



ST. ANTHONY'S SCHOOL
FOR BOYS

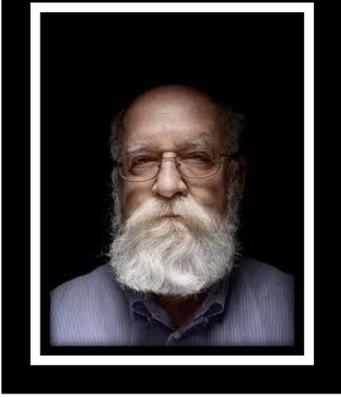
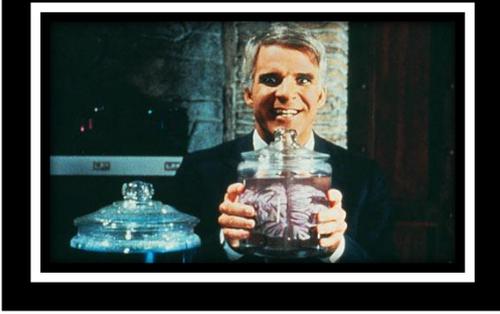
Paul's Puzzles

Learning Enrichment

General Paper

&

Scholarship

<p>Where am I?</p> <p>Daniel Dennett</p>		
<p>Laying on our backs and Looking up at the stars.</p> <p>Garrison Keillor</p>		
<p>On being the right Size.</p> <p>J S B Haldane</p>		
<p>On the death of a Moth</p> <p>Virginia Woolf</p>		

Learning Enrichment

These Four Essays will be used as possible stimulus material for those candidates who are likely to encounter General Papers or who are considering Scholarship applications to schools such as *Eton College, Westminster, Winchester, Habs, Sevenoaks, St. Paul's* etc. They are all worth reading in their own right, but are definitely challenging. I have used extracts from them over several years, either in interviews or when testing 11+ and 13 + scholarship candidates at Senior schools such as KCS, Dulwich and Winchester. Some pupils in the present years 6-8 read the Dennett article with me in my chats and in some mock scholarship sessions: our present Year 5 will be familiar with the issues raised by the Dennett short story from their philosophy classes. The heavily highlighted text in bold red/yellow is not necessary for understanding the gist and wit of the short story, and they can all look up the word physicalist, since it is possibly the most widely believed view and, coincidentally, the least imaginative or plausible to any one with half a brain or the imagination to reflect on what thinking is actually like.

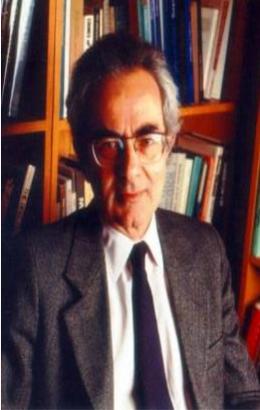
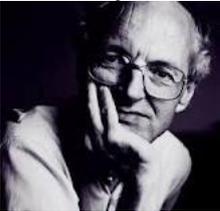
I leave it to your discretion whether you print these off and it would not be economical yet to print them for each year group. I suggest again downloading to your home computer and your son's, if he is in the Senior House.

They are all fascinating pieces of writing. Many of you with a science background will know the J S B Haldane article; the Virginia Woolf essay is rightly famous. The Garrison Keillor essay became much loved after being read, by him, on the BBC. Dennett's short story, '*Where am I*', is probably now (justly) the most famous well known *popular* piece of late twentieth century philosophy writing, alongside the seminal essay by Thomas Nagel, '*What is it like to be a bat*' and John Searle's '*Chinese Room*' essay.

Paul's Puzzles

A good number of parents, not trained in philosophy, have asked if I could recommend some reading **for them**, linked to my puzzles. *Assuming that you were not being ironic*, I would start with these four essays themselves! They are not the cause of any of my Friday puzzles, but each is clearly linked to them in obvious ways. In terms of good general introductions to philosophy and ethics, these in the table below are all *jargon-free* and thus readable by normal and sane human beings! They also demonstrate my own prejudices! Some helpful websites:

http://www.philosophy-foundation.org/	The school's visiting philosophy teachers' site;
http://www.royalinstitutephilosophy.org/	Royal Institute of Philosophy;
http://www.microphilosophy.net/	Julian Bagginni's site;
http://plato.stanford.edu/	Excellent online Encyclopaedia.

Title	Theme	Author	
<p><i>What does it all mean?</i></p> <p><i>A very short introduction to philosophy.</i></p>	<p>Brilliant modern introduction; now a classic like Bertrand Russell's, <i>Problems of Philosophy</i>.</p>	<p>Thomas Nagel</p> 	<p>Professor of Philosophy and Law at New York University.</p> <p>One of my reading heroes! He actually writes to be understood!</p>
<p><i>Mortal Questions</i></p>	<p>Famous selection of his essays on everything from a bat's consciousness, to the nature of the absurd.</p>		
<p><i>The View from Nowhere</i></p>	<p>Fascinating discussion of the mystery of the mind and how we may grapple with the mind-body problem.</p>		
<p><i>Think</i></p>	<p>Fine introduction to philosophy.</p>	<p>Simon Blackburn</p> 	<p>Recently retired, Professor of Philosophy at Cambridge.</p>
<p><i>Being Good</i></p>	<p>Fine introduction to ethical reflection.</p>		
<p><i>The Pig that wants to be eaten.</i></p>	<p>Playful and funny reflections by a really generous and un-pompous philosopher journalist.</p>	<p>Julian Baggini</p> 	<p>Baggini is great fun and great populariser of philosophy. See his blog!</p>
<p><i>The Human Touch</i></p>	<p>Beautiful extended discussion of the human quest for understanding and man's making of meaning.</p>	<p>Michael Frayn</p> 	<p>These two brilliant novelists have also produced excellent and accessible philosophical books. Simon Blackburn reviewed the Frayn book as one better than most professionals can produce, yet so readable and jargon free!</p>
<p><i>The Absence of Mind</i></p>	<p>Superb lectures on human consciousness.</p>	<p>Marilynne Robinson</p> 	<p>(If you have not read <i>Gilead</i> and <i>Home</i>, your life is incomplete!)</p>

Where Am I?**Daniel C. Dennett**

Now that I've won my suit under the Freedom of Information Act, I am at liberty to reveal for the first time a curious episode in my life that may be of interest not only to those engaged in research in the philosophy of mind, artificial intelligence, and neuroscience but also to the general public.

Several years ago I was approached by Pentagon officials who asked me to volunteer for a highly dangerous and secret mission. In collaboration with NASA and Howard Hughes, the Department of Defense was spending billions to develop a Supersonic Tunneling Underground Device, or STUD. It was supposed to tunnel through the earth's core at great speed and deliver a specially designed atomic warhead "right up the Red's missile silos," as one of the Pentagon brass put it.

The problem was that in an early test they had succeeded in lodging a warhead about a mile deep under Tulsa, Oklahoma, and they wanted me to retrieve it for them. "Why me?" I asked. Well, the mission involved some pioneering applications of current brain research, and they had heard of my interest in brains and of course my Faustian curiosity and great courage and so forth Well, how could I refuse? The difficulty that brought the Pentagon to my door was that the device I'd been asked to recover was fiercely radioactive, in a new way. According to monitoring instruments, something about the nature of the device and its complex interactions with pockets of material deep in the earth had produced radiation that could cause severe abnormalities in certain tissues of the brain. No way had been found to shield the brain from these deadly rays, which were apparently harmless to other tissues and organs of the body. So it had been decided that the person sent to recover the device should leave his brain behind. It would be kept in a safe place as there it could execute its normal control functions by elaborate radio links. Would I submit to a surgical procedure that would completely remove my brain, which would then be placed in a life-support system at the Manned Spacecraft Centre in Houston? Each input and output pathway, as it was severed, would be restored by a pair of microminiaturized radio transceivers, one attached precisely to the brain, the other to the nerve stumps in the empty cranium. No information would be lost, all the connectivity would be preserved. At first I was a bit reluctant. Would it really work? The Houston brain surgeons encouraged me. "Think of it," they said, "as a mere stretching of the nerves. If your brain were just moved over an inch in your skull, that would not alter or impair your mind. We're simply going to make the nerves indefinitely elastic by splicing radio links into them."

I was shown around the life-support lab in Houston and saw the sparkling new vat in which my brain would be placed, were I to agree. I met the large and brilliant support team of neurologists, haematologists, biophysicists, and electrical engineers, and after

several days of discussions and demonstrations I agreed to give it a try. I was subjected to an enormous array of blood tests, brain scans, experiments, interviews, and the like. They took down my autobiography at great length, recorded tedious lists of my beliefs, hopes, fears, and tastes. They even listed my favourite stereo recordings and gave me a crash session of psychoanalysis.

The day for surgery arrived at last and of course I was anesthetized and remember nothing of the operation itself. When I came out of anaesthesia, I opened my eyes, looked around, and asked the inevitable, the traditional, the lamentably hackneyed postoperative question: "Where am I?" The nurse smiled down at me. "You're in Houston," she said, and I reflected that this still had a good chance of being the truth one way or another. She handed me a mirror. Sure enough, there were the tiny antennae poling up through their titanium ports cemented into my skull.

"I gather the operation was a success," I said. "I want to go see my brain." They led me (I was a bit dizzy and unsteady) down a long corridor and into the life-support lab. A cheer went up from the assembled support team, and I responded with what I hoped was a jaunty salute. Still feeling lightheaded, I was helped over to the life-support vat. I peered through the glass. There, floating in what looked like ginger ale, was undeniably a human brain, though it was almost covered with printed circuit chips, plastic tubules, electrodes, and other paraphernalia. "Is that mine?" I asked. "Hit the output transmitter switch there on the side of the vat and see for yourself," the project director replied. I moved the switch to OFF, and immediately slumped, groggy and nauseated, into the arms of the technicians, one of whom kindly restored the switch to its ON position. While I recovered my equilibrium and composure, I thought to myself: "Well, here I am sitting on a folding chair, staring through a piece of plate glass at my own brain . . . But wait," I said to myself, "shouldn't I have thought, 'Here I am, suspended in a bubbling fluid, being stared at by my own eyes'?" I tried to think this latter thought. I tried to project it into the tank, offering it hopefully to my brain, but I failed to carry off the exercise with any conviction. I tried again. "Here am I, Daniel Dennett, suspended in a bubbling fluid, being stared at by my own eyes." No, it just didn't work. Most puzzling and confusing. Being a philosopher of firm physicalist conviction, I believed unswervingly that the tokening of my thoughts was occurring somewhere in my brain: yet, when I thought "Here I am," where the thought occurred to me was here, outside the vat, where I, Dennett, was standing staring at my brain.

I tried and tried to think myself into the vat, but to no avail. I tried to build up to the task by doing mental exercises. I thought to myself, "The sun is shining over there," five times in rapid succession, each time mentally ostending a different place: in order, the sunlit corner of the lab, the visible front lawn of the hospital, Houston, Mars, and Jupiter. I found I had little difficulty in getting my "there"s to hop all over the celestial map with their proper references. I could loft a "there" in an instant through the farthest reaches of space, and then aim the next "there" with pinpoint accuracy at the upper left quadrant of a freckle on my arm. Why was I having such trouble with "here"? "Here in Houston" worked well enough, and so did "here in the lab," and even "here in

this part of the lab,” but “here in the vat” always seemed merely an unmeant mental mouthing. I tried closing my eyes while thinking it. This seemed to help, but still I couldn't manage to pull it off, except perhaps for a fleeting instant. I couldn't be sure. The discovery that I couldn't be sure was also unsettling. How did I know where I meant by “here” when I thought “here”? Could I think I meant one place when in fact I meant another? I didn't see how that could be admitted without untying the few bonds of intimacy between a person and his own mental life that had survived the onslaught of the brain scientists and philosophers, the physicalists and behaviourists. Perhaps I was incorrigible about where I meant when I said “here.” But in my present circumstances it seemed that either I was doomed by sheer force of mental habit to thinking systematically false indexical thoughts, or where a person is (and hence where his thoughts are tokened for purposes of semantic analysis) is not necessarily where his brain, the physical seat of his soul, resides. Nagged by confusion, I attempted to orient myself by falling back on a favourite philosopher's ploy. I began naming things.

“Yorick,” I said aloud to my brain, “you are my brain. The rest of my body, seated in this chair, I dub ‘Hamlet.’” So here we all are: Yorick's my brain, Hamlet's my body, and I am Dennett. Now, where am I? And when I think “where am I?”, where's that thought tokened? Is it tokened in my brain, lounging about in the vat, or right here between my ears where it seems to be tokened? Or nowhere? Its temporal coordinates give me no trouble; must it not have spatial coordinates as well? I began making a list of the alternatives.

1. Where Hamlet goes there goes Dennett. This principle was easily refuted by appeal to the familiar brain-transplant thought experiments so enjoyed by philosophers. If Tom and Dick switch brains, Tom is the fellow with Dick's former body — just ask him; he'll claim to be Tom and tell you the most intimate details of Tom's autobiography. It was clear enough, then, that my current body and I could part company, but not likely that I could be separated from my brain. The rule of thumb that emerged so plainly from the thought experiments was that in a brain-transplant operation, one wanted to be the donor not the recipient. Better to call such an operation a body transplant, in fact. So perhaps the truth was,

2. Where Yorick goes there goes Dennett. This was not at all appealing, however. How could I be in the vat and not about to go anywhere, when I was so obviously outside the vat looking in and beginning to make guilty plans to return to my room for a substantial lunch? This begged the question I realized, but it still seemed to be getting at something important. Casting about for some support for my intuition, I hit upon a legalistic sort of argument that might have appealed to Locke.

