Dominion Drive in rural Falls Church outside the

city. The first 10 years of young Fischer's life were thus spent in a kind of rural idyll, playing with his younger sister Janice Blakeney Black and brother Louis Engleman Black, tending the victory garden with his father, catching crawfish in the stream behind the house with his cousins Peter and Warren Cox, shooting squirrels while visiting his maternal grandmother in Camden, and fishing the mountain streams while visiting his paternal grandparents in Bryson City. The junior Fischer's early childhood was not so different from that of his parents.

The consequence was an abiding sense of security and acceptance that never left him. The simple country life built around loving family relations was a very good life, and always available in case other plans didn't work out. Later on, when sister Blakeney married a Jewish mathematician with two children of his own and moved to Quebec to raise goats, Fischer said he wanted to join her. He drove everyone up to see the farm and announced, "I think I'd like that." Probably he would not have lasted a week—he didn't even like exercise, much less actual physical labor—but that's not the important thing. His childhood life in the country was always a place he could go in his mind to find peace and calm.

From the beginning, it was clear that Fischer was special. His father taught him to read when he was only four years old, and his kindergarten teacher said he was the smartest student she ever had. He took obvious pleasure in learning new things, and also in teaching what he knew to his sister and brother. The move to Bronxville, when Fischer was 10 and already entering sixth grade—he had skipped a year—placed Fischer in one of the top public school systems in the country and confirmed his bookish nature. Schoolmates would come to the house at 46 Elm Rock Road and call for him to come out, but he wouldn't go despite his mother's encouragement. "They just want to hack around, and I don't like to hack around." He was always most comfortable at home, surrounded by his family, and his books and magazines.

As he got exposed to new ideas and ways of thinking at school, he would bring them home and try them out on his family. Knowing his father's conventionally conservative political preferences, he would make the case for Russian communism. Knowing his mother's strong views on proper etiquette, he would dismiss manners as mere convention, and defend the bohemian lifestyle that was then growing up in

nearby Greenwich Village. More generally, he rejected the status-conscious corporate climber culture of Bronxville, as well as the casual prejudice against outsiders. His sister and brother remember rip-roaring arguments at the dinner table. But there was never any danger of a lasting rift. Fischer's parents understood that Fischer was playing around with ideas, just as he always liked to play around with words.

As Fischer gained experience with this kind of robust intellectual interchange on ground that was fundamentally safe for him, he began to try it out in other more risky locations. A favorite target at school was the physics teacher, Joseph "Cappy" Ricketts. "You're wrong, Mr. Ricketts," Fischer would interject calmly. "According to the laws of physics bumble bees can't fly." Here began a lifelong habit of questioning authority that could easily be mistaken for personal attack. Probably Fischer had no sense of how his comments made other people feel. Certainly he never felt the need to develop such a sense since he never had the slightest interest in fitting in. He was different from other people, and he knew it.

The American Society of Creators, Apostles, and Prophets was Fischer's attempt to expand his experiments with intellectual interchange to a select circle of his peers. They read *Scientific American* and discussed all the latest developments, such as Norbert Wiener's cybernetic theory of the human nervous system. They read Aldous Huxley on altered states of consciousness and tried their hand at hypnosis. But even with his closest friends, Fischer always came across as a very closed and private person, cerebral and isolated, detached and aloof. Everyone knew he was the brightest person in the class, but no one knew who he was.

The first person outside his family with whom Fischer made a significant emotional connection was his very first girlfriend, Cynthia "Tinna" Carpenter, from neighboring Scarsdale, whom he met on a school trip to France and Switzerland during the summer between high school and college. They connected right away, and the tour leaders spent the rest of the trip trying to keep them apart. By the time they got back, it was all arranged that she would be his steady girlfriend when he went off to Harvard. Throughout his college years, he and Tinna would write to one another almost daily, and visit regularly. The first year she was still finishing high school, and after that she was at Smith College in western Massachusetts.

Tinna was a quiet girl, serious, shy, studious, and, until she met Fischer, obedient to her parents' wishes. Her father, Ralph Emerson

Carpenter Jr., from a very old New England family, had made plenty of money in the pensions and investments business, and used it to support his passion for antique collection and the preservation of historic homes.[9] In the latter field, he made his reputation by constructing his own Georgian-style home on Morris Lane in Scarsdale, called Mowbra Hall, as a bow to Mowbra Castle, from which three rooms of the home had been salvaged. In 1956, Tinna would make her debut at the Westchester Cotillion and the Holly Ball. Suffice it to say that the Carpenters were a step up on the social ladder from the Blacks, and as such more than suitable for an eventual family merger.

