7

PROJECT SKYVAULT

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("Secrets of Antigravity Propulsion" - Tesla,
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7.1 EARLY MICROWAVE RESEARCH

One evening in 1986, a friend and I went out for a beer. Like myself, he had a keen interest in alternative, cutting-edge science. The topic of our conversation eventually turned to electrogravitics, and at this point my friend shared an interesting story. He told me that during the late 1950s, his father had worked as a physicist at the Rocketdyne Aerospace Corporation in Southern California and had been involved in some sort of super-secret antigravity research. At that time, my friend had been just a young boy. He said his father normally told him nothing about what he did at work because of an oath of secrecy he had taken, but one evening, after returning home from work he had been unable to contain himself. Very exuberantly, he had exclaimed, "We got it to work, we got it to work!" When my friend inquired what it was that was made to work, his father drew him a picture showing a lens-shaped craft suspended in midair. He said, "We got it to lift off!" He would not say anything more about it, but that moment stuck in my friend's mind and now he shared it with me. I knew my friend well enough to know that what he told me was entirely genuine.

Rocketdyne was first formed in the post–World War II era as a rocket engine R&D company. For most of its history, it was associated with North American Aviation. It was spun off from North American

Aviation as a separate division in 1955. Then in 1984, it remerged with its former company, which by then was named North American Rockwell as a result of the merger in 1967 of North American Aviation and Rockwell International. North American's aerospace and defense business had, among other things, developed the Apollo spacecraft and the space shuttle. At the time of the merger in 1984, Rocketdyne was producing most of the rocket engines used in the United States, but it appears it was developing much more than conventional rockets for its aerospace propulsion business. As we will discover below, its scientists were working on a next-generation propulsion system, a technology that goes far beyond the conventional rocket. At the end of 1996, Rockwell sold off its Rocketdyne division, along with most of its space and defense business, to Boeing Integrated Defense Systems. Then in 2005, Rocketdyne was resold to Pratt and Whitney, a business unit of United Technologies Corporation.

I frequently thought about my friend's story about this Rocketdyne project. It implied that the United States successfully demonstrated a field propulsion vehicle by the late 1950s, a time when Townsend Brown was still trying to interest the Pentagon and aerospace companies in his own electrogravitics research. The 1956 "Electrogravitics Systems" report did mention that North American was studying electrogravitic propulsion but that the company had not yet openly declared that it was working in this exotic field. No mention was made of its Rocketdyne division, which indicates that, at that early date, a very tight lid was already in place on Rocketdyne's antigravity project.

Some years later, in the summer of 1994, another piece of the puzzle dropped into place. At the time, I was attending a Tesla science symposium in Colorado Springs, where I was an invited speaker. I had just finished delivering my lecture on NASA's apparent suppression of electrogravitics technologies (discussed in chapter 13) and was surrounded by a small group of people asking various follow-up questions when someone handed me a quickly scribbled note, which I had a chance to read only much later. The note read:

> Sir, I've worked with the Biefeld-Brown effect for a number of years. I may be of help to you on verifying the effect. I believe I know your

> mistake with the discs. I did correspond with T. Brown by mail and phone. Also associated with Project Winterhaven was a project with a slang name of "Sky Vaulting," a government funded project with North American Rockwell. If you are interested contact me.
>
> P.S. NASA data is shared with the Department of Defense. Your key is with the Air Force. They are many years ahead of civilian research. NASA is a PR or a front to obscure Air Force research.

For purposes of confidentiality, I have chosen to withhold this person's name and refer to him only as Tom. The story he later told me about the Skyvault project was quite astounding. He said that he first heard about it in the fall of 1974, when working for an engineering firm in Texas. His supervisor, with whom he had come to be very good friends, one day told him about a top-secret government project that he had worked on between 1952 and 1957 while at North American Aviation, a company that was later renamed North American Rockwell. The project had been initiated by the Defense Department through North American's Rocketdyne division. Although Tom's boss had already passed away, Tom did not wish to reveal his name, so to facilitate the discussion, we will call him Murray. Well, Tom had heard from Murray that the purpose of this project was to develop an antigravity vehicle that used microwave beams as its means for propulsion. It is uncertain whether Skyvault was the official name of the project, but at least this is what the scientists at Rocketdyne used to call it.