Suppose, I argued to myself, I were now to fly to California, rob a bank, and be apprehended. In which state would I be tried: in California, where the robbery took place, or in Texas, where the brains of the outfit were located? Would I be a California felon with an out-of-state brain, or a Texas felon remotely controlling an accomplice of

sorts in California? It seemed possible that I might beat such a rap just on the undecidability of that jurisdictional question, though perhaps it would be deemed an interstate, and hence Federal, offense. In any event, suppose I were convicted. Was it likely that California would be satisfied to throw Hamlet into the brig, knowing that Yorick was living the good life and luxuriously taking the waters in Texas? Would Texas incarcerate Yorick, leaving Hamlet free to take the next boat to Rio? This alternative appealed to me. Barring capital punishment or other cruel and unusual punishment, the state would be obliged to maintain the life-support system for Yorick though they might move him from Houston to Leavenworth, and aside from the unpleasantness of the opprobrium, I, for one, would not mind at all and would consider myself a free man under those circumstances. If the state has an interest in forcibly relocating persons in institutions, it would fail to relocate me in any institution by locating Yorick there. If this were true, it suggested a third alternative.

3. Dennett is wherever he thinks he is. Generalized, the claim was as follows: At any given time a person has a point of view and the location of the point of view (which is determined internally by the content of the point of view) is also the location of the person.

Such a proposition is not without its perplexities, but to me it seemed a step in the right direction. The only trouble was that it seemed to place one in a heads-I-win/tails-you-lose situation of unlikely infallibility as regards location. Hadn't I myself often been wrong about where I was, and at least as often uncertain? Couldn't one get lost? Of course, but getting lost geographically is not the only way one might get lost. If one were lost in the woods one could attempt to reassure oneself with the consolation that at least one knew where one was: one was right here in the familiar surroundings of one's own body. Perhaps in this case one would not have drawn one's attention to much to be thankful for. Still, there were worse plights imaginable, and I wasn't sure I wasn't in such a plight right now.

Point of view clearly had something to do with personal location, but it was itself an unclear notion. It was obvious that the content of one's point of view was not the same as or determined by the content of one's beliefs or thoughts. For example, what should we say about the point of view of the Cinerama viewer who shrieks and twists in his seat as the roller-coaster footage overcomes his psychic distancing? Has he forgotten that he is safely seated in the theatre? Here I was inclined to say that the person is experiencing an illusory shift in point of view. In other cases, my inclination to call such shifts illusory was less strong. The workers in laboratories and plants who handle dangerous materials by operating feedback-controlled mechanical arms and hands undergo a shift in point of view that is crisper and more pronounced than anything Cinerama can provoke. They can feel the heft and slipperiness of the containers they manipulate with their metal fingers. They know perfectly well where they are and are not fooled into false beliefs by the experience, yet it is as if they were inside the isolation chamber they are peering into. With mental effort, they can manage to shift their point of view back and forth, rather like making a transparent Necker cube or an

Escher drawing change orientation before one's eyes. It does seem extravagant to suppose that in performing this bit of mental gymnastics, they are transporting themselves back and forth.

Still their example gave me hope. If I was in fact in the vat in spite of my intuitions, I might be able to train myself to adopt that point of view even as a matter of habit. I should dwell on images of myself comfortably floating in my vat, beaming volitions to that familiar body out there. I reflected that the ease or difficulty of this task was presumably independent of the truth about the location of one's brain. Had I been practicing before the operation, I might now be finding it second nature. You might now yourself try such a *trompe l'oeil*. Imagine you have written an inflammatory letter which has been published in the Times, the result of which is that the government has chosen to impound your brain for a probationary period of three years in its Dangerous Brain Clinic in Bethesda, Maryland. Your body of course is allowed freedom to earn a salary and thus to continue its function of laying up income to be taxed. At this moment, however, your body is seated in an auditorium listening to a peculiar account by Daniel Dennett of his own similar experience. Try it. Think yourself to Bethesda, and then hark back longingly to your body, far away, and yet seeming so near. It is only with long-distance restraint (yours? the government's?) that you can control your impulse to get those hands clapping in polite applause before navigating the old body to the rest room and a well-deserved glass of evening sherry in the lounge. The task of imagination is certainly difficult, but if you achieve your goal the results might be consoling.

Anyway, there I was in Houston, lost in thought as one might say, but not for long. My speculations were soon interrupted by the Houston doctors, who wished to test out my new prosthetic nervous system before sending me off on my hazardous mission. As I mentioned before, I was a bit dizzy at first, and not surprisingly, although I soon habituated myself to my new circumstances (which were, after all, well nigh indistinguishable from my old circumstances). My accommodation was not perfect, however, and to this day I continue to be plagued by minor coordination difficulties. The speed of light is fast, but finite, and as my brain and body move farther and farther apart, the delicate interaction of my feedback systems is thrown into disarray by the time lags. Just as one is rendered close to speechless by a delayed or echoic hearing of one's speaking voice so, for instance, I am virtually unable to track a moving object with my eyes whenever my brain and my body are more than a few miles apart. In most matters my impairment is scarcely detectable, though I can no longer hit a slow curve ball with the authority of yore. There are some compensations of course. Though liquor tastes as good as ever, and warms my gullet while corroding my liver, I can drink it in any quantity I please, without becoming the slightest bit inebriated, a curiosity some of my close friends may have noticed (though I occasionally have feigned inebriation, so as not to draw attention to my unusual circumstances). For similar reasons, I take aspirin orally for a sprained wrist, but if the pain persists I ask

Houston to administer codeine to me in vitro. In times of illness the phone bill can be staggering.

But to return to my adventure. At length, both the doctors and I were satisfied that I was ready to undertake my subterranean mission. And so I left my brain in Houston and headed by helicopter for Tulsa. Well, in any case, that's the way it seemed to me. That's how I would put it, just off the top of my head as it were. On the trip I reflected further about my earlier anxieties and decided that my first postoperative speculations had been tinged with panic. The matter was not nearly as strange or metaphysical as I had been supposing. Where was I? In two places, clearly: both inside the vat and outside it. Just as one can stand with one foot in Connecticut and the other in Rhode Island, I was in two places at once. I had become one of those scattered individuals we used to hear so much about. The more I considered this answer, the more obviously true it appeared. But, strange to say, the more true it appeared, the less important the question to which it could be the true answer seemed. A sad, but not unprecedented, fate for a philosophical question to suffer. This answer did not completely satisfy me, of course. There lingered some question to which I should have liked an answer, which was neither "Where are all my various and sundry parts?" nor "What is my current point of view?" Or at least there seemed to be such a question. For it did seem undeniable that in some sense I and not merely most of me was descending into the earth under Tulsa in search of an atomic warhead.

When I found the warhead, I was certainly glad I had left my brain behind, for the pointer on the specially built Geiger counter I had brought with me was off the dial. I called Houston on my ordinary radio and told the operation control centre of my position and my progress. In return, they gave me instructions for dismantling the vehicle, based upon my on-site observations. I had set to work with my cutting torch when all of a sudden a terrible thing happened. I went stone deaf. At first I thought it was only my radio earphones that had broken, but when I tapped on my helmet, I heard nothing. Apparently the auditory transceivers had gone on the fritz. I could no longer hear Houston or my own voice, but I could speak, so I started telling them what had happened. In midsentence, I knew something else had gone wrong. My vocal apparatus had become paralyzed. Then my right hand went limp — another transceiver had gone. I was truly in deep trouble. But worse was to follow. After a few more minutes, I went blind. I cursed my luck, and then I cursed the scientists who had led me into this grave peril. There I was, deaf, dumb, and blind, in a radioactive hole more than a mile under Tulsa. Then the last of my cerebral radio links broke, and suddenly I was faced with a new and even more shocking problem: whereas an instant before I had been buried alive in Oklahoma, now I was disembodied in Houston. My recognition of my new status was not immediate. It took me several very anxious minutes before it dawned on me that my poor body lay several hundred miles away, with heart pulsing and lungs respirating, but otherwise as dead as the body of any heart-transplant donor, its skull packed with useless, broken electronic gear. The shift in perspective I had earlier found well nigh impossible now seemed quite natural.

Though I could think myself back into my body in the tunnel under Tulsa, it took some effort to sustain the illusion. For surely it was an illusion to suppose I was still in Oklahoma: I had lost all contact with that body.

It occurred to me then, with one of those rushes of revelation of which we should be suspicious, that I had stumbled upon an impressive demonstration of the immateriality of the soul based upon physicalist principles and premises. For as the last radio signal between Tulsa and Houston died away, had I not changed location from Tulsa to Houston at the speed of light? And had I not accomplished this without any increase in mass? What moved from A to B at such speed was surely myself, or at any rate my soul or mind — the massless centre of my being and home of my consciousness. My point of view had lagged somewhat behind, but I had already noted the indirect bearing of point of view on personal location. I could not see how a physicalist philosopher could quarrel with this except by taking the dire and counterintuitive route of banishing all talk of persons. Yet the notion of personhood was so well entrenched in everyone's world view, or so it seemed to me, that any denial would be as curiously unconvincing, as systematically disingenuous, as the Cartesian negation, "non sum."

The joy of philosophic discovery thus tided me over some very bad minutes or perhaps hours as the helplessness and hopelessness of my situation became more apparent to me. Waves of panic and even nausea swept over me, made all the more horrible by the absence of their normal body-dependent phenomenology. No adrenaline rush of tingles in the arms, no pounding heart, no premonitory salivation. I did feel a dread sinking feeling in my bowels at one point, and this tricked me momentarily into the false hope that I was undergoing a reversal of the process that landed me in this fix — a gradual undisembodiment. But the isolation and uniqueness of that twinge soon convinced me that it was simply the first of a plague of phantom body hallucinations that I, like any other amputee, would be all too likely to suffer.

My mood then was chaotic. On the one hand, I was fired up with elation of my philosophic discovery and was wracking my brain (one of the few familiar things I could still do), trying to figure out how to communicate my discovery to the journals; while on the other, I was bitter, lonely, and filled with dread and uncertainty. Fortunately, this did not last long, for my technical support team sedated me into a dreamless sleep from which I awoke, hearing with magnificent fidelity the familiar opening strains of my favorite Brahms piano trio. So that was why they had wanted a list of my favourite recordings! It did not take me long to realize that I was hearing the music without ears. The output from the stereo stylus was being fed through some fancy rectification circuitry directly into my auditory nerve. I was mainlining Brahms, an unforgettable experience for any stereo buff. At the end of the record it did not surprise me to hear the reassuring voice of the project director speaking into a microphone that was now my prosthetic ear. He confirmed my analysis of what had gone wrong and assured me that steps were being taken to re-embodiment me. He did not elaborate, and after a few more recordings, I found myself drifting off to sleep. My sleep lasted, I later learned, for the better part of a year, and when I awoke, it was to find myself fully

restored to my senses. When I looked into the mirror, though, I was a bit startled to see an unfamiliar face. Bearded and a bit heavier, bearing no doubt a family resemblance to my former face, and with the same look of spritely intelligence and resolute character, but definitely a new face. Further self-explorations of an intimate nature left me no doubt that this was a new body, and the project director confirmed my conclusions. He did not volunteer any information on the past history of my new body and I decided (wisely, I think in retrospect) not to pry. As many philosophers unfamiliar with my ordeal have more recently speculated, the acquisition of a new body leaves one's person intact. And after a period of adjustment to a new voice, new muscular strengths and weaknesses, and so forth, one's personality is by and large also preserved. More dramatic changes in personality have been routinely observed in people who have undergone extensive plastic surgery, to say nothing of sex-change operations, and I think no one contests the survival of the person in such cases. In any event I soon accommodated to my new body, to the point of being unable to recover any of its novelties to my consciousness or even memory. The view in the mirror soon became utterly familiar. That view, by the way, still revealed antennae, and so I was not surprised to learn that my brain had not been moved from its haven in the life-support lab.

I decided that good old Yorick deserved a visit. I and my new body, whom we might as well call Fortinbras, strode into the familiar lab to another round of applause from the technicians, who were of course congratulating themselves, not me. Once more I stood before the vat and contemplated poor Yorick, and on a whim I once again cavalierly flicked off the output transmitter switch. Imagine my surprise when nothing unusual happened. No fainting spell, no nausea, no noticeable change. A technician hurried to restore the switch to ON, but still I felt nothing. I demanded an explanation, which the project director hastened to provide. It seems that before they had even operated on the first occasion, they had constructed a computer duplicate of my brain, reproducing both the complete information-processing structure and the computational speed of my brain in a giant computer program. After the operation, but before they had dared to send me off on my mission to Oklahoma, they had run this computer system and Yorick side by side. The incoming signals from Hamlet were sent simultaneously to Yorick's transceivers and to the computer's array of inputs. And the outputs from Yorick were not only beamed back to Hamlet, my body; they were recorded and checked against the simultaneous output of the computer program, which was called "Hubert" for reasons obscure to me. Over days and even weeks, the outputs were identical and synchronous, which of course did not prove that they had succeeded in copying the brain's functional structure, but the empirical support was greatly encouraging.