The only problem was that Tinna's parents didn't much like young Fischer and his challenging ways. Tinna called him a nonconformist, and was attracted by his willingness to question God, materialism, and social conventions more generally. Under Fischer's influence, she fancied herself as something of a bohemian as well. No doubt her parents hoped that this infatuation would pass, but no such luck. In fact, Fischer was already talking to his own parents about getting married, and they only insisted that he wait until after graduation. In his first semester at Harvard, Fischer wrote to his grandmother: "Ya know, it looks like you'll be a great grandmother before yer very old—in 6–8 years. Congratulations (6th anniversary before yer 1st grandchild). Ya know, ya might even have some great great grandchildren. How odd."[10] Fischer was always a great one for making plans.

Instead of waiting four years, Fischer and Tinna married after three in July 1958, when Fischer still had one more year to go at Harvard—and soon thereafter they produced the first grandchild. Ultimately the marriage did not work out, but throughout Fischer's early college years the idea of marriage and children was always in the back of his mind as a source of personal security, as he threw himself into the intellectual ferment that was Harvard in the late 1950s.

To the chagrin of his parents, Fischer would put no constraints on the choice of his college roommates, except that they have different interests from his own. When asked to characterize his interests, he would only say "the human being." When asked about a potential major, he would only say "education." There were four of them assigned to the

suite in Wigglesworth D-31. Fischer shared a room with Steven Jervis, a New Yorker who would go on to become a professor of English literature. The next year he and Jervis would continue together in Adams House B-42 joined by Elliot Elson, a native of St. Louis whom Fischer had met during his summer at the Jackson Memorial Laboratory. Elson would go on to become a professor of biochemistry. Jervis and Elson were both friends of Fischer, but again not really intimates.

Unlike his roommates, Fischer never focused on conventional academic success. He would write papers on his own topic, not the assignment, and was more interested in finding new and unconventional approaches to problems than in learning the standard stuff. Even then his way was to make an intuitive leap, and leave the details for later. In daily life, he was unwilling to accept normal conventions, such as waiting until others have read the newspaper before tearing out an article than interests you. He was always challenging and provoking arguments about even the smallest thing, and would not brook obstacles to his own independence, including other people's feelings and opinions. When he and Jervis were called on the carpet for snickering and exchanging glances during the weekly section meeting of Social Science 2, the famous introduction to "Western Thought and Institutions" taught by Professor Samuel Beer, Fischer simply switched to a section leader he liked better.

Behind the outward show of childishness and immaturity, Fischer led a simple, almost monastic life with large areas kept completely private. Tinna was one of those areas, and also his own family, but the most significant was Fischer's own internal life. He kept detailed records of his emotional state over time, writing down numbers on a little pad he kept with him. Probably he was looking for patterns, or causal connections with outside stimuli, but he never talked about it. Scientific findings about himself were more about himself than they were about science. And anyway, he always knew he was different from other people, so his findings were unlikely to have any general application.

Fischer's course selection seems to have been similarly directed by a scientific interest, now directed outward at other people. In his first semester, he took an introduction to anthropology "all about how early man and institutions developed" and decided to major in Social Relations, which he described as a "conglomeration of sociology, anthropology, psychology, psychiatry, etc."[11] As a sophomore, he jumped

immediately into advanced classes that could also be taken by graduate students in the field. By his own account, the most important of these was "Psychological Foundations of Social Behavior," taught by Jerome Bruner.[12]

Bruner was at that time in the forefront of the new cognitive approach to psychology that was rising up to challenge the old behaviorist approach championed by fellow Harvard professor B. F. Skinner. Instead of viewing behavior as a conditioned response to stimuli, the cognitive psychologists were focusing on the internal thought processes that mediated any such response. Bruner's specific focus was on education, and he had a message that Fischer liked. "Intuitive thinking, the training of hunches, is a much-neglected and essential feature of productive thinking not only in formal academic disciplines but also in everyday life. . . . Usually intuitive thinking rests on familiarity with the domain of knowledge involved and with its structure, which makes it possible for the thinker to leap about, skipping steps and employing shortcuts in a manner that requires a later rechecking of conclusions by more analytical means, whether deductive or inductive."[13] In effect, Bruner gave Fischer permission to proceed with his own education in the way he was already inclined. Even more, Bruner's ruminations about "The Conditions of Creativity"—detachment and commitment, passion and decorum, freedom to be dominated by the object, deferral and immediacy, and the internal drama—provided Fischer with a kind of road map showing how to get where he wanted to go.[14]