Although Project Skyvault was initiated by the government in the early 1950s, investigations into this exotic microwave propulsion technique actually dated back to the late 1940s. Murray, who held a Ph.D., said that in those earlier days he had worked on projects that were associated with an initial phase of this research and that later he had continued this work at Rocketdyne, where he worked up until the 1960s. This microwave antigravity propulsion research project was still in progress in 1974, because Tom learned that a close friend of Murray's was then still working on the project at North American Rockwell, presumably in its Rocketdyne division. At that time, the whole matter was still very secret, because there was a lot that his boss couldn't tell him about the project.

Later, in 1975, Tom obtained what he felt was additional confirmation for the existence of Project Skyvault when the military sent his Texas-based engineering firm a bid request for building a vehicle launch gantry in New Mexico. From the blatant description of the shape of the gantry and the way it was to be built, he recognized that this was to be a launcher for a microwave beam antigravity craft. In this particular version, the power was generated on the ground and sent up to the craft as a microwave beam. The beam was emitted from upward-pointing microwave horns that were supported by the launch gantry. The craft was made of a special kind of material that was repelled by microwaves and, hence, was to be buoyed upward by the beam (see figure 7.1). A portion of the beam was returned to the ground to modulate the outgoing microwave beam. The craft was to be able to go straight up and down and could deviate only a small amount to either side of vertical.

In 1996, two years after my conversation with Tom, CBS-TV aired a weekly spy thriller called *Mr. and Mrs. Smith,* which starred Scott Bakula, an actor who also has had leading roles in various science-fiction series such as *Quantum Leap* and *Star Trek*. Interestingly, the "Space Flight Episode," number nine in the series, which aired on November 8, 1996, came very close to portraying Tom's story about the propulsion beam craft and launch gantry his firm was asked to bid on. The plot of this particular episode was based on the testing of an experimental disc-shaped vehicle called a "beam rider." The launching took place from a secret desert location. The test vehicle was lofted on a powerful microwave beam that was directed vertically upward toward the craft from a ground-based parabolic mirror. Since much of the early Rocketdyne research on Project Skyvault was done in the Los Angeles area, it is not surprising that this idea would one day find itself worked into a Hollywood script. However, even though there were four more episodes left to run, to the disappointment of many, *Mr. and Mrs. Smith* was canceled immediately after this episode had aired. As we shall see, the notion of using microwave beams for aerospace propulsion is not science fiction.

The discussion about Project Skyvault that is presented here and in the next chapter is based on notes I made of my conversations with Tom and on some material Tom had sent me. The latter includes copies of