Hubert's input, and hence activity, had been kept parallel with Yorick's during my disembodied days. And now, to demonstrate this, they had actually thrown the master switch that put Hubert for the first time in on-line control of my body — not Hamlet, of course, but Fortinbras. (Hamlet, I learned, had never been recovered from its

underground tomb and could be assumed by this time to have largely returned to the dust. At the head of my grave still lay the magnificent bulk of the abandoned device, with the word STUD emblazoned on its side in large letters — a circumstance which may provide archeologists of the next century with a curious insight into the burial rites of their ancestors.)

The laboratory technicians now showed me the master switch, which had two positions, labeled B, for Brain (they didn't know my brain's name was Yorick) and H, for Hubert. The switch did indeed point to H, and they explained to me that if I wished, I could switch it back to B. With my heart in my mouth (and my brain in its vat), I did this. Nothing happened. A click, that was all. To test their claim, and with the master switch now set at B. I hit Yorick's output transmitter switch on the vat and sure enough, I began to faint. Once the output switch was turned back on and I had recovered my wits, so to speak, I continued to play with the master switch, flipping it back and forth. I found that with the exception of the transitional click, I could detect no trace of a difference. I could switch in mid-utterance, and the sentence I had begun speaking under the control of Yorick was finished without a pause or hitch of any kind under the control of Hubert. I had a spare brain, a prosthetic device which might someday stand me in very good stead, were some mishap to befall Yorick. Or alternatively, I could keep Yorick as a spare and use Hubert. It didn't seem to make any difference which I chose, for the wear and tear and fatigue on my body did not have any debilitating effect on either brain, whether or not it was actually causing the motions of my body, or merely spilling its output into thin air.

The one truly unsettling aspect of this new development was the prospect, which was not long in dawning on me, of someone detaching the spare — Hubert or Yorick, as the case might be — from Fortinbras and hitching it to yet another body — some Johnny-come-lately Rosencrantz or Guildenstern. Then (if not before) there would be two people, that much was clear. One would be me, and the other would be a sort of super-twin brother. If there were two bodies, one under the control of Hubert and the other being controlled by Yorick, then which would the world recognize as the true Dennett? And whatever the rest of the world decided, which one would be me? Would I be the Yorick-brained one, in virtue of Yorick's causal priority and former intimate relationship with the original Dennett body, Hamlet? That seemed a bit legalistic, a bit too redolent of the arbitrariness of consanguinity and legal possession, to be convincing at the metaphysical level. For suppose that before the arrival of the second body on the scene, I had been keeping Yorick as the spare for years, and letting Hubert's output drive my body — that is, Fortinbras — all that time. The Hubert-Fortinbras couple would seem then by squatter's rights (to combat one legal intuition with another) to be the true Dennett and the lawful inheritor of everything that was Dennett's. This was an interesting question, certainly, but not nearly so pressing as another question that bothered me. My strongest intuition was that in such an eventuality I would survive so long as either brain-body couple remained intact, but I had mixed emotions about whether I should want both to survive.

I discussed my worries with the technicians and the project director. The prospect of two Dennetts was abhorrent to me, I explained, largely for social reasons. I didn't want to be my own rival for the affections of my wife, nor did I like the prospect of the two Dennetts sharing my modest professor's salary. Still more vertiginous and distasteful, though, was the idea of knowing that much about another person, while he had the very same goods on me. How could we ever face each other? My colleagues in the lab argued that I was ignoring the bright side of the matter. Weren't there many things I wanted to do but, being only one person, had been unable to do? Now one Dennett could stay at home and be the professor and family man while the other could strike out on a life of travel and adventure — missing the family of course, but happy in the knowledge that the other Dennett was keeping the home fires burning. I could be faithful and adulterous at the same time. I could even cuckold myself — to say nothing of other more lurid possibilities my colleagues were all too ready to force upon my overtaxed imagination. But my ordeal in Oklahoma (or was it Houston?) had made me less adventurous, and I shrank from this opportunity that was being offered (though of course I was never quite sure it was being offered to me in the first place).

There was another prospect even more disagreeable: that the spare, Hubert or Yorick as the case might be, would be detached from any input from Fortinbras and just left detached. Then, as in the other case, there would be two Dennetts, or at least two claimants to my name and possessions, one embodied in Fortinbras, and the other sadly, miserably disembodied. Both selfishness and altruism bade me take steps to prevent this from happening. So I asked that measures be taken to ensure that no one could ever tamper with the transceiver connections or the master switch without my (our? no, my) knowledge and consent. Since I had no desire to spend my life guarding the equipment in Houston, it was mutually decided that all the electronic connections in the lab would be carefully locked. Both those that controlled the life-support system for Yorick and those that controlled the power supply for Hubert would be guarded with fail-safe devices, and I would take the only master switch, outfitted for radio remote control, with me wherever I went. I carry it strapped around my waist and — wait a moment — here it is. Every few months I reconnoitre the situation by switching channels. I do this only in the presence of friends, of course, for if the other channel were, heaven forbid, either dead or otherwise occupied, there would have to be somebody who had my interests at heart to switch it back, to bring me back from the void. For while I could feel, see, hear, and otherwise sense whatever befell my body, subsequent to such a switch, I'd be unable to control it. By the way, the two positions on the switch are intentionally unmarked, so I never have the faintest idea whether I am switching from Hubert to Yorick or vice versa. (Some of you may think that in this case I really don't know who I am, let alone where I am. But such reflections no longer make much of a dent on my essential Dennettness, on my own sense of who I am. If it is true that in one sense I don't know who I am then that's another one of your philosophical truths of underwhelming significance.)

In any case, every time I've flipped the switch so far, nothing has happened. So let's give it a try

“THANK GOD! I THOUGHT YOU'D NEVER FLIP THAT SWITCH! You can't imagine how horrible it's been these last two weeks — but now you know; it's your turn in purgatory. How I've longed for this moment! You see, about two weeks ago — excuse me, ladies and gentlemen, but I've got to explain this to my . . . um, brother, I guess you could say, but he's just told you the facts, so you'll understand — about two weeks ago our two brains drifted just a bit out of synch. I don't know whether my brain is now Hubert or Yorick, any more than you do, but in any case, the two brains drifted apart, and of course once the process started, it snowballed, for I was in a slightly different receptive state for the input we both received, a difference that was soon magnified. In no time at all the illusion that I was in control of my body — our body — was completely dissipated. There was nothing I could do — no way to call you. YOU DIDN'T EVEN KNOW I EXISTED! It's been like being carried around in a cage, or better, like being possessed — hearing my own voice say things I didn't mean to say, watching in frustration as my own hands performed deeds I hadn't intended. You'd scratch our itches, but not the way I would have, and you kept me awake, with your tossing and turning. I've been totally exhausted, on the verge of a nervous breakdown, carried around helplessly by your frantic round of activities, sustained only by the knowledge that some day you'd throw the switch.

“Now it's your turn, but at least you'll have the comfort of knowing I know you're in there. Like an expectant mother, I'm eating — or at any rate tasting, smelling, seeing — for two now, and I'll try to make it easy for you. Don't worry. Just as soon as this colloquium is over, you and I will fly to Houston, and we'll see what can be done to get one of us another body. You can have a female body — your body could be any colour you like. But let's think it over. I tell you what — to be fair, if we both want this body, I promise I'll let the project director flip a coin to settle which of us gets to keep it and which then gets to choose a new body. That should guarantee justice, shouldn't it? In any case, I'll take care of you, I promise. These people are my witnesses.

“Ladies and gentlemen, this talk we have just heard is not exactly the talk I would have given, but I assure you that everything he said was perfectly true. And now if you'll excuse me, I think I'd — we'd — better sit down.”

(From *Brainstorms: Philosophical Essays on Mind and Psychology*, Daniel C. Dennett.)

Lying on our backs, looking up at the stars**Garrison Keillor**

We caught and talked, and we took a swim now and then to keep off sleepiness. It was kind of solemn, drifting down the big still river, laying on our backs looking up at the stars, and we didn't ever feel like talking loud, and it warn't often that we laughed, only a little kind of low chuckle. We had mighty good weather, as a general thing, and nothing ever happened to us at all, that night, nor the next, nor the next.

—MARK TWAIN, "The Adventures of Huckleberry Finn"

It always made me proud as a kid to think that my great-great-great-great-great-grandfather Elder John Crandall, who left England in 1634 and settled in Rhode Island on land he bought from the Misquamicut Indians, was a considerable man in Colonial history, who, according to family history, accompanied Roger Williams to London in 1663 to obtain a charter from King Charles II guaranteeing the inhabitants of Rhode Island Colony political and religious freedom, and I felt his lustre reflected on us, his descendants in the little white house on a hot July day in the potato fields along the Mississippi north of Minneapolis. Our family didn't have any money, and none of us had been to college, so he was our main claim to fame. He didn't come over on the Mayflower, but he knew people who did. If he only had bought up more land in the right places, he'd have been richer than Vanderbilt and we'd all be sitting in Newport sipping lemonade on a cool veranda instead of hoeing rows of potatoes in the sun and getting dust in our mouths. We'd go to Crandall University. The problem was that our ancestors had left America. When the Revolution came along, our family was loyal to the King and left their land behind and shipped out to Nova Scotia before the shooting began. A hard fact to face, that your ancestors were on the side that hung Nathan Hale, and if they'd been in attendance at the gallows and heard his immortal last words, they'd have hung him just the same probably and maybe hung him harder. Perhaps that was why we went all out at the Fourth of July. We celebrated by grilling hamburgers and picking the first of the sweet corn and blowing off fireworks that my dad got from someone who smuggled them in from South Dakota, fireworks being illegal in our state. Sensible Minnesota Scandinavians had passed a reasonable and good law to protect us which all of us disobeyed in the spirit of the great national holiday. We set off cherry bombs in culverts and lit strings of firecrackers between houses for maximum reverberation, and after dark we set off rockets. The sight of one made my mother's heart flutter and she had to close her eyes. "You be careful you don't blow your hand off!" she called from the porch, afraid to look, but personal safety was not the point of the Fourth. We stuck the rockets in the grass and lit them one by one. The fuses sizzled and up they went screaming into the night and hung in silence at the apogee and drifted down and then suddenly lit up the sky with a burst of red white and blue sparks and a blast that rattled the birch trees, a ka-boom loud enough

to wake up every law-abiding citizen for a mile around, and then, satisfied that we had made our country freer, we went to bed.

All that thunder and lightning plus a patriotic picnic and a ball game between married men and single men, and what better day for it? What day could be more deserving of racket and good cooking than July 4, the anniversary of the day in 1776 when the Second Continental Congress adopted Jefferson's Declaration of Independence? As the delegates talked in Philadelphia, the Revolution was more than a year old. Paul Revere had galloped through Middlesex, and Ethan Allen and the Green Mountain Boys had captured Fort Ticonderoga, and the Battle of Bunker Hill ("Don't fire until you see the whites of their eyes!") had been fought, but the revolutionaries had not yet agreed that a revolution was what they wanted. There were plenty of people like my ancestors who felt the quarrel with the mother country could be patched up if patient men would negotiate reasonably, as Englishmen, and avoid further bloodshed. After all, they were no revolutionaries, those Crandalls—they were English, and how can you change what you are? (By a revolution, of course.)

The Declaration set out to justify the uprising and the violence by accusing the King of "repeated injuries and usurpations all having in direct object the establishment of an absolute Tyranny over these States"—of sending "swarms of Officers to harass our People and eat out their substance," of "imposing Taxes on us without our Consent" and "altering fundamentally the Forms of our Governments"—meanwhile, "In every stage of these Oppressions We have Petitioned for Redress in the most humble terms: Our repeated Petitions have been answered only by repeated injury." But the genius of the document lies in two sentences, a pure and passionate statement of natural rights:

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed

Like anyone who gets in a fight, the early politicians claimed the noblest purpose for themselves and nailed their flag to the highest tree in the woods, and they connected the American enterprise to the greater cause of human rights so that nobody could be in doubt about it. Nobody has ever been in doubt about it. They wrote their propaganda so well that it became our shining ideal. The Declaration set the country on a course that neither ignorance nor cruelty could distract us from for very long—a journey toward a day when we all look at each other with love and respect, black and white, men and women, religious and irreligious and anti-religious, immigrants from every point on the globe—when we look at each other as God looks at us, as free and equal and dignified and good-looking people.