A second course, "The Socialization Process in Variable Family Structures," taught by Clyde Kluckhohn, gave Fischer greater appreciation for the parenting he had received, and he told his parents so.[15] "Cultural Ecology," taught by Clifford Geertz, offered an account of broader human culture as the product of co-evolution along with the natural environment. Fischer was so captivated by the latter course that, in summer 1957, he and Tinna typed up the lecture notes Geertz had prepared, and distributed them to interested graduate students. Geertz concluded the course with an ecological critique of modern culture: "Production per se has thus become a central value in our society; our utopian image is the ever-expanding economy. Such an image, though it is held by some of the most prudent, realistic, and practical men in our society, is truly utopian for it rests on the false premise that the potentialities of the environment in which we live are

infinite, that 'science' will always find a way to make any damage we do to nature unimportant and will enable us to go on forever milking the cow without feeding her."[16]

As a sophomore, Fischer spent much of his spare time with the graduate students he was meeting in his classes. His closest connection was with the graduate student Karl Reisman, his sophomore tutor in the fall semester, the section leader in Beer's course to whose section Fischer transferred, and a classmate in the Geertz course. Hanging around with Reisman's crowd, Fischer tried once to interest them in his experimentation with hallucinogenic drugs, apparently some kind of mushroom. As usual, he approached the experience like a scientist, taking notes every half hour on what he was feeling. At about this same time, Tinna recalls that Fischer was also experimenting with changing his sleep patterns, alternating four hours of sleep with four hours awake, to see how it affected his mental state. He took lab notes on that experiment as well. Neither experiment was sufficiently successful to cause him to change his ways permanently. In fact, by the end of the sophomore year he seems to have exhausted his interest in pursuing his study of social relations any further, and he was going on to other things.

All the while he was pursuing his intensive study of social relations, he had also been taking courses in mathematics and physics. He seems to have had the idea that he could always return to physics for graduate school if nothing else worked out. In May 1957 he wrote to his parents that physics was not interesting to him but would lead to the kind of job he wanted, namely in research. "In social relations the subject matter would be more interesting and everything would be great if I could get the right kind of job, but I doubt if such jobs even exist. I'm now considering other fields, even economics."[17] Given the timing, it seems reasonable to infer that he was thinking about jobs because he was thinking about marriage. He had to have something to say when Tinna's father asked the inevitable question.

Fischer spent the fall of 1957 trying out biology and chemistry as possible alternatives to physics before he accepted the inevitable. (He also took the philosopher Van Quine's course "Deductive Logic" for his own interest, and was sufficiently engaged to urge Tinna to take a logic course as well.) In May 1958 he switched his major to physics, and on July 12 he and Tinna were married and set up housekeeping at 2 Ware Street right next to campus. Tinna transferred from Smith College to

Boston University, while Fischer continued on to complete his degree, making up for lost time by taking a full load of physics courses, several of them intended only for graduate students.

In October of his senior year he applied to graduate school in physics, once again only to Harvard. He seems to have had the idea that if he showed he could do the work, Harvard would have to accept him, but he made sure of acceptance by scoring 870 (out of 900) on the Graduate Record Exam in Physics. It probably also helped that, after the shock of Sputnik in October 1957, graduate schools were flooded with government money. Fischer won a National Science Foundation fellowship to study theoretical physics, and Harvard took him in, just as he had planned.

He wrote to his parents: "I'm interested only in fundamental theory and physics. Fundamental work is done both at the universities and in industry, but primarily at universities. So it will probably be best for me to be at a university. I don't particularly care what I'm doing to 'earn my salary'—in industry I would spend part of my time on company projects, and at a university I would spend part of my time teaching. This is more or less irrelevant to me, though I think I might like teaching best. I am not interested in creating 'better things for better living,' but rather in making better sense out of the physical world. It is a great challenge to me."[18]

But once he got to graduate school, he took only one physics course—Julian Schwinger's famous course on "Quantum Mechanics"—and barely passed it, no doubt because he paid it little attention. Instead he was focusing his attention on Howard Aiken's course on the theory of switching and Van Quine's advanced course on "Mathematical Logic." Apparently he had gotten interested in computers. In November he petitioned to switch officially from theoretical physics to applied mathematics in the Division of Engineering and Applied Sciences, and in spring 1960 he enrolled in Marvin Minsky's course down the road at MIT, "Automata and Artificial Intelligence." Back at Harvard, one of his mathematics professors set the students a challenge problem, with the prize being a fellowship for the next year. Fischer was by no means getting the best grade in the class, but he focused his energies and within two weeks solved the problem and won the Gordon McKay Fellowship.