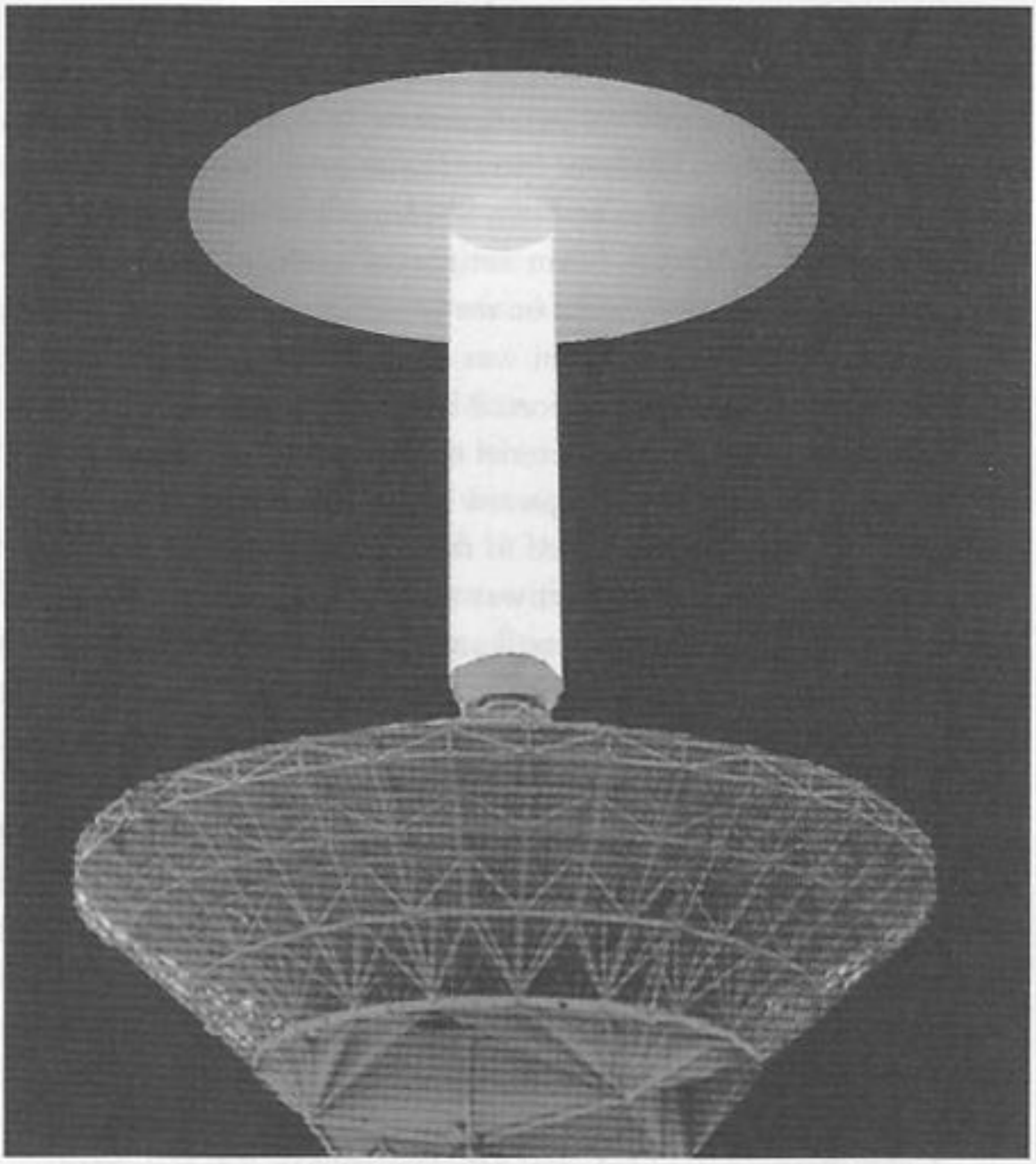

Figure 7.1. Artist's conception of a Skyvault-type craft being launched on a ground-based microwave beam. (P. LaViolette, © 2007)

notes that he made of his 1974 discussions with Murray and a copy of a letter written by Murray's friend who was at the time still working on Project Skyvault (see appendix E).

According to Murray, the first indication that microwaves could be used for propulsion came about when it was discovered that microwave beams could move objects if the objects happened to be made from the right kind of material. The scientists believed that the microwave beam was somehow inducing a gravitational force on the object. The idea that microwaves could move objects was believable to Tom since he had heard of something remotely similar from a radar engineer friend of his who worked at Homestead Air Force Base in Florida. His friend had witnessed an experiment in which a low-power microwave beam from a klystron tube was aimed at pencils placed on a table and caused them to move around. Tom theorized that the microwaves must induce electric charge gradients in certain materials having nonlinear electrical properties and that the observed movement was actually due to the Biefeld-Brown effect imparting a thrust to the material.

The group that Murray had worked with had experimented with a whole lot of different kinds of samples to find out which ones worked best. Paper, silk, and some kinds of wood, for example, showed no movement. Brick and concrete also exhibited no movement, being essentially transparent to the microwaves. They found that some materials would move quite violently, whereas others would just vaporize. Aluminum foil would move but would disintegrate upon exposure. They carried out extensive tests, subjecting various kinds of materials to microwave waveforms of varying shapes, and accumulated data on the destruction and burning of the materials and on the effect of shock waves on those materials that responded. They found that the best propulsion effect occurred in materials that had a particular *magnetic* property. Tom attempted to find out more specifically what these types of materials were, but was told that the information was classified.