All of the wahoos and bigots and snake-oil salesmen who ever wrapped themselves and their dismal causes in the flag and tried to sell hatred as Americanism could not

last long because this Declaration said so clearly what the flag and the nation stand for. Freedom and equality. Once people gain a measure of it, they will not give it up, no matter how hard the struggle, as Walt Whitman wrote in 1855:

The battle rages with many a loud alarm and frequent advance and retreat. . . the enemy triumphs. . . the cause is asleep. . . and is liberty gone out of that place? No never. When liberty goes . . . it waits for all the rest to go. . . It is the last. When the memories of the old martyrs are faded utterly away. . . when the large names of patriots are laughed at in the public halls from the lips of the orators. . . when the swarms of cringers, suckers, doughfaces, lice of politics, planners of sly involutions for their own preferment to city offices or state legislatures or the judiciary or congress or the presidency, obtain a response of love and natural deference from the people. . . when it is better to be a bound booby and rogue in office at a high salary than the poorest free mechanic or farmer with his hat unmoved from his head and firm eyes and a candid and generous heart ... or rather when all the souls of men and women are discharged from any part of the earth—then only shall the instinct of liberty be discharged

Prosperous Anglo-Saxon men, many of them slaveholders, wrote equality and natural rights into the political language, which cracked open the society they knew and began the revolution that began after the Revolution ended and took us in the direction of a dream down the long winding road that leads from those elegant fellows in knee-breeches to the folks who live in my neighbourhood in New York, black families, women, white gentry, black welfare mothers, gay people, German Lutherans, Russian Jews, Greeks, Koreans, homeless people, exiled Midwesterners, New Yorkers all, and all of them having ridden the Eighth Avenue subway at rush hour, claim unalienable dignity as individuals.

Heroes, all of them—at least they're my heroes, especially the new immigrants, especially the refugees. Everyone makes fun of New York cabdrivers who can't speak English: they're heroes. To give up your country is the hardest thing a person can do: to leave the old familiar places and ship out over the edge of the world to America and learn everything over again different that you learned as a child, learn the new language that you will never be so smart or funny in as in your true language. It takes years to start to feel semi-normal. And yet people still come—from Russia, Vietnam and Cambodia and Laos, Ethiopia, Iran, Haiti, Korea, Cuba, Chile, and they come on behalf of their children, and they come for freedom. Not for our land (Russia is as beautiful) not for our culture (they have their own, thank you), not for our standard of living (it frankly ain't that great), not for our system of government (they don't know about it, may not even agree with it), but for freedom. They are heroes who make an adventure on our behalf showing us by their struggle how precious beyond words freedom is, and if we knew their stories, we could not keep back the tears.

In 1970, in search of freedom and dignity and cheap rent, I moved out to a farmhouse on the rolling prairie in central Minnesota, near Freeport, where I planted a garden and

wrote stories to support my wife and year-old son. Rent was \$80 a month. It got us a big square brick house with a porch that looked out on a peaceful barnyard, a granary and machine sheds and corncribs and silo, and the barn and feedlot where Norbert, the farmer who I rented from, kept his beef cattle. Beyond the windbreak of red oak and spruce to the west and north lay a hundred sixty acres of his corn and oats. (I believed it was oats, but on the odd chance it might be wheat or barley, I didn't mention anything to Norbert about it being oats.) Our long two-rut driveway ran due north through the woods to where the gravel road made an L, where our mailbox stood, where you could stand and see for a couple miles in all directions, the green fields and the thick groves around the farmsites.

My pals in Minnesota considered this a real paradise (so did we) and they often drove up and enjoyed a weekend of contemplating corn and associating with large animals. On the Fourth of July, 1971, we had twenty people come for a picnic in the yard, an Olympic egg toss and gunnysack race, a softball game with the side of the barn for a right-field fence, and that night we sat around the kitchen and made pizza and talked about the dismal future.

America was trapped in Vietnam, our good country bleeding for its awful mistakes and unable to withdraw, and how could the tragedy end, if not in nuclear disaster or revolution? We were pessimists; we needed fear to make us feel truly alive. We talked about death. We put on "A Hard Day's Night," loud, and made lavish pizzas with fresh mushrooms and onions, zucchini, eggplant, garlic, green pepper, and drank beer and talked about the end of life on earth with a morbid piety that made a person sick.

"I don't see how a person can have children right now," said a pal, his mouth full. My little boy sat on my lap, surveying the three pizzas: three domes of melted cheese on three hills of hot fresh greens on three beds of fresh bread crust, executive and judicial and legislative pizzas.

"I mean it's fine if you do," he said, "but I couldn't. What right do we have to bring a kid into the world, knowing there very likely might not even be a world ten years from now? Ten years—hell, five. Three."

There was much more: about racial hatred, pesticides, radiation, television, the invincible stupidity of the government and whether Vietnam was the result of strategic mistakes or a reflection of evil in American culture—it was a conversation with concrete shoes, and while I can be as grim and pretentious as the next person, when I hear the word "culture" I reach for the doorknob. I snuck out to the screen porch with my son and sat and listened to crickets, and my friend Greg sat with us and I recall that two others joined us, all of us tired of apocalyptic politics and talk, and we walked along the driveway out of the yardlight and through the dark trees and sat down in a strip of alfalfa between the woods and the oats. ("What's that?" they said. "Oats," I replied.) And then we lay down on our backs and looked up at the sky full of stars.

The sky was clear. Lying there, looking up at the hemisphere of billions of dazzling single brilliances, made us feel we had gone away and left the farm far behind.

As we usually see the sky, it is a backdrop, the sky over our house, the sky beyond the clotheslines, but lying down eliminates the horizon and rids us of that strange realistic perspective of the sky as a canopy cantered over our heads, and we see the sky as what it is: everything known and unknown, the universe, the whole beach other than the grain of sand we live on. The sight of the sky was so stunning it made us drunk. I felt as if I could put one foot forward and walk away from the wall of ground at my back and hike out toward Andromeda. I didn't feel particularly American. Out there in the Milky Way and the world without end Amen, America was a tiny speck of a country, a nickel tossed into the Grand Canyon, and American culture the amount of the Pacific Ocean you bring home in your swimsuit. The president wasn't the president out there, the Constitution was only a paper, and what newspapers wrote about was sawdust and coffee grounds. The light I saw was from fires burning before America existed, when the Crandalls lived in Rhode Island. Looking out there, my son lying on my chest, I could imagine my grandchildren and they were more real to me than Congress.

I imagined them strong and free, curious, sensuous, indelibly cheerful and affectionate, openhanded—sympathetic to pain and misery and quick in charity, proud when insulted and modest if praised, fiercely loyal to friends, loving God and the beautiful world including our land from the California coast to the North Dakota prairie to faraway Manhattan, loving music and our American language—when you look at the stars you don't think small. You don't hope your descendants will enjoy your mutual fund portfolio, you imagine them as giants on the earth.

Between the tree line and my left elbow, a billion stars in the sky, each representing a billion we couldn't see. We lay in the grass, thinking about America and also slightly about snakes and about spiders clambering from blade to blade who might rappel down into our mouths, and looked open-mouthed up at the heavens and everything we said out loud seemed hilarious to us. Tiny us gazing up at The South Wall of The Unimaginable Everything and feeling an obligation to comment, and our most profound comments sounded like peas dropped in a big empty bucket. "It makes you feel small, doesn't it." Plink. "I used to know the names of those." Plunk. One more peabrain having to share the effect that the world is having on him. "It's beautiful, isn't it ... I remember when I was a kid—" someone said and we laughed ourselves limp—shut up, we said, laughing, we're sick of sensitive people, everything you see just reminds you of yourself! So stick it in your ear.

The Revolution was launched in frustration and anger at the mess that greed and arrogance make in the world (and most of the Declaration is as angry as what was said around the kitchen table), but the Revolution was harnessed to a great idea thought by men who lay on the ground and looked up at the stars. Or so I thought, lying there in the alfalfa. Perhaps in 1776 they too were rattled by current events and

the perfect logic of despair and had to go out and lie in the weeds for a while. Indoors all the news is secondhand, mostly bad, and even good people are drawn into a dreadful fascination with doom and demise; their faith in extinction gets stronger; they sit and tell stories that begin with The End. But one look at heaven can restore our spirits to their natural immensity and blessedness, and we feel free, and the idea of liberty becomes larger. The sentence about equal rights does not sound small or ridiculous when you recite it while looking at the stars:

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.

The stars in the sky, my friends in the grass, my son asleep on my chest, and a fly flew in my mouth, and went deep, forcing me to swallow, inducing a major life change for him, from fly to simple protein, and so shall we all be changed someday, but meanwhile: Life! Liberty! and (huff huff pant pant huff huff) Happiness!

The boy is nineteen now. Almost all my friends' children are suddenly grown up, including kids of girls who I looked at the stars with while listening to Buddy Holly and the Everly Brothers and guys I ran around with including one who owned a pink '57 Oldsmobile with yards of glittering chrome and a custom airhorn that when you pulled a wire under the dash it made a long moo, like a singing Holstein. He and I never thought about being dads but it didn't surprise us either. Our parents told us that listening to rock 'n' roll would lead to having babies, and they were right, and you kids are them.

The day you were born, our nostalgia for our own youth flickered and dimmed, the book snapped shut on our grudges against our elders who brought us up miserably and taught us the wrong things and so badly, and we began to look forward to your life.

We lived in dread of various unnameable calamities—waking up at night in fear and getting up to make sure your little rear end was rising and falling in the crib, leaping out of chairs at the sound of a crash, panicking sometimes at the sound of silence or a small sound such as crunching, e.g., the time my little boy came into view chewing a morsel that sounded funny and turned out to be half of the carcass of a mouse dead from rat poison and we flew to the car with him and for some reason didn't drive the car straight into a tree en route to the doctor's and all die instantly—but mostly we have been hopeful and progressive, forward looking, anticipating your first steps, your first words, and eventually your winning your freedom from us and going bravely through the door to pursue your happiness in this free country.

And we are hopeful about the progress of liberty and believe that the idea of equal rights that Americans have struggled with for two hundred and twelve years will be more perfectly realized and understood by our children and grandchildren.

You will grow up less weighted down by fears and shame and all the rocks we carried in our pockets. You being easier about who you are will be less troubled by people who are different from you, whose names are strange, who are another colour, who speak another language, pray to a different God or don't pray at all, whose feelings and opinions seem odd and even wrong, who put pickles on their hot dogs instead of onions and mustard: you will take them in stride, as people. You will live in an America where women and men, black and white, have something like an equal chance to learn, to work, to create, and to enjoy the good things in life. You will meet each other on simple equal terms and not be afraid or ashamed, seeing that the other is as good as yourself, whether they know it or not, and as capable of comedy or grief.

What we celebrate isn't loyalty to a culture, or love of the land, or dedication to institutions of government, but love of the idea: Liberty—Equality—one and inseparable. We have turned our faces toward this sun since 1776 and will not turn away from it. Whitman said: "Liberty relies upon itself, invites no one, promises nothing, sits in calmness and light, is positive and composed, and knows no discouragement."

Courage. God bless the idea of America and hats off to the writers who produced this fine Declaration. I'm sorry that my family wasn't around to sign it or cheer for it, but if you pass me a rocket, I'd be happy to light it for them.

On Being the Right Size

J. B. S. Haldane

The most obvious differences between different animals are differences of size, but for some reason the zoologists have paid singularly little attention to them. In a large textbook of zoology before me I find no indication that the eagle is larger than the sparrow, or the hippopotamus bigger than the hare, though some grudging admissions are made in the case of the mouse and the whale. But yet it is easy to show that a hare could not be as large as a hippopotamus or a whale as small as a herring. For every type of animal there is a most convenient size, and a large change in size inevitably carries with it a change of form.

Let us take the most obvious of possible cases, and consider a giant man sixty feet high - about the height of Giant Pope and Giant Pagan in the illustrated Pilgrim's progress of my childhood. These monsters were not only ten times as high as Christian, but ten times as wide and ten times as thick, so that their total weight was a thousand times his, or about eighty to ninety tons. Unfortunately the cross sections of their bones were only a hundred times those of Christian, so that every square inch of giant bone had to support ten times the weight borne by a square inch of human bone. As the human thigh-bone breaks under about ten times the human weight, Pope and Pagan would have broken their thighs every time they took a step. This was doubtless why they were sitting down in the picture I remember. But it lessens ones respect for Christian and Jack the Giant Killer.

To turn to zoology, suppose that a gazelle, a graceful little creature with long thin legs, is to become large, it will break its bones unless it does one of two things. It may make its legs short and thick, like the rhinoceros, so that every pound of weight has still about the same area of bone to support it. Or it can compress its body and stretch out its legs obliquely to gain stability, like the giraffe. I mention these two beasts because they happen to belong to the same order as the gazelle, and both are quite successful mechanically, being remarkably fast runners.

Gravity, a mere nuisance to Christian, was a terror to Pope, Pagan, and Despair. To the mouse and any smaller animal it presents practically no dangers. You can drop a mouse down a thousand-yard mine shaft; and, on arriving at the bottom it gets a slight shock and walks away, provided that the ground is fairly soft. A rat is killed, a man is broken, a horse splashes. For the resistance presented to movement by the air is proportional to the surface of the moving object. Divide an animal's length, breadth, and height each by ten; its weight is reduced to a thousandth, but its surface only a hundredth. So the resistance to falling in the case of the small animal is relatively ten times greater than the driving force.