Possibly it was this accomplishment that gave Fischer and Tinna the confidence to accelerate their plan to have a child. At any rate, soon thereafter Tinna realized that she was pregnant. Working at the Harvard Computation Lab in the summer of 1960, Fischer wrote to his parents: "One of the things I am most interested in is building computers which can think like human beings. I think it will be possible within 20 years. We don't really care if the baby is a boy or a girl." Fischer's interest in computers had thus morphed into an interest in artificial intelligence, and got connected in his mind with the prospect of raising a child. "I am working on a general plan for a machine which will be able to do 'anything' you or I can do—learn languages, make decisions, solve problems, etc. . . . The general idea is that it starts out like a child, with some basic learning principle but no knowledge, and it slowly is taught all it needs to know."[19]

To help him think about the problem of raising a computer/child, in fall 1960 he took a course on the "Psychology of Learning" that explored the behaviorist approach of B. F. Skinner, but fatefully managed to fail it. More interesting to him was the cognitive approach that he had been exposed to as an undergraduate, and was now exploring in a graduate seminar with Jerome Bruner on "The Cognitive Functions of Personality," and in a reading course with the experimental psychologist George Miller.[20] As an alternative to the stimulus-response framework of the behaviorist, Miller taught, the cognitive theorists propose an Image-Plan framework. An individual formulates an Image of the goal, and a Plan to get there, and then uses that Image-Plan to evaluate all received stimuli and potential actions. The computer, Miller suggested, is a material metaphor for this process.[21]

It is probably from Miller that Fischer got the idea to use the computer to simulate the higher-order cognitive functions. And it is probably through Miller's connections with the RAND Corporation in California that Fischer got offered a job there to pursue the idea over the summer of 1961. The plan was for him to collaborate with the leaders in the field, two professors from Carnegie-Mellon University, Herbert Simon and Alan Newell. All the stars seemed to be lining up in his favor.

But in the midst of this exciting intellectual voyage, relations in Fischer's marriage had begun seriously to deteriorate. Conflict had begun to build soon after Tinna got pregnant, and only worsened after the

baby, Fischer Sheffey Black III, was born on December 10, 1960. When Fischer went to California, Tinna stayed in Cambridge with the baby. And when Fischer returned, he found a place of his own. He and Tinna got a legal separation in November 1961 and then a Mexican divorce over the Christmas holidays, and Fischer gave up all rights to the child. After a few years, Tinna found someone else, remarried, renamed the child, and moved away. It was the first big reversal of Fischer's life.

And marital trouble was only the tip of the iceberg. Fischer's willful failure in the "Psychology of Learning" had drawn the attention of department authorities, initially only because it threatened his satisfactory progress through the program. More troublesome was Fischer's unwillingness to be tied down to a specific program of work. December 14, 1960, only four days after the birth of his son, in his formal application for admission to the thesis-writing stage of the PhD, Fischer listed his proposed subject as "artificial intelligence or foundations of mathematics." Well, which was it to be? In February 1961, his adviser, Anthony Oettinger, wrote a note to the Committee on Higher Degrees: "I have reason to be concerned about his intellectual discipline so that, while recognizing his ability and his desire for independence, I am concerned lest he lapse into dilettantism."

On April 21, the same Oettinger would chair the oral qualifying examination that Fischer had to pass in order to be allowed to continue on to write a thesis.[22] Fischer did pass, but with the explicit requirement that he produce by the next January 1962 "a coherent, lucid thesis outline reflecting a thorough survey of the relevant literature." More immediately, he had also to pass on May 5 yet another oral examination, this one in the field of psychology to make up for the course he had failed, and once again Oettinger would sit in judgment. Fischer's state of mind can be judged by what happened in the interim.