Murray said that their group had found that the effects were very frequency-sensitive, that is, that they were observed only within certain frequency bands that were characteristic of each material. If the frequency was off by a slight amount, the object could suddenly vaporize. He described an experience they had in their lab one time when they were experimenting with various frequencies—they had turned on their microwave generator and it had produced a bluish microwave beam that blew a hole through their laboratory wall and continued through an adjoining outside embankment as well. The beam was going into another building before they managed to shut it off. He said it "scared the living daylights out of them."

7.4 ■ THE BEAM GENERATOR

According to Murray, during the early stages of their research, the Project Skyvault group used magnetron vacuum tubes to generate their microwave source beam. They worked with frequencies ranging from 7 gigahertz (7,000 megacycles) to upward of 1,000 gigahertz. By comparison, the magnetron tubes used in microwave ovens typically have frequencies of 2.54 gigahertz. The cavity magnetron has a central electron-emitting cathode surrounded by a positively charged copper plate, the anode (see figure 7.8). An axial magnetic field causes electrons emitted by the cathode to cycle in a circular orbit. They revolve at a frequency that depends on the applied voltage potential and the strength of the magnetic field. As they cycle, they induce microwave frequency oscillations in a series of cylindrical cavities spaced around the anode's inner circumference. Just as the length of an organ pipe tunes the pipe to a certain pitch, the diameter of these cavities can efficiently tune microwaves to a particular wavelength. These oscillations transfer to the cycling electron cloud and are then channeled out of the magnetron to form a microwave beam.

The microwave signal from the magnetron tubes used by the Skyvault group was sent into a wave amplifier cavity. This was essentially a metallic duct of rectangular cross-section whose long dimension

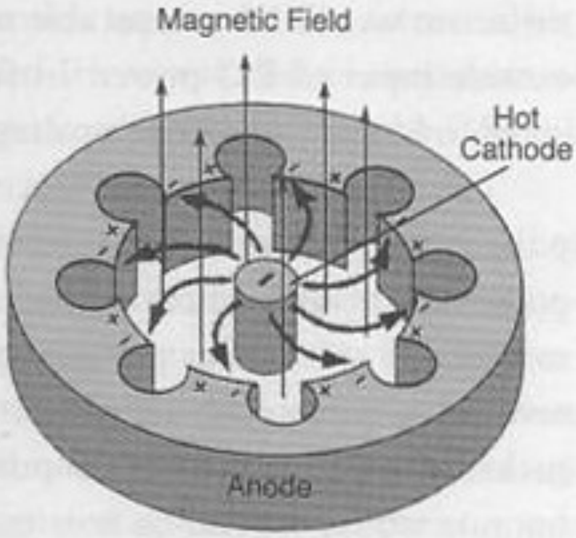

Figure 7.8. Cross-sectional view of a cavity magnetron.

was such as to fit a whole number of wavelengths of the microwave signal along its length. For example, if the magnetron emitted waves at a frequency of 100 gigahertz, the emitted wavelength would have been 3 millimeters. So if the cavity was made to have a length that was some multiple of 3 millimeters, then, as these waves reflected back and forth inside this cavity, they would develop a condition of resonance allowing them to build up a high-voltage amplitude.