An insect, therefore, is not afraid of gravity; it can fall without danger, and can cling to the ceiling with remarkably little trouble. It can go in for elegant and fantastic forms of support like that of the daddy-longlegs. But there is a force which is as formidable to

an insect as gravitation to a mammal. This is surface tension. A man coming out of a bath carries with him a film of water about one-fiftieth of an inch in thickness. This weighs roughly a pound. A wet mouse has to carry about its own weight of water. A wet fly has to lift many times its own weight and, as everyone knows, a fly once wetted by water or any other liquid is in a very serious position indeed. An insect going for a drink is in a great danger as man leaning out over a precipice in search of food. If it once falls into the grip of the surface tension of the water -that is to say, gets wet - it is likely to remain so until it drowns. A few insects, such as water-beetles, contrive to be unwettable; the majority keep well away from their drink by means of a long proboscis.

Of course tall land animals have other difficulties. They have to pump their blood to greater heights than a man, and, therefore, require a larger blood pressure and tougher blood-vessels. A great many men die from burst arteries, greater for an elephant or a giraffe. But animals of all kinds find difficulties in size for the following reason. A typical small animal, say a microscopic worm or rotifer, has a smooth skin through which all the oxygen it requires can soak in, a straight gut with sufficient surface to absorb its food, and a single kidney. Increase its dimensions tenfold in every direction, and its weight is increased a thousand times, so that if it to use its muscles as efficiently as its miniature counterpart, it will need a thousand times as much food and oxygen per day and will excrete a thousand times as much of waste products.

Now if its shape is unaltered its surface will be increased only a hundredfold, and ten times as much oxygen must enter per minute through each square millimeter of skin, ten times as much food through each square millimetre of intestine. When a limit is reached to their absorptive powers their surface has to be increased by some special device. For example, a part of the skin may be drawn out into tufts to make gills or pushed in to make lungs, thus increasing the oxygen-absorbing surface in proportion to the animal's bulk. A man, for example, has a hundred square yards of lung. Similarly, the gut, instead of being smooth and straight, becomes coiled and develops a velvety surface, and other organs increase in complication. The higher animals are not larger than the lower because they are more complicated. They are more complicated because they are larger. Just the same is true of plants. The simplest plants, such as the green algae growing in stagnant water or on the bark of trees, are mere round cells. The higher plants increase their surface by putting out leaves and roots. Comparative anatomy is largely the story of the struggle to example, while vertebrates carry the oxygen from the gills or lungs all over the body in the blood, insects take air directly to every part of their body by tiny blind tubes called tracheae which open to the surface at many different points. Now, although their breathing movements they can renew the air in the outer part of the tracheal system, the oxygen has to penetrate the finer branches by means of diffusion. Gases can diffuse easily through very small distances, not many times larger than the average length travelled by a gas molecule between collisions with other molecules. But when such vast journeys-from the point of view of a molecule-as a quarter of an inch have to be made,

the process becomes slow. So the portions of an insect's body more than a quarter of an inch from the air would always be short of oxygen. In consequence hardly any insects are much more than half an inch thick. Land crabs are built on the same general plan as insects, but are much clumsier. Yet like ourselves they carry oxygen around in their blood, and are therefore able to grow far larger than any insects. If the insects had hit on a plan for driving air through their tissues instead of letting it soak in, they might well have become as large as lobsters, though other considerations would have prevented them from becoming as large as man.

Exactly the same difficulties attach to flying. It is an elementary principle of aeronautics that the minimum speed needed to keep an aeroplane of a given shape in the air varies as the square root of its length. If its linear dimensions are increased four times, it must fly twice as fast. Now the power needed for the minimum speed increases more rapidly than the weight of the machine. So the larger aeroplane, which weighs sixty-four times as much as the smaller, needs one hundred and twenty-eight times its horsepower to keep up. Applying the same principle to the birds, we find that the limit to their size is soon reached. An angel whose muscles developed no more power weight for weight than those of an eagle or a pigeon would require a breast projecting for about four feet to house the muscles engaged in working its wings, while to economize in weight, its legs would have to be reduced to mere stilts. Actually a large bird such as an eagle or kite does not keep in the air mainly by moving its wings. It is generally to be seen soaring, that is to say balanced on a rising column of air. And even soaring becomes more and more difficult with increasing size. Were this not the case eagles might be as large as tigers and as formidable to man as hostile aeroplanes.

But it is time that we pass to some of the advantages of size. One of the most obvious is that it enables one to keep warm. All warm-blooded animals at rest lose the same amount of heat from a unit area of skin, for which purpose they need a food-supply proportional to their surface and not to their weight. Five thousand mice weigh as much as a man. Their combined surface and food or oxygen consumption are about seventeen times a man's. In fact a mouse eats about one quarter its own weight of food every day, which is mainly used in keeping it warm. For the same reason small animals cannot live in cold countries. In the arctic regions there are no reptiles or amphibians, and no small mammals. The smallest mammal in Spitzbergen is the fox. The small birds fly away in winter, while the insects die, though their eggs can survive six months or more of frost. The most successful mammals are bears, seals, and walruses.

Similarly, the eye is a rather inefficient organ until it reaches a large size. The back of the human eye on which an image of the outside world is thrown, and which corresponds to the film of a camera, is composed of a mosaic of "rods and cones" whose diameter is little more than a length of an average light wave. Each eye has about a half a million, and for two objects to be distinguishable their images must fall on separate rods or cones. It is obvious that with fewer but larger rods and cones we

should see less distinctly. If they were twice as broad two points would have to be twice as far apart before we could distinguish them at a given distance. But if their size were diminished and their number increased we should see no better. For it is impossible to form a definite image smaller than a wave-length of light. Hence a mouse's eye is not a small-scale model of a human eye. Its rods and cones are not much smaller than ours, and therefore there are far fewer of them. A mouse could not distinguish one human face from another six feet away. In order that they should be of any use at all the eyes of small animals have to be much larger in proportion to their bodies than our own. Large animals on the other hand only require relatively small eyes, and those of the whale and elephant are little larger than our own. For rather more recondite reasons the same general principle holds true of the brain. If we compare the brain-weights of a set of very similar animals such as the cat, cheetah, leopard, and tiger, we find that as we quadruple the body-weight the brain-weight is only doubled. The larger animal with proportionately larger bones can economize on brain, eyes, and certain other organs.

Such are a very few of the considerations which show that for every type of animal there is an optimum size. Yet although Galileo demonstrated the contrary more than three hundred years ago, people still believe that if a flea were as large as a man it could jump a thousand feet into the air. As a matter of fact the height to which an animal can jump is more nearly independent of its size than proportional to it. A flea can jump about two feet, a man about five. To jump a given height, if we neglect the resistance of air, requires an expenditure of energy proportional to the jumper's weight. But if the jumping muscles form a constant fraction of the animal's body, the energy developed per ounce of muscle is independent of the size, provided it can be developed quickly enough in the small animal. As a matter of fact an insect's muscles, although they can contract more quickly than our own, appear to be less efficient; as otherwise a flea or grasshopper could rise six feet into the air.

And just as there is a best size for every animal, so the same is true for every human institution. In the Greek type of democracy all the citizens could listen to a series of orators and vote directly on questions of legislation. Hence their philosophers held that a small city was the largest possible democratic state. The English invention of representative government made a democratic nation possible, and the possibility was first realized in the United States, and later elsewhere. With the development of broadcasting it has once more become possible for every citizen to listen to the political views of representative orators, and the future may perhaps see the return of the national state to the Greek form of democracy. Even the referendum has been made possible only by the institution of daily newspapers.

To the biologist the problem of socialism appears largely as a problem of size. The extreme socialists desire to run every nation as a single business concern. I do not suppose that Henry Ford would find much difficulty in running Andorra or Luxembourg on a socialistic basis. He has already more men on his pay-roll than their population. It is conceivable that a syndicate of Fords, if we could find them, would make Belgium

Ltd or Denmark Inc. pay their way. But while nationalization of certain industries is an obvious possibility in the largest of states, I find it no easier to picture a completely socialized British Empire or United States than an elephant turning somersaults or a hippopotamus jumping a hedge.

About the Author

John Burdon Sanderson Haldane (November 5, 1892 - December 1, 1964) was a geneticist born in Scotland and educated at Eton and Oxford University. He was one of the founders (along with Fisher and Wright) of population genetics.

His famous book, *The Causes of Evolution* (1932), was the first major work of what came to be known as the "modern evolutionary synthesis", reestablishing natural selection as the premier mechanism of evolution by explaining it in terms of the mathematical consequences of Mendelian genetics.

He was also a great science populariser, and was perhaps the Stephen Jay Gould or Richard Dawkins of his day. His essay, *Daedalus or Science and the Future* (1923), was remarkable in predicting many scientific advances but has been criticized for presenting a too idealistic view of scientific progress.

Haldane was himself a very idealistic man, and in his youth was a devoted Communist and author of many articles in *The Daily Worker*. Events in the Soviet Union, such as the rise of the anti-Mendelian agronomist Trofim Lysenko and the crimes of Stalin, caused him to break with the Communist Party later in life.

He is also known for an observation from his essay, *On Being the Right Size*, which Jane Jacobs and others have since referred to as Haldane's principle. This is that sheer size very often defines what bodily equipment an animal must have: "Insects, being so small, do not have oxygen-carrying bloodstreams. What little oxygen their cells require can be absorbed by simple diffusion of air through their bodies. But being larger means an animal must take on complicated oxygen pumping and distributing systems to reach all the cells." The conceptual metaphor to animal body complexity has been of use in energy economics and secession ideas.

Haldane was friends with the author Aldous Huxley, and was the basis for the biologist Shearwater in Huxley's novel *Antic Hay*. Ideas from Haldane's *Daedalus*, such as ectogenesis (the development of foetuses in artificial wombs), also influenced Huxley's *Brave New World*.

He had many students, the most famous of whom, John Maynard Smith, was perhaps also the one most like himself.

In one of the last speeches of his life, *Biological Possibilities for the Human Species of the Next Ten Thousand Years* (1963), Haldane coined the word "clone", from the Greek word for twig.

Haldane was a very quotable man. Some of the things he said are probably more famous than he is:

- The Creator, if He exists, has a special preference for beetles.. This is referring to the fact that 25% of all known animal species are types of beetle.

- Four stages of acceptance: i) this is worthless nonsense; ii) this is an interesting, but perverse, point of view; iii) this is true, but quite unimportant; iv) I always said so. This is referring to the stages that a scientific theory goes through.

- Now my own suspicion is that the Universe is not only queerer than we suppose, but queerer than we CAN suppose. Often referred to as "Haldane's Law" (not to be confused with Haldane's rule), this is an explanation for the increasing counterintuitiveness of modern scientific theories.

•Would I lay down my life to save my brother? No, but I would to save two brothers or eight cousins. This is a joke based on the idea of inclusive fitness. Basically, the joke is as you only share 50% of your genes with a brother, and 12.5% with a cousin, you would have to save enough relatives to at least break even.

The Death of the Moth**by Virginia Woolf**

Moths that fly by day are not properly to be called moths; they do not excite that pleasant sense of dark autumn nights and ivy-blossom which the commonest yellow-underwing asleep in the shadow of the curtain never fails to rouse in us. They are hybrid creatures, neither gay like butterflies nor sombre like their own species. Nevertheless the present specimen, with his narrow hay-coloured wings, fringed with a tassel of the same colour, seemed to be content with life. It was a pleasant morning, mid-September, mild, benignant, yet with a keener breath than that of the summer months. The plough was already scoring the field opposite the window, and where the share had been, the earth was pressed flat and gleamed with moisture. Such vigour came rolling in from the fields and the down beyond that it was difficult to keep the eyes strictly turned upon the book. The rooks too were keeping one of their annual festivities; soaring round the tree tops until it looked as if a vast net with thousands of black knots in it had been cast up into the air; which, after a few moments sank slowly down upon the trees until every twig seemed to have a knot at the end of it. Then, suddenly, the net would be thrown into the air again in a wider circle this time, with the utmost clamour and vociferation, as though to be thrown into the air and settle slowly down upon the tree tops were a tremendously exciting experience.

The same energy which inspired the rooks, the ploughmen, the horses, and even, it seemed, the lean bare-backed downs, sent the moth fluttering from side to side of his square of the window-pane. One could not help watching him. One was, indeed, conscious of a queer feeling of pity for him. The possibilities of pleasure seemed that morning so enormous and so various that to have only a moth's part in life, and a day moth's at that, appeared a hard fate, and his zest in enjoying his meagre opportunities to the full, pathetic. He flew vigorously to one corner of his compartment, and, after waiting there a second, flew across to the other. What remained for him but to fly to a third corner and then to a fourth? That was all he could do, in spite of the size of the downs, the width of the sky, the far-off smoke of houses, and the romantic voice, now and then, of a steamer out at sea. What he could do he did. Watching him, it seemed as if a fibre, very thin but pure, of the enormous energy of the world had been thrust into his frail and diminutive body. As often as he crossed the pane, I could fancy that a thread of vital light became visible. He was little or nothing but life.

Yet, because he was so small, and so simple a form of the energy that was rolling in at the open window and driving its way through so many narrow and intricate corridors in my own brain and in those of other human beings, there was something marvellous as well as pathetic about him. It was as if someone had taken a tiny bead of pure life and decking it as lightly as possible with down and feathers, had set it dancing and zig-zagging to show us the true nature of life. Thus displayed one could not get over the strangeness of it. One is apt to forget all about life, seeing it humped and bossed and garnished and cumbered so that it has to move with the greatest circumspection

and dignity. Again, the thought of all that life might have been had he been born in any other shape caused one to view his simple activities with a kind of pity.