The spring of 1961 was, in the larger world, a time when the currents that would produce the upheavals of the 1960s were just beginning to come to the surface. President John F. Kennedy was newly in the White House, and change was in the air. On April 15, the daily *Harvard Crimson* editorialized for relaxation of the parietal rules regulating dormitory visits by members of the opposite sex, and on April 28 the weekly *Crimson Review* carried an article on "Oral Contraceptives and

the College Community." The Pill had come to Harvard, and not just the contraceptive variety. Over on Divinity Avenue, at the Harvard Center for Personality Research, Timothy Leary and Richard Alpert were completing their first year of experiments with the hallucinogen psilocybin, using Harvard graduate students as their experimental subjects. By the spring of 1961, they had given hallucinogenic drugs to more than 200 experimental subjects.[23]

Meanwhile, in the politics of the day, the 1950s-era activity of the House Un-American Activities Committee still loomed large, as the folk singer Pete Seeger was sentenced to a year in prison for his refusal to cooperate back in 1955. Other headlines spoke of new concerns. "Kennedy warns Soviets against armed support of war in Laos." "Malcolm X demands states for Negroes." "Anti-Castro invasion of Cuba collapses." On Thursday, April 27 the *Crimson* landed on Fischer's doorstep with the banner headline, "2000 Riot After Protest on Widener Steps." On Friday, the headline was even bigger: "Police Use Tear Gas Smoke Bombs to Dispel 4000 Students in Second Riot." Having read these headlines, Fischer found himself in Harvard Square being told by a nervous Cambridge policeman to move on. He refused, and was promptly arrested and thrown in jail.

The irony of the story is that the April 1961 riots were not about Vietnam, or civil rights, or even the Bay of Pigs. The riots were about the decision of Harvard president Nathan Pusey to print diplomas in English, rather than Latin, in a radical departure from 325 years of tradition. Thus did the 1960s begin at Harvard. Eight years later, in April 1969, several hundred students would occupy University Hall with a list of demands, provoking the same President Pusey to order their forcible removal at dawn by more than 400 Cambridge police, an action that prompted a student strike that shut down the entire university. But in 1961, nothing like this was remotely imaginable.

A Harvard dean who was called to the jail to talk to Fischer found him quite unrepentant, indeed "surly" and "insolent." "Black remarked that he hated authority, and seemed to want for a while to stay in jail, but then decided to accept the chance to get out."[24] Of course the authority that Fischer hated was not the police, but Oettinger, and even that target was misplaced. In truth, there was nothing very unusual about Oettinger's actions. Probably he was trying to help Fischer to focus his energies, but Fischer was in no condition to see that. Oettinger

was throwing up obstacles to what he wanted to do, and Fischer had only one way of dealing with obstacles, namely stubborn refusal to recognize their legitimacy.

In any event, Fischer managed to pull himself together sufficiently to pass the May 5 psychology exam, but that was the end of it. By spring 1962, his lack of progress toward a viable thesis was evident to everyone, and Oettinger graded his work unsatisfactory. In June he was officially informed that he would not be allowed to register in the fall. Fischer had always said that he wanted independence, and now he had it. There was anger, and disappointment, but also relief. "For the first time in 19 years I am out of school for more than a summer."[25]

Long before the official end finally came, Fischer had begun to take steps to build a new life for himself, beginning with the summer of 1961 in Santa Monica, when he was ostensibly working on a computer simulation project at RAND. On his own, away from both Harvard and Tinna, he tried the California lifestyle and found that he liked it: beaches and mountain climbing, folk dancing and recorder lessons, and the easy company of women not his wife. One girlfriend that summer was Jewish, a fact Fischer was pleased to point out to his parents. "Friendships are one thing and marriage is another. A friendship can be terminated at any time if it stops being enjoyable or meaningful. Therefore there is no reason whatever to be cautious in one's choice of friends. It is good to be close friends with a variety of people."[26] To his grandmother he wrote: "I like the west coast a great deal. It's like a frontier. I think I would like to come out here to work when I finish school."[27]

Back in Cambridge in the fall of 1961, Fischer shared an apartment at 1560 Cambridge Street with three physicists and a historian, Bart Bernstein, whom Fischer would view as his closest friend during this period. Fischer described his life with his roommates: "Hard to get much work done from all the talking, but fun. I have been doing many more things than I ever did before—lots of reading, parties, political work, etc. . . . We helped elect some reasonable politicians in Cambridge." The reference is to the Cambridge Civic Association, a liberal reform movement in town politics. In national politics, Fischer was a supporter of Kennedy.

Separated from Tinna, Fischer was also doing a great deal of dating, including an affair with the wife of a neighbor. Fischer himself understood this period in his life as "a rapid, if delayed, adolescence."[28] It was like a return to his first college days, only without the tie to Tinna. He was supposed to be writing his thesis, but no one was watching over him, so he was in fact free to do whatever he wanted, and he did. After a year of this, the consequence was that he got kicked out of graduate school, but after the initial annoyance that turned out not to be such a big consequence. In May 1962, shortly before the official end, Fischer was making plans to stay in Cambridge for the summer and take a course on the modern American short story. "I like Hemingway, Ring Lardner, Fitzgerald, Farrell, and Salinger the best."