By adding various types of microwave radar-absorbing materials to the resonator cavity, the inputted microwave signal could be changed from a sine wave into a sawtooth-shaped wave. For this, the Skyvault group may have used ceramic dielectrics such as barium titanate polarized with a high-voltage DC potential on the order of 10 kilovolts per centimeter. Once polarized, the high-K dielectric would have presented a highly nonlinear environment for the microwaves. The same wave transformation into a sawtooth shape would have occurred in Brown's AC-energized vertical-thrust apparatus described in chapter 3. The dielectric would have changed the shape of the input wave, causing it to have a more rapid rise of potential in the direction of the dielectric's polarization and a more gradual fall of potential during the other half of the cycle. The polarity of the sawtooth wave, whether it would rise sharply to a positive or to a negative potential, would depend on the polarity applied to the high-K dielectric. Microwave power from this amplifier would then have been conducted down a waveguide tube to a microwave horn, the horn's dimensions having been chosen so that its impedance would match that of the surrounding air to allow a microwave beam to efficiently radiate from the horn. Once polarized, the dielectric would have been able to retain its polarization without any outside input of DC power. In fact, the sawtooth waves would have acted to bias the dielectric's voltage potential.

The Skyvault team did not power their tubes continuously, but pulsed them about a thousand times per second using a mechanical pulser. This was a wheel in an evacuated chamber that spun at 60,000 to 100,000 revolutions per minute (1,000 to 2,000 hertz) and on each revolution actuated a set of platinum electrical contacts that briefly turned on high-voltage DC to power the magnetrons. The proper pulsing rate would depend on how much voltage and power one wished to extract from the tube. If the pulser was cycled at a faster rate or was in its on state for a longer fraction of the cycle period, more power would be radiated from the magnetron.

Murray said that they needed to make fine adjustments to the pulser's "square wave" signal envelope to get its pulse cycle amplitude and timing just right. In particular, the magnetron would have had to be turned on at just the right moment so that its waves would match the phase of the waves already reflecting back and forth in the microwave amplifier waveguide, thereby allowing its energy to properly add to the amplified signal. Magnetrons are very sensitive. If the pulse timing is wrong, the tube's energy potential can build up so high that the tube will burn out. Failure occurs when an arc jumps from the tube's cathode to its anode, burning off the cathode's electron-emitting thorium coating and rendering the tube useless.

Radar researchers later replaced this older mechanical pulser technology with thyrotron tubes, which were able to produce shock discharge pulses having a much sharper rise time. Thyrotrons had a fixed spark gap enclosed in sealed glass tube filled with hydrogen and used a third ignitor electrode to trigger the gap to discharge. These discharges would be much like Tesla's shock discharges, except that the magnetrons would convert these pulses into microwave frequency shocks. In *Secrets of Cold War Technology,* Vassilatos commented about the explosive forces that these radar bursts can produce, noting, "As these pulse methods were reaching their state of refinement, engineers found it possible to produce single DC impulses of extraordinary power. Components often ruptured when these explosive electrical applications were employed. Wires exploded. Gaskets and sealed electrodes ruptured. Magnetron tubes, high vacuum vessels, literally exploded. Here was that phenomenon of which Tesla spoke so highly."[18] The microwave bursts that the Skyvault engineers were experimenting with were most likely of this sort.

Murray said they were using the very best magnetron tubes they could find, which at that time were being used on military radar systems. To maximize the gravity wave propulsion effect, they had to operate these tubes well beyond their voltage specifications, powering them with up to 250 kilovolts. Murray did not say what the normal voltage range was for these special radar magnetrons, but for comparison, one unclassified research paper published in 1956 described the development of a 1.3-gigahertz magnetron that operated in the range of 50 to 75 kilovolts and delivered power outputs on the order of 10 megawatts during its ten-microsecond pulse period.[19] Magnetrons available in military black projects likely had achieved higher power outputs than this at a much earlier date.

In this "out-of-spec," high-voltage operating region, the tube's characteristics would have become highly nonlinear and prone to develop what is called the longitudinal sawtooth instability, which causes electrons circulating in the magnetron to begin to bunch up into clusters, transforming the tube's normal sine wave output into a series of sawtooth spikes. A similar effect has been reported to have been seen in the operation of the Synchrotron Ultraviolet Radiation Facility (SURF III).[20] When the sawtooth instability was present in SURF III, researchers observed bursts of coherent microwave radiation that were 10,000 times more intense than the normal synchrotron beam radiation and which consisted of sawtooth-shaped waves in the 10-gigahertz frequency range.