After a time, tired by his dancing apparently, he settled on the window ledge in the sun, and, the queer spectacle being at an end, I forgot about him. Then, looking up, my eye was caught by him. He was trying to resume his dancing, but seemed either so stiff or so awkward that he could only flutter to the bottom of the window-pane; and when he tried to fly across it he failed. Being intent on other matters I watched these futile attempts for a time without thinking, unconsciously waiting for him to resume his flight, as one waits for a machine, that has stopped momentarily, to start again without considering the reason of its failure. After perhaps a seventh attempt he slipped from the wooden ledge and fell, fluttering his wings, on to his back on the window sill. The helplessness of his attitude roused me. It flashed upon me that he was in difficulties; he could no longer raise himself; his legs struggled vainly. But, as I stretched out a pencil, meaning to help him to right himself, it came over me that the failure and awkwardness were the approach of death. I laid the pencil down again.

The legs agitated themselves once more. I looked as if for the enemy against which he struggled. I looked out of doors. What had happened there? Presumably it was midday, and work in the fields had stopped. Stillness and quiet had replaced the previous animation. The birds had taken themselves off to feed in the brooks. The horses stood still. Yet the power was there all the same, massed outside indifferent, impersonal, not attending to anything in particular. Somehow it was opposed to the little hay-coloured moth. It was useless to try to do anything. One could only watch the extraordinary efforts made by those tiny legs against an oncoming doom which could, had it chosen, have submerged an entire city, not merely a city, but masses of human beings; nothing, I knew, had any chance against death. Nevertheless after a pause of exhaustion the legs fluttered again. It was superb this last protest, and so frantic that he succeeded at last in righting himself. One's sympathies, of course, were all on the side of life. Also, when there was nobody to care or to know, this gigantic effort on the part of an insignificant little moth, against a power of such magnitude, to retain what no one else valued or desired to keep, moved one strangely. Again, somehow, one saw life, a pure bead. I lifted the pencil again, useless though I knew it to be. But even as I did so, the unmistakable tokens of death showed themselves. The body relaxed, and instantly grew stiff. The struggle was over. The insignificant little creature now knew death. As I looked at the dead moth, this minute wayside triumph of so great a force over so mean an antagonist filled me with wonder. Just as life had been strange a few minutes before, so death was now as strange. The moth having righted himself now lay most decently and uncomplainingly composed. O yes, he seemed to say, death is stronger than I am.

Where Am I?**Daniel C Dennett**

Now that I've won my **suit** under the Freedom of Information Act, I am at liberty to reveal for the first time a curious episode in my life that may be of interest not only to those engaged in research in the philosophy of mind, artificial intelligence, and **neuroscience** but also to the general public.

Several years ago I was approached by Pentagon officials who asked me to volunteer for a highly dangerous and secret mission. In **collaboration** with NASA and Howard Hughes, the Department of Defense was spending billions to develop a Supersonic Tunnelling Underground Device, or STUD. It was supposed to tunnel through the earth's core at great speed and deliver a specially designed atomic warhead "right up the Red's missile silos," as one of the **Pentagon brass** put it.

The problem was that in an early test they had succeeded in lodging a warhead about a mile deep under Tulsa, Oklahoma, and they wanted me to **retrieve** it for them. "Why me?" I asked. Well, the mission involved some pioneering applications of current brain research, and they had heard of my interest in brains and of course my **Faustian curiosity** and great courage and so forth Well, how could I refuse? The difficulty that brought the Pentagon to my door was that the device I'd been asked to recover was fiercely **radioactive**, in a new way. According to monitoring instruments, something about the nature of the device and its complex interactions with pockets of material deep in the earth had produced radiation that could cause **severe abnormalities** in certain tissues of the brain. No way had been found to shield the brain from these deadly rays, which were apparently harmless to other tissues and organs of the body. So it had been decided that the person sent to recover the device should leave his brain behind. It would be kept in a safe place as there it could execute its normal control functions by elaborate radio links. Would I submit to a surgical procedure that would completely remove my brain, which would then be placed in a life-support system at the Manned Spacecraft Centre in Houston? Each input and output pathway, as it was **severed**, would be restored by a pair of **microminiaturized radio transceivers**, one attached precisely to the brain, the other to the nerve stumps in the **empty cranium**. No information would be lost, all the connectivity would be preserved. At first I was a bit reluctant. Would it really work? The Houston brain surgeons encouraged me. "Think of it," they said, "as a mere stretching of the nerves. If your brain were just moved over an inch in your skull, that would not alter or impair your mind. We're simply going to make the nerves indefinitely elastic by splicing radio links into them."

I was shown around the life-support lab in Houston and saw the sparkling new vat in which my brain would be placed, were I to agree. I met the large and brilliant support team of **neurologists, haematologists**, biophysicists, and electrical engineers, and after several days of discussions and demonstrations I agreed to give it a try. I was subjected to an enormous array of blood tests, brain scans, experiments, interviews, and the like. They took down my autobiography at great length, recorded tedious lists

of my beliefs, hopes, fears, and tastes. They even listed my favourite stereo recordings and gave me a crash session of **psychoanalysis**.

The day for surgery arrived at last and of course I was **anesthetized** and remember nothing of the operation itself. When I came out of anaesthesia, I opened my eyes, looked around, and asked the inevitable, the traditional, the lamentably hackneyed postoperative question: "Where am I?" The nurse smiled down at me. "You're in Houston," she said, and I reflected that this still had a good chance of being the truth one way or another. She handed me a mirror. Sure enough, there were the tiny antennae poling up through their **titanium** ports cemented into my skull.

"I gather the operation was a success," I said. "I want to go see my brain." They led me (I was a bit dizzy and unsteady) down a long corridor and into the life-support lab. A cheer went up from the assembled support team, and I responded with what I hoped was a jaunty salute. Still feeling lightheaded, I was helped over to the life-support vat. I peered through the glass. There, floating in what looked like ginger ale, was undeniably a human brain, though it was almost covered with printed circuit chips, plastic tubules, electrodes, and other **paraphernalia**. "Is that mine?" I asked. "Hit the output transmitter switch there on the side of the vat and see for yourself," the project director replied. I moved the switch to OFF, and immediately slumped, groggy and nauseated, into the arms of the technicians, one of whom kindly restored the switch to its ON position. While I recovered my **equilibrium and composure**, I thought to myself: "Well, here I am sitting on a folding chair, staring through a piece of plate glass at my own brain . . . But wait," I said to myself, "shouldn't I have thought, 'Here I am, suspended in a bubbling fluid, being stared at by my own eyes'?" I tried to think this latter thought. I tried to project it into the tank, offering it hopefully to my brain, but I failed to carry off the exercise with any conviction. I tried again. "Here am I, Daniel Dennett, suspended in a bubbling fluid, being stared at by my own eyes." No, it just didn't work. Most puzzling and confusing. Being a philosopher of **firm physicalist conviction**, I believed unswervingly that the **tokening of my thoughts was occurring somewhere in my brain**: yet, when I thought "Here I am," where the thought occurred to me was here, outside the vat, where I, Dennett, was standing staring at my brain.

I tried and tried to think myself into the vat, but to **no avail**. I tried to build up to the task by doing mental exercises. I thought to myself, "The sun is shining over there," five times in rapid succession, each time mentally **ostending** a different place: in order, the sunlit corner of the lab, the visible front lawn of the hospital, Houston, Mars, and Jupiter. I found I had little difficulty in getting my "there's" to hop all over the **celestial map** with their proper references. I could loft a "there" in an instant through the farthest reaches of space, and then aim the next "there" with pinpoint accuracy at the upper left quadrant of a freckle on my arm. Why was I having such trouble with "here"? "Here in Houston" worked well enough, and so did "here in the lab," and even "here in this part of the lab," but "here in the vat" always seemed merely an unmeant mental mouthing. I tried closing my eyes while thinking it. This seemed to help, but

still I couldn't manage to pull it off, except perhaps for a **fleeting** instant. I couldn't be sure. The discovery that I couldn't be sure was also unsettling. How did I know where I meant by "here" when I thought "here"? Could I think I meant one place when in fact I meant another? I didn't see how that could be admitted without untying the few **bonds of intimacy** between a person and his own mental life that had survived the onslaught of the brain scientists and philosophers, **the physicalists and behaviorists. Perhaps I was incorrigible about where I meant when I said "here." But in my present circumstances it seemed that either I was doomed by sheer force of mental habit to thinking systematically false indexical thoughts, or where a person is (and hence where his thoughts are tokened for purposes of semantic analysis) is not necessarily where his brain, the physical seat of his soul, resides. Nagged by confusion, I attempted to orient myself by falling back on a favourite philosopher's ploy. I began naming things.**

"Yorick," I said aloud to my brain, "you are my brain. The rest of my body, seated in this chair, I dub 'Hamlet.'" So here we all are: Yorick's my brain, Hamlet's my body, and I am Dennett. Now, where am I? And when I think "where am I?", where's that thought tokened? Is it tokened in my brain, lounging about in the vat, or right here between my ears where it seems to be tokened? Or nowhere? Its **temporal** coordinates give me no trouble; must it not have **spatial** coordinates as well? I began making a list of the alternatives.

1. Where Hamlet goes there goes Dennett. This principle was easily refuted by appeal to the familiar brain-transplant thought experiments so enjoyed by philosophers. If Tom and Dick switch brains, Tom is the fellow with Dick's former body — just ask him; he'll claim to be Tom and tell you the most intimate details of Tom's autobiography. It was clear enough, then, that my current body and I could part company, but not likely that I could be separated from my brain. The rule of thumb that emerged so plainly from the thought experiments was that in a brain-transplant operation, one wanted to be the donor not the recipient. Better to call such an operation a body transplant, in fact. So perhaps the truth was,

2. Where Yorick goes there goes Dennett. This was not at all appealing, however. How could I be in the vat and not about to go anywhere, when I was so obviously outside the vat looking in and beginning to make guilty plans to return to my room for a substantial lunch? This begged the question I realized, but it still seemed to be getting at something important. Casting about for some support for my intuition, I hit upon a legalistic sort of argument that might have appealed to Locke.

Suppose, I argued to myself, I were now to fly to California, rob a bank, and be apprehended. In which state would I be tried: in California, where the robbery took place, or in Texas, where the brains of the outfit were located? Would I be a California felon with an out-of-state brain, or a Texas **felon** remotely controlling an **accomplice** of sorts in California? It seemed possible that I might beat such a rap just on the **undecidability** of that **jurisdictional** question, though perhaps it would be deemed an

interstate, and hence Federal, offense. In any event, suppose I were convicted. Was it likely that California would be satisfied to throw Hamlet into the brig, knowing that Yorick was living the good life and luxuriously taking the waters in Texas? Would Texas incarcerate Yorick, leaving Hamlet free to take the next boat to Rio? This alternative appealed to me. Barring capital punishment or other cruel and unusual punishment, the state would be obliged to maintain the life-support system for Yorick though they might move him from Houston to Leavenworth, and aside from the unpleasantness of the **opprobrium**, I, for one, would not mind at all and would consider myself a free man under those circumstances. If the state has an interest in forcibly relocating persons in institutions, it would fail to relocate me in any institution by locating Yorick there. If this were true, it suggested a third alternative.

3. Dennett is wherever he thinks he is. Generalized, the claim was as follows: At any given time a person has a point of view and the location of the point of view (which is determined internally by the content of the point of view) is also the location of the person.

Such a proposition is not without its **perplexities**, but to me it seemed a step in the right direction. The only trouble was that it seemed to place one in a heads-I-win/tails-you-lose situation of unlikely **infallibility** as regards location. Hadn't I myself often been wrong about where I was, and at least as often uncertain? Couldn't one get lost? Of course, but getting lost geographically is not the only way one might get lost. If one were lost in the woods one could attempt to reassure oneself with the consolation that at least one knew where one was: one was right here in the familiar surroundings of one's own body. Perhaps in this case one would not have drawn one's attention to much to be thankful for. Still, there were worse plights imaginable, and I wasn't sure I wasn't in such a plight right now.

Point of view clearly had something to do with personal location, but it was itself an unclear notion. It was obvious that the content of one's point of view was not the same as or determined by the content of one's beliefs or thoughts. For example, what should we say about the point of view of the Cinerama viewer who shrieks and twists in his seat as the roller-coaster footage overcomes his psychic distancing? Has he forgotten that he is safely seated in the theatre? Here I was inclined to say that the person is experiencing an illusory shift in point of view. In other cases, my inclination to call such shifts illusory was less strong. The workers in laboratories and plants who handle dangerous materials by operating feedback-controlled mechanical arms and hands undergo a shift in point of view that is crisper and more pronounced than anything Cinerama can provoke. They can feel the heft and slipperiness of the containers they manipulate with their metal fingers. They know perfectly well where they are and are not fooled into false beliefs by the experience, yet it is as if they were inside the isolation chamber they are peering into. With mental effort, they can manage to shift their point of view back and forth, rather like making a transparent **Necker cube or an Escher** drawing change **orientation** before one's eyes. It does seem extravagant to

suppose that in performing this bit of **mental gymnastics**, they are transporting themselves back and forth.