Like so many who drift away from graduate study at Harvard or MIT, he found a job at the local consulting firm Bolt Beranek and Newman (BBN). In July, only a month after his expulsion from graduate school, he described his life: "I am studying modern art in summer school, taking guitar lessons, taking a speed reading course, working on my thesis, working at Bolt Beranek and Newman, participating in psychological experiments on hypnotism. Therefore I am very busy. You don't seem to approve of my social life, so I won't tell you about it."[29]

Needless to say, there was a lot for a parent to disapprove of. Hardest to take, the break with Tinna meant the loss of their first grandchild, who was supposed to carry the Fischer Sheffey Black name into the next generation. (At Libby's suggestion, Tinna changed the child's name to Terry, short for Tertius, as a lasting reference to the missing III.) And yet, no matter how much they disapproved of what their son was doing, Fischer's parents never ceased to support him, both financially and emotionally. In March 1962, after the divorce from Tinna but before the divorce from Harvard, Fischer wrote to his father: "I was just thinking about how much of a difference the money you gave me is making and will make in my life, and I thought I would thank you again."[30] A year later, after he had started to get his life back in some order, he reflected: "My current theory of wisdom is that he is wise who speaks not about the empires he will build until he is emperor. Too many people talk endlessly about their plans and accomplish nothing."[31]

Fischer's roommate Bernstein remembers Fischer during this period as "the most disengaged person I've ever known," quite friendly and

generous, gentle and easygoing, but completely incapable of emotional intimacy. He was curious about other people, but always as an outsider and from a distance. "It was as though everyone spoke a different language from him. He could learn it, but he was not a native speaker." Most people conceal their deficits, but Fischer revealed and even emphasized them, because he learned that his differences held some benefit. The Fischer that his college roommates remember, the one who challenged everything and everyone, was apparently gone only to be replaced by a wide-eyed Candide, willing to try everything but unwilling to commit to anything in particular.

One of the benefits of this style was a certain attractiveness to women, who tended to appreciate Fischer's softness and honesty. Soon after Fischer settled down to his job at BBN, he settled down with a steady girlfriend as well. Shirley Noakes was studying humanities and comparative literature, while supporting herself with part-time secretarial work in the physics department. Fischer spent Thanksgiving and Christmas of 1962 with Shirley and her sister Tina, who lived in New York. Shirley remembers Fischer playfully interacting with Tina's two small children. Thus did Fischer discover the kind of family involvement that most suited him.

He could help Shirley and her sister with money and kindness—Shirley remembers Fischer as both "rescuer" and "nurturer"—without being bound by any more complicated emotional bond. In turn Shirley could provide a comfortable home where Fischer was always welcome, but never obligated. He was focused on his work and she was focused on hers, so both needed someone regular, but neither one was thinking about marriage. He taught her to play Space Wars on the PDP-1 computer at BBN, and she took him to her music theory class. They were lovers for the year, and friends afterward.

BBN hired Fischer initially to work on automatic simplification of computer programs, and toward the end of his time there he worked on a syntax-directed compiler,[32] but mostly he worked on computer-based information retrieval systems for a study about "Libraries of the Future," sponsored by the Council on Library Resources and directed by J. C. R. Licklider. Vice president of BBN, Licklider was just leaving for a position in the Defense Department in Washington where he would control the funds that would finance the next step of the computer revolution, what we now know as the Internet.[33]

The library study grew out of Licklider's famous 1960 article on "Man-Computer Symbiosis," which promoted the idea that the main use of the new digital computer, at least in the short to medium run, would not be to replace humans entirely but rather to extend and enhance human capabilities. "The hope is that, in not too many years, human brains and computing machines will be coupled together very tightly, and that the resulting partnership will think as no human brain has ever thought and process data in a way not approached by the information-handling machines we know today. . . . Those years should be intellectually the most creative and exciting in the history of mankind."[34]

Licklider's focus was on designing what he called a "procognitive system," a system for knowledge that would not only do what humans don't do well, such as calculate and retrieve information, but would also aid humans in doing better what they already do well, such as formulate new questions. "It is both our hypothesis and our conviction that people can handle the major part of their interaction with the fund of knowledge better by controlling and monitoring the processing of information than by handling all the detail themselves." The point was not division of labor between man and machines, but interlocking dependency in a dynamically "adaptive, self-organizing process."[35]