By operating the tubes beyond their specifications, the Skyvault team was apparently attempting to produce microwaves having a maximally abrupt rise time—hence, a very nonlinear negative potential onset curve. This in turn would have maximized the electrogravitic thrust that these waves were producing. As seen in our analysis of the gravity shocks produced by Podkletnov's gravity impulse beam, the subquantum kinetics electrogravitic relation indicates that such waveforms would have been repulsive.

Murray said that as a result of running the tubes beyond their specifications, the research team was blowing out magnetrons by the thousands. Members were willing to take this risk because they knew that this propulsion effect existed. Apparently, someone in the past fortuitously got the frequency and wave shape right and discovered the effect.

Initially, the equipment generating the Skyvault propulsion beam was quite bulky. The entire set up, which included high-voltage power generators, microwave generators, waveguide ducts, and wave-shaping resonators, required a building the size of a barn. Murray disclosed that in this early version, the conical test beam was projected upward and made to buoy a test vehicle that had a concave bottom wide enough to receive the beam. He disclosed that this concave portion was made from a ceramic similar to CorningWare.

Although CorningWare is optically opaque, it is partially transparent to microwaves. Thus, given the proper shape, it could be made to act as a microwave lens, which would look similar to an optical lens but would not necessarily be optically transparent. Such a lens could be made out of paraffin, ceramic, or glass. The important thing is that it be made of a material having the proper permittivity and permeability. So the Skyvault team could have used the craft's ceramic bottom as a lens to refract the microwaves that were being beamed up to it.

However, for a diverging microwave beam, one would expect that they would have used a converging lens to bring the waves to a focus inside the craft. One wonders whether this concave ceramic was actually a metamaterial that was engineered to have a negative index of refraction. One characteristic of left-handed (negative index) materials is that they have a concave shape in order to bring a microwave beam to a focus on the other side of the lens.

Although the beam generator for the Skyvault prototype craft was initially very bulky, with time the Skyvault team was able to make its equipment more compact. Murray said that eventually they got the apparatus small enough to put inside the craft. However, he didn't specify what kind of power supply was used. The craft were circular in shape and emitted a greenish blue microwave propulsion beam toward the earth. The beam was made to pass through an "iris type of convex lens" toward the ground, where it would reflect back up to buoy the craft upward. It is unclear what Murray meant by an "iris type of convex lens." An iris is a small opening at the end of a waveguide that allows microwaves to pass out.

Perhaps the microwaves were emitted through an iris at the end of the wave amplifier conduit and were then focused by a ceramic convex lens. The microwaves leaving the iris would have diverged and would have needed a convergent lens to refract them into a microwave beam. The diameter of the beam at the ground target region could have been adjusted by controlling the position of the lens relative to the iris.

This experimental version of the Skyvault craft, which was being developed in the 1960s, was apparently much more advanced than its forerunner, the version that Tom's engineering firm was asked to bid on in 1975. That is, by carrying its own onboard beam, it was far more mobile. Murray said that the craft was remotely controlled by signals relayed from a radio transmitter, probably situated on top of a mountain. The transmitter sent out encoded signals 6,400 times per second that controlled the craft's pitch, yaw, bank, and velocity. The vehicle had a range of nearly three hundred miles over the desert and could attain altitudes of 50,000 feet or more. Murray said that it could attain "extreme speeds." Initially, they did test flights of an unmanned craft. Later, they built and flew around a craft having a crew on board. Murray told Tom the vehicles he worked on had an estimated propulsion efficiency of 60 percent, and he imagined that by 1974 much higher propulsion efficiencies had been obtained. By comparison, a jet aircraft has a propulsion efficiency of only about 20 percent.

In the mid-1960s, after Murray had left the project, the Skyvault team began replacing their magnetrons with solid-state oscillators, called Gunn diodes, that were much more reliable. Murray had learned about this from a friend who had continued to work on the Skyvault project. Wanting to know more, Tom asked his boss if it would be possible for him to speak to Murray's friend. Murray contacted his friend, who told him that he would instead write Tom a letter, which he would send via Murray. The letter, which is written in a somewhat whimsical style, is reproduced in appendix E.