Still their example gave me hope. If I was in fact in the vat in spite of my **intuitions**, I might be able to train myself to adopt that point of view even as a matter of habit. I should dwell on images of myself comfortably floating in my vat, **beaming volitions** to that familiar body out there. I reflected that the ease or difficulty of this task was presumably independent of the truth about the location of one's brain. Had I been practicing before the operation, I might now be finding it second nature. You might now yourself try such a **trompe l'oeil**. Imagine you have written an **inflammatory** letter which has been published in the Times, the result of which is that the government has chosen to impound your brain for a **probationary period** of three years in its Dangerous Brain Clinic in Bethesda, Maryland. Your body of course is allowed freedom to earn a salary and thus to continue its function of laying up income to be taxed. At this moment, however, your body is seated in an auditorium listening to a peculiar account by Daniel Dennett of his own similar experience. Try it. Think yourself to Bethesda, and then hark back longingly to your body, far away, and yet seeming so near. It is only with long-distance **restraint** (yours? the government's?) that you can control your impulse to get those hands clapping in polite applause before navigating the old body to the rest room and a well-deserved glass of evening sherry in the lounge. The task of imagination is certainly difficult, but if you achieve your goal the results might be **consoling**.

Anyway, there I was in Houston, lost in thought as one might say, but not for long. My speculations were soon interrupted by the Houston doctors, who wished to test out my new **prosthetic** nervous system before sending me off on my **hazardous** mission. As I mentioned before, I was a bit dizzy at first, and not surprisingly, although I soon habituated myself to my new circumstances (which were, after all, **well nigh indistinguishable** from my old circumstances). My **accommodation** was not perfect, however, and to this day I continue to be plagued by minor coordination difficulties. The speed of light is fast, but finite, and as my brain and body move farther and farther apart, the delicate interaction of my **feedback systems** is thrown into disarray by the time lags. Just as one is **rendered** close to speechless by a delayed or echoic hearing of one's speaking voice so, for instance, I am virtually unable to track a moving object with my eyes whenever my brain and my body are more than a few miles apart. In most matters my impairment is scarcely detectable, though I can no longer hit a slow curve ball with the authority of yore. There are some **compensations** of course. Though liquor tastes as good as ever, and warms my **gullet** while corroding my liver, I can drink it in any quantity I please, without becoming the slightest bit **inebriated**, a curiosity some of my close friends may have noticed (though I occasionally have **feigned inebriation**, so as not to draw attention to my unusual circumstances). For similar reasons, I take aspirin orally for a sprained wrist, but if the pain persists I ask Houston to administer **codeine to me in vitro**. In times of illness the phone bill can be staggering.

But to return to my adventure. At length, both the doctors and I were satisfied that I was ready to undertake my **subterranean mission**. And so I left my brain in Houston and headed by helicopter for Tulsa. Well, in any case, that's the way it seemed to me. That's how I would put it, just off the top of my head as it were. On the trip I reflected further about my earlier anxieties and decided that my first **postoperative** speculations had been tinged with panic. The matter was not nearly as strange or metaphysical as I had been supposing. Where was I? In two places, clearly: both inside the vat and outside it. Just as one can stand with one foot in Connecticut and the other in Rhode Island, I was in two places at once. I had become one of those scattered individuals we used to hear so much about. The more I considered this answer, the more obviously true it appeared. But, strange to say, the more true it appeared, the less important the question to which it could be the true answer seemed. A sad, but not **unprecedented**, fate for a philosophical question to suffer. This answer did not completely satisfy me, of course. There **lingered** some question to which I should have liked an answer, which was neither "Where are all my various and **sundry** parts?" nor "What is my current point of view?" Or at least there seemed to be such a question. For it did seem undeniable that in some sense I and not merely most of me was descending into the earth under Tulsa in search of an atomic warhead.

When I found the warhead, I was certainly glad I had left my brain behind, for the pointer on the specially built **Geiger** counter I had brought with me was off the dial. I called Houston on my ordinary radio and told the operation control centre of my position and my progress. In return, they gave me instructions for dismantling the vehicle, based upon my on-site observations. I had set to work with my cutting torch when all of a sudden a terrible thing happened. I went stone deaf. At first I thought it was only my radio earphones that had broken, but when I tapped on my helmet, I heard nothing. Apparently the **auditory transceivers** had gone on the fritz. I could no longer hear Houston or my own voice, but I could speak, so I started telling them what had happened. In midsentence, I knew something else had gone wrong. My vocal apparatus had become paralyzed. Then my right hand went limp — another transceiver had gone. I was truly in deep trouble. But worse was to follow. After a few more minutes, I went blind. I cursed my luck, and then I cursed the scientists who had led me into this grave peril. There I was, deaf, dumb, and blind, in a radioactive hole more than a mile under Tulsa. Then the last of my cerebral radio links broke, and suddenly I was faced with a new and even more shocking problem: whereas an instant before I had been buried alive in Oklahoma, now I was **disembodied** in Houston. My recognition of my new status was not immediate. It took me several very anxious minutes before it dawned on me that my poor body lay several hundred miles away, with heart pulsing and lungs **respirating**, but otherwise as dead as the body of any heart-transplant donor, its skull packed with useless, broken electronic gear. The shift in perspective I had earlier found well nigh impossible now seemed quite natural. Though I could think myself back into my body in the tunnel under Tulsa, it took some effort to sustain the illusion. For surely it was an illusion to suppose I was still in Oklahoma: I had lost all contact with that body.

It occurred to me then, with one of those **rushes of revelation** of which we should be suspicious, that I had stumbled upon an impressive demonstration of the **immateriality** of the soul based upon **physicalist principles and premises**. For as the last radio signal between Tulsa and Houston died away, had I not changed location from Tulsa to Houston at the speed of light? And had I not accomplished this without any increase in mass? What moved from A to B at such speed was surely myself, or at any rate my soul or mind — the massless centre of my being and home of my consciousness. My point of view had **lagged** somewhat behind, but I had already noted the indirect bearing of point of view on personal location. I could not see how a **physicalist philosopher** could quarrel with this except by taking the dire and **counterintuitive** route of banishing all talk of persons. Yet the notion of personhood was so well **entrenched** in everyone's world view, or so it seemed to me, that any denial would be as curiously unconvincing, as systematically **disingenuous, as the Cartesian negation, "non sum."**

The joy of philosophic discovery thus **tided me over** some very bad minutes or perhaps hours as the helplessness and hopelessness of my situation became more apparent to me. Waves of panic and even nausea swept over me, made all the more horrible by the absence of their normal **body-dependent phenomenology**. No **adrenaline** rush of tingles in the arms, no pounding heart, no premonitory salivation. I did feel a dread sinking feeling in my bowels at one point, and this tricked me momentarily into the false hope that I was undergoing a reversal of the process that landed me in this fix — a gradual **undisembodiment**. But the isolation and uniqueness of that twinge soon convinced me that it was simply the first of a plague of **phantom body hallucinations** that I, like any other **amputee**, would be all too likely to suffer.

My mood then was chaotic. On the one hand, I was fired up with **elation of my philosophic discovery** and was wracking my brain (one of the few familiar things I could still do), trying to figure out how to communicate my discovery to the journals; while on the other, I was bitter, lonely, and filled with dread and uncertainty. Fortunately, this did not last long, for my technical support team **sedated** me into a dreamless sleep from which I awoke, hearing with magnificent fidelity the familiar opening strains of my favorite Brahms piano trio. So that was why they had wanted a list of my favourite recordings! It did not take me long to realize that I was hearing the music without ears. The output from the stereo **stylus** was being fed through some fancy **rectification circuitry** directly into my **auditory** nerve. I was mainlining Brahms, an unforgettable experience for any stereo buff. At the end of the record it did not surprise me to hear the reassuring voice of the project director speaking into a microphone that was now my prosthetic ear. He confirmed my analysis of what had gone wrong and assured me that steps were being taken to re-embodiment me. He did not elaborate, and after a few more recordings, I found myself drifting off to sleep. My sleep lasted, I later learned, for the better part of a year, and when I awoke, it was to find myself fully restored to my senses. When I looked into the mirror, though, I was a bit startled to see an unfamiliar face. Bearded and a bit heavier, bearing no doubt a family

resemblance to my former face, and with the same look of spritely intelligence and resolute character, but definitely a new face. Further self-explorations of an intimate nature left me no doubt that this was a new body, and the project director confirmed my conclusions. He did not volunteer any information on the past history of my new body and I decided (wisely, I think in retrospect) not to pry. As many philosophers unfamiliar with my ordeal have more recently speculated, the **acquisition** of a new body leaves one's person intact. And after a period of adjustment to a new voice, new muscular strengths and weaknesses, and so forth, one's personality is by and large also preserved. More dramatic changes in personality have been routinely observed in people who have undergone extensive plastic surgery, to say nothing of sex-change operations, and I think no one **contests** the survival of the person in such cases. In any event I soon accommodated to my new body, to the point of being unable to recover any of its **novelties** to my consciousness or even memory. The view in the mirror soon became utterly familiar. That view, by the way, still revealed antennae, and so I was not surprised to learn that my brain had not been moved from its haven in the life-support lab.

I decided that good old Yorick deserved a visit. I and my new body, whom we might as well call **Fortinbras**, strode into the familiar lab to another round of applause from the technicians, who were of course congratulating themselves, not me. Once more I stood before the vat and **contemplated** poor Yorick, and on a whim I once again cavalierly flicked off the output transmitter switch. Imagine my surprise when nothing unusual happened. No fainting spell, no nausea, no noticeable change. A technician hurried to restore the switch to ON, but still I felt nothing. I demanded an explanation, which the project director hastened to provide. It seems that before they had even operated on the first occasion, they had constructed a computer duplicate of my brain, reproducing both the complete information-processing structure and the **computational speed** of my brain in a giant computer program. After the operation, but before they had dared to send me off on my mission to Oklahoma, they had run this computer system and Yorick side by side. The incoming signals from Hamlet were sent simultaneously to Yorick's transceivers and to the computer's array of inputs. And the outputs from Yorick were not only beamed back to Hamlet, my body; they were recorded and checked against the simultaneous output of the computer program, which was called "Hubert" for reasons obscure to me. Over days and even weeks, the outputs were identical and **synchronous**, which of course did not prove that they had succeeded in copying the brain's functional structure, but the **empirical support** was greatly encouraging.

Hubert's input, and hence activity, had been kept parallel with Yorick's during my **disembodied** days. And now, to demonstrate this, they had actually thrown the master switch that put Hubert for the first time in on-line control of my body — not Hamlet, of course, but Fortinbras. (Hamlet, I learned, had never been recovered from its underground tomb and could be assumed by this time to have largely returned to the dust. At the head of my grave still lay the magnificent bulk of the abandoned device,

with the word STUD **emblazoned** on its side in large letters — a circumstance which may provide **archaeologists** of the next century with a curious insight into the **burial rites of their ancestors.**)

The laboratory technicians now showed me the master switch, which had two positions, labelled B, for Brain (they didn't know my brain's name was Yorick) and H, for Hubert. The switch did indeed point to H, and they explained to me that if I wished, I could switch it back to B. With my heart in my mouth (and my brain in its vat), I did this. Nothing happened. A click, that was all. To test their claim, and with the master switch now set at B. I hit Yorick's output transmitter switch on the vat and sure enough, I began to faint. Once the output switch was turned back on and I had recovered my wits, so to speak, I continued to play with the master switch, flipping it back and forth. I found that with the exception of the **transitional click**, I could detect no trace of a difference. I could switch in mid-utterance, and the sentence I had begun speaking under the control of Yorick was finished without a pause or hitch of any kind under the control of Hubert. I had a spare brain, a **prosthetic device** which might some day stand me in very good stead, were some mishap to befall Yorick. Or alternatively, I could keep Yorick as a spare and use Hubert. It didn't seem to make any difference which I chose, for the wear and tear and fatigue on my body did not have any **debilitating effect** on either brain, whether or not it was actually causing the motions of my body, or merely spilling its output into thin air.

The one truly unsettling aspect of this new development was the prospect, which was not long in dawning on me, of someone detaching the spare — Hubert or Yorick, as the case might be — from Fortinbras and hitching it to yet another body — some **Johnny-come-lately Rosencrantz or Guildenstern**. Then (if not before) there would be two people, that much was clear. One would be me, and the other would be a sort of super-twin brother. If there were two bodies, one under the control of Hubert and the other being controlled by Yorick, then which would the world recognize as the true Dennett? And whatever the rest of the world decided, which one would be me? Would I be the Yorick-brained one, **in virtue of** Yorick's causal priority and former intimate relationship with the original Dennett body, Hamlet? That seemed a **bit legalistic**, a bit too redolent of the **arbitrariness of consanguinity** and legal possession, to be convincing at the metaphysical level. For suppose that before the arrival of the second body on the scene, I had been keeping Yorick as the spare for years, and letting Hubert's output drive my body — that is, Fortinbras — all that time. The Hubert-Fortinbras couple would seem then by squatter's rights (to combat one legal intuition with another) to be the true Dennett and the lawful inheritor of everything that was Dennett's. This was an interesting question, certainly, but not nearly so **pressing** as another question that bothered me. My strongest intuition was that in such an eventuality I would survive so long as either brain-body couple remained intact, but I had mixed emotions about whether I should want both to survive.