In September 1962, Fischer's boss, Tom Marill, suggested that he try his hand at writing a computer program that would be able to deduce answers to questions from a set of given statements, using as a framework the predicate logic that Fischer had learned from Quine. (John McCarthy had suggested something like this as early as 1958 in his proposal for an "Advice Taker," but apparently Fischer didn't know that, and anyway by 1962 McCarthy was no longer in Cambridge, having left MIT for Stanford University.)[36] The goal was to produce a few concrete demonstrations in order to stimulate further investigation. Over the next year, Fischer built a system that was able to understand simple questions—"What is the largest planet?"—and work out the answer from information it had stored in its database. Limitations of computer memory and calculation speed kept the system from being very useful, but that would presumably be overcome eventually. In his final report, Licklider chose to highlight Fischer's "Question Answering System," calling it "a signal advance in automated question answering."[37]

As part of that project, in spring 1963 Fischer sat in on courses at MIT in the grammar of English and in semantics.[38] He was trying to

learn about how natural language works in the hope that it might help him with the tricky problem of programming a computer to understand questions posed in natural language. He never made much progress on the problem, but along the way he did gain a lasting respect for the power and flexibility of natural language. For the rest of his life, he would consciously choose to express himself whenever possible in English rather than the formal language of mathematics. And the kind of English he would choose was the "Fairly Easy" English recommended by Rudolf Flesch, whose books Fischer first encountered at this crucial moment in his life.[39] It was Flesch who finally gave Fischer the effective method of true discussion he had been looking for since high school days, and a workable technology for communicating ideas from one mind to another.

Flesch wrote how-to guides—*The Art of Plain Talk* (1946), *The Art of Readable Writing* (1949), and *How to Make Sense* (1954). Here is the origin of Fischer's distinctive mature writing style, a style that is at once plain, direct, simple, informal, and yet strangely compelling. Twenty years later, at Goldman Sachs, when Fischer hired an editor into the Quantitative Strategies Group in order to improve the readability of the departmental memos he was reading, he wanted someone familiar with the Flesch approach.[40]

It would take much practice before he mastered the style, but already in July 1963 Fischer was consciously using the Flesch method to present a talk on his year's work at BBN. A second talk on "Styles of Programming," given at a conference at Stanford University, not only adopted the Flesch method, but also adapted the Flesch content. The point of programming style, Fischer argued, is not so much to communicate effectively with the computer, since the compiler takes care of that, but to communicate with oneself and with other human programmers in later revisions of the program. "Make your style simple, not complicated, even though the complicated style may seem to have some abstract virtues."[41]

When Fischer's work at BBN came to the attention of Marvin Minsky at MIT, it opened the possibility for a return to school. Minsky agreed to take responsibility for him, and at Harvard a new junior professor, Patrick Fischer, agreed to sign off on the formalities. Over

the next year, Fischer wrote a dissertation that was accepted for the PhD in applied mathematics in June 1964. The title of the dissertation was "A Deductive Question Answering System." He dedicated it to his parents and singled out for special thanks "S. Noakes for help and encouragement."[42]

The original idea behind the question-answering system was to use the logical structure of the question itself to guide the search for an answer. We start by thinking of the question as a logical statement that follows at the end of some chain of deductive reasoning, and then we work backwards to construct possible earlier links in the chain. Eventually we arrive at a link that matches a statement we already know is true, and that tells us one answer to the question. When we have examined all possible logical chains, we know we have all the possible answers, and we are done.

The main conceptual problem with implementing such a system is how to avoid endless deduction. Fischer's idea for how to handle that problem was to work forward from the corpus of known statements by making all possible deductions once and for all. (He notes the alternative to classify statements hierarchically, but does not pursue it.) Essentially we ask the computer to figure out all the logical consequences of what we already know, and then we use it also to keep a record of those consequences until we have a question to ask.

Given the extremely limited capacity of computers at the time, there was no hope of actually implementing Fischer's question-answering system, but the same could be said of almost everything then being developed in the infant field of artificial intelligence. Had Fischer wanted to continue working in this area, it seems highly probable that funds would have been forthcoming, not least from Licklider at the Defense Department. More generally, Fischer was in contact with essentially all of the key players in artificial intelligence during the years that one historian has called the "Dawn of the Golden Years" (1956–1963).[43] There are any number of ways he could have parlayed his contacts and skills into a career, but he didn't. After finishing his thesis he essentially turned his back on the field.

Even as he was writing the thesis, he wrote to his parents: "I'm trying to decide what I want to do after I get my degree. The field is wide open. I don't really like any of these labels: scientist, engineer, researcher. I'm not at all sure I want to stay in the computer field. . . . I'm not sure

I like computer people very much. I suppose they're no different from anyone else, but they strike me as being overenthusiastic about their ideas—like the people in the electric utility business who are putting in expensive nuclear plants."[44]

Unlike most computer people, Fischer was interested not so much in the underlying technology of the computer but rather in how it could be used to enhance human capabilities, not least his own. From his studies in psychology, he knew well both the strengths and weaknesses of the human mind. No computer would ever have the creative and intuitive cognitive powers that Bruner emphasized as characteristically human. But also no human would ever have the memory and information retrieval powers that computers could offer, at least potentially. (Fischer's professor George Miller had a famous paper "The Magical Number Seven" pointing out that humans are typically unable to hold more than seven separate items in memory simultaneously.) But computers were as yet far too primitive to make Licklider's man-computer symbiosis practical. For the time being, and for some time to come, a well-organized paper filing system could do a lot better.

In this regard, the most important visible legacy of Fischer's exposure to artificial intelligence was the filing system that he used throughout his life as an ever-expanding corpus to keep track of every paper he read and every idea he had. At his death, 30 years later, there were more than 6,000 letter-sized manila folders. His editor at Goldman Sachs describes how he used them: "In going about his research, Fischer made the most of three ordinary tools: pencils, paper, and manila folders. As ideas played about in his head, he was quick to write everything down, and he kept copies of the material he needed or might need. Then, he filed it all where he could find it and use it. It was a simple, elegant approach that freed his mind to do the work he loved."[45] It was, one might say, a paper version of his "Deductive Question Answering System."

A deeper legacy of Fischer's encounter with the idea of man-computer symbiosis was finally to achieve an integration of the two sides of his character, the wildly creative and the ruthlessly logical. Thirty years later, a colleague would remember Fischer: "No one's mind is, or will ever be, as fertile as Fischer's was. No one is even close. He was crazy and logical at the same time. The force of his logic would push you into corners you didn't like, or it could open vistas you had not imagined.

The crazy streak freed him from conventional wisdom. He was intellectually fearless."[46]

Fischer's childhood ambition was to create something new, to think ideas that no one had ever thought before. But creativity unharnessed is close to madness, and anyway society will not tolerate it, as Fischer found out the hard way. In this regard, the most important thing that Fischer's version of man-computer symbiosis gave him was a way to discipline and channel his creative impulse. As "man" he could be as wildly creative as he wanted to be, knowing always that as "computer" he could rigorously check the logic behind any of the ideas he might come up with. And in the interval between ideas, instead of "man" restlessly switching fields in search of fresh stimulation, "computer" could be kept busy extending and organizing the corpus for future use, or answering routine questions posed by other people.

In retrospect, it is clear that the metaphor of man-computer symbiosis helped Fischer to stabilize himself, and so made it possible for him to work productively. But at the time, this was not clear at all, least of all to Fischer himself, mainly because he had not yet found any work that he wanted to do. Throughout his final year at Harvard, there is a sense that he was trying to pack in as much enjoyment of his freedom as he could before the door shut behind him. He moved into a new apartment at 334 Harvard Street, Apt. E-2, and led a very active social life, including some peripheral involvement in the civil rights movement of the day. He attended a concert to raise money for the March on Washington for Jobs and Freedom where Martin Luther King Jr. gave his famous "I Have a Dream" speech. And as the year came to a close, he began looking for a job.

His father, of course, pressed him to consider a career in business, preferably at a big company like IBM. Fischer responded: "I think maybe the best way for me to get things done is to write—papers for journals, articles for magazines, and books. Being an executive and writing are about equally good as ways of getting things done, and I think I would prefer writing. Besides technical articles, I might write books like [Rachel Carson's] *Silent Spring* or [Jessica Mitford's] *The American Way of Death*."[47] Other possibilities included a postdoctoral fellowship in Harvard's new University Program on Technology and Society, or a position

with a start-up time-sharing technology company called Real Applications, Inc., and there were other possibilities as well.

In the end, none of the alternatives Fischer explored came through, so he wound up taking a position at Arthur D. Little, Inc. (ADL), a local consulting firm where he got an interview through his father's business contacts. Fischer told himself that the job at ADL was more or less a continuation of his job at BBN, but with industry rather than the government as the primary client. One good thing was that such work was more likely to be of practical use to someone. At BBN, the culture was that consultants decide what they want to work on and then find some argument why the government should fund it. Fischer always thought this put the cart before the horse, and he looked forward to a different culture at ADL. His job would be to help businesses make better use of their computers, and he would start work in January 1965.