I discussed my worries with the technicians and the project director. The prospect of two Dennetts was **abhorrent** to me, I explained, largely for social reasons. I didn't want

to be my own rival for the affections of my wife, nor did I like the prospect of the two Dennetts sharing my modest professor's salary. Still more vertiginous and distasteful, though, was the idea of knowing that much about another person, while he had the very same goods on me. How could we ever face each other? My colleagues in the lab argued that I was ignoring the bright side of the matter. Weren't there many things I wanted to do but, being only one person, had been unable to do? Now one Dennett could stay at home and be the professor and family man while the other could strike out on a life of travel and adventure — missing the family of course, but happy in the knowledge that the other Dennett was keeping the home fires burning. I could be faithful and adulterous at the same time. I could even cuckold myself — to say nothing of other more **lurid possibilities** my colleagues were all too ready to force upon my **overtaxed** imagination. But my ordeal in Oklahoma (or was it Houston?) had made me less adventurous, and I shrank from this opportunity that was being offered (though of course I was never quite sure it was being offered to me in the first place).

There was another prospect even more disagreeable: that the spare, Hubert or Yorick as the case might be, would be detached from any input from Fortinbras and just left detached. Then, as in the other case, there would be two Dennetts, or at least two claimants to my name and possessions, one embodied in Fortinbras, and the other sadly, miserably disembodied. Both selfishness and altruism bade me take steps to prevent this from happening. So I asked that measures be taken to ensure that no one could ever tamper with the transceiver connections or the master switch without my (our? no, my) knowledge and consent. Since I had no desire to spend my life guarding the equipment in Houston, it was mutually decided that all the electronic connections in the lab would be carefully locked. Both those that controlled the life-support system for Yorick and those that controlled the power supply for Hubert would be guarded with fail-safe devices, and I would take the only master switch, outfitted for radio remote control, with me wherever I went. I carry it strapped around my waist and — wait a moment — here it is. Every few months I **reconnoitre** the situation by switching channels. I do this only in the presence of friends, of course, for if the other channel were, heaven forbid, either dead or otherwise occupied, there would have to be somebody who had my interests at heart to switch it back, to bring me back from the void. For while I could feel, see, hear, and otherwise sense whatever befell my body, subsequent to such a switch, I'd be unable to control it. By the way, the two positions on the switch are intentionally unmarked, so I never have the faintest idea whether I am switching from Hubert to Yorick or **vice versa**. (Some of you may think that in this case I really don't know who I am, let alone where I am. But such reflections no longer make much of a dent on my essential Dennettness, on my own sense of who I am. If it is true that in one sense I don't know who I am then that's another one of your philosophical truths of underwhelming significance.)

In any case, every time I've flipped the switch so far, nothing has happened. So let's give it a try

“THANK GOD! I THOUGHT YOU'D NEVER FLIP THAT SWITCH! You can't imagine how horrible it's been these last two weeks — but now you know; it's your turn in purgatory. How I've longed for this moment! You see, about two weeks ago — excuse me, ladies and gentlemen, but I've got to explain this to my . . . um, brother, I guess you could say, but he's just told you the facts, so you'll understand — about two weeks ago our two brains drifted just a bit out of synch. I don't know whether my brain is now Hubert or Yorick, any more than you do, but in any case, the two brains drifted apart, and of course once the process started, it snowballed, for I was in a slightly different **receptive state** for the input we both received, a difference that was soon magnified. In no time at all the illusion that I was in control of my body — our body — was completely dissipated. There was nothing I could do — no way to call you. YOU DIDN'T EVEN KNOW I EXISTED! It's been like being carried around in a cage, or better, like being possessed — hearing my own voice say things I didn't mean to say, watching in frustration as my own hands performed deeds I hadn't intended. You'd scratch our itches, but not the way I would have, and you kept me awake, with your tossing and turning. I've been totally exhausted, on the verge of a nervous breakdown, carried around helplessly by your frantic round of activities, sustained only by the knowledge that some day you'd throw the switch.

“Now it's your turn, but at least you'll have the comfort of knowing I know you're in there. Like an expectant mother, I'm eating — or at any rate tasting, smelling, seeing — for two now, and I'll try to make it easy for you. Don't worry. Just as soon as this colloquium is over, you and I will fly to Houston, and we'll see what can be done to get one of us another body. You can have a female body — your body could be any colour you like. But let's think it over. I tell you what — to be fair, if we both want this body, I promise I'll let the project director flip a coin to settle which of us gets to keep it and which then gets to choose a new body. That should guarantee justice, shouldn't it? In any case, I'll take care of you, I promise. These people are my witnesses.

“Ladies and gentlemen, this talk we have just heard is not exactly the talk I would have given, but I assure you that everything he said was perfectly true. And now if you'll excuse me, I think I'd — we'd — better sit down.”

From Brainstorms: Philosophical Essays on Mind and Psychology, Daniel C. Dennett,

Lying on our backs, looking up at the stars: Garrison Keillor,

We caught and talked, and we took a swim now and then to keep off sleepiness. It was kind of solemn, drifting down the big still river, laying on our backs looking up at the stars, and we didn't ever feel like talking loud, and it warn't often that we laughed, only a little kind of low chuckle. We had mighty good weather, as a general thing, and nothing ever happened to us at all, that night, nor the next, nor the next.

—MARK TWAIN, "The Adventures of Huckleberry Finn"

It always made me proud as a kid to think that my great-great-great-great-great-grandfather Elder John Crandall, who left England in 1634 and settled in Rhode Island on land he bought from the Misquamicut Indians, was a considerable man in Colonial history, who, according to family history, accompanied Roger Williams to London in 1663 to obtain a **charter** from King Charles II guaranteeing the inhabitants of Rhode Island Colony political and religious freedom, and I felt his **lustre** reflected on us, his descendants in the little white house on a hot July day in the potato fields along the Mississippi north of Minneapolis. Our family didn't have any money, and none of us had been to college, so he was our main claim to fame. He didn't come over on **the Mayflower**, but he knew people who did. If he only had bought up more land in the right places, he'd have been richer than Vanderbilt and we'd all be sitting in Newport sipping lemonade on a cool **veranda** instead of **hoeing** rows of potatoes in the sun and getting dust in our mouths. We'd go to Crandall University. The problem was that our ancestors had left America. When the Revolution came along, our family was loyal to the King and left their land behind and shipped out to Nova Scotia before the shooting began. A hard fact to face, that your ancestors were on the side that hung Nathan Hale, and if they'd been in attendance at the **gallows** and heard his **immortal** last words, they'd have hung him just the same probably and maybe hung him harder. Perhaps that was why we went all out at the Fourth of July. We celebrated by grilling hamburgers and picking the first of the sweet corn and blowing off fireworks that my dad got from someone who smuggled them in from South Dakota, fireworks being illegal in our state. Sensible Minnesota Scandinavians had passed a reasonable and good law to protect us which all of us disobeyed in the spirit of the great national holiday. We set off cherry bombs in **culverts** and lit strings of firecrackers between houses for maximum **reverberation**, and after dark we set off rockets. The sight of one made my mother's heart **flutter** and she had to close her eyes. "You be careful you don't blow your hand off!" she called from the porch, afraid to look, but personal safety was not the point of the Fourth. We stuck the rockets in the grass and lit them one by one. The fuses sizzled and up they went screaming into the night and hung in silence at the **apogee** and drifted down and then suddenly lit up the sky with a burst of red white and blue sparks and a blast that rattled the birch trees, a ka-boom loud enough

to wake up every law-abiding citizen for a mile around, and then, satisfied that we had made our country freer, we went to bed.

All that thunder and lightning plus a patriotic picnic and a ball game between married men and single men, and what better day for it? What day could be more deserving of racket and good cooking than July 4, the anniversary of the day in 1776 when the Second Continental Congress adopted **Jefferson's Declaration of Independence**? As the delegates talked in Philadelphia, the Revolution was more than a year old. Paul Revere had galloped through Middlesex, and Ethan Allen and the Green Mountain Boys had captured Fort Ticonderoga, and the Battle of Bunker Hill ("Don't fire until you see the whites of their eyes!") had been fought, but the revolutionaries had not yet agreed that a revolution was what they wanted. There were plenty of people like my ancestors who felt the quarrel with the mother country could be patched up if patient men would negotiate reasonably, as Englishmen, and avoid further bloodshed. After all, they were no revolutionaries, those Crandalls—they were English, and how can you change what you are? (By a revolution, of course.)

The Declaration set out to justify the uprising and the violence by accusing the King of "repeated injuries and **usurpations** all having in direct object the establishment of an **absolute Tyranny** over these States"—of sending "swarms of Officers to **harass** our People and eat out their substance," of "imposing Taxes on us without our Consent" and "altering fundamentally the Forms of our Governments"—meanwhile, "In every stage of these Oppressions We have Petitioned for Redress in the most humble terms: Our repeated Petitions have been answered only by repeated injury." But the genius of the document lies in two sentences, a pure and passionate statement of natural rights:

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed

Like anyone who gets in a fight, the early politicians claimed the **noblest purpose** for themselves and nailed their flag to the highest tree in the woods, and they connected the American enterprise to the greater cause of human rights so that nobody could be in doubt about it. Nobody has ever been in doubt about it. They wrote their **propaganda** so well that it became our **shining ideal**. The Declaration set the country on a course that neither ignorance nor cruelty could distract us from for very long—a journey toward a day when we all look at each other with love and respect, black and white, men and women, religious and **irreligious** and anti-religious, immigrants from every point on the globe—when we look at each other as God looks at us, as free and equal and dignified and good-looking people.

All of the **wahoos and bigots** and snake-oil salesmen who ever wrapped themselves and their dismal causes in the flag and tried to sell hatred as Americanism could not

last long because this Declaration said so clearly what the flag and the nation stand for. Freedom and equality. Once people gain a measure of it, they will not give it up, no matter how hard the struggle, as Walt Whitman wrote in 1855:

The battle rages with many a loud alarm and frequent advance and retreat. . . the enemy triumphs. . . the cause is asleep. . . and is liberty gone out of that place? No never. When liberty goes . . . it waits for all the rest to go. . . It is the last. When the memories of the old martyrs are faded utterly away. . . when the large names of patriots are laughed at in the public halls from the lips of the orators. . . when the swarms of **cringers**, suckers, **doughfaces**, lice of politics, planners of **sly involutions** for their **own preferment** to city offices or state legislatures or the judiciary or congress or the presidency, obtain a response of love and **natural deference** from the people. . . when it is better to be a bound booby and rogue in office at a high salary than the poorest free mechanic or farmer with his hat unmoved from his head and firm eyes and a candid and generous heart ... or rather when all the souls of men and women are discharged from any part of the earth—then only shall the instinct of liberty be discharged

Prosperous Anglo-Saxon men, many of them slaveholders, wrote equality and natural rights into the political language, which cracked open the society they knew and began the revolution that began after the Revolution ended and took us in the direction of a dream down the long winding road that leads from those elegant fellows in knee-breeches to the folks who live in my neighbourhood in New York, black families, women, white gentry, black welfare mothers, gay people, German Lutherans, Russian Jews, Greeks, Koreans, homeless people, **exiled** Midwesterners, New Yorkers all, and all of them having ridden the Eighth Avenue subway at rush hour, claim **unalienable dignity as individuals**.

Heroes, all of them—at least they're my heroes, especially the new immigrants, especially the refugees. Everyone makes fun of New York cabdrivers who can't speak English: they're heroes. To give up your country is the hardest thing a person can do: to leave the old familiar places and ship out over the edge of the world to America and learn everything over again different that you learned as a child, learn the new language that you will never be so smart or funny in as in your true language. It takes years to start to feel semi-normal. And yet people still come—from Russia, Vietnam and Cambodia and Laos, Ethiopia, Iran, Haiti, Korea, Cuba, Chile, and they come on behalf of their children, and they come for freedom. Not for our land (Russia is as beautiful) not for our culture (they have their own, thank you), not for our standard of living (it frankly ain't that great), not for our system of government (they don't know about it, may not even agree with it), but for freedom. They are heroes who make an adventure on our behalf showing us by their struggle how precious beyond words freedom is, and if we knew their stories, we could not keep back the tears.

In 1970, in search of freedom and dignity and cheap rent, I moved out to a farmhouse on the rolling prairie in central Minnesota, near Freeport, where I planted a garden and

wrote stories to support my wife and year-old son. Rent was \$80 a month. It got us a big square brick house with a porch that looked out on a peaceful barnyard, a granary and machine sheds and corncribs and silo, and the barn and feedlot where Norbert, the farmer who I rented from, kept his beef cattle. Beyond the windbreak of red oak and spruce to the west and north lay a hundred sixty acres of his corn and oats. (I believed it was oats, but on the odd chance it might be wheat or barley, I didn't mention anything to Norbert about it being oats.) Our long two-rut driveway ran due north through the woods to where the gravel road made an L, where our mailbox stood, where you could stand and see for a couple miles in all directions, the green fields and the thick groves around the farmsites.

My pals in Minnesota considered this a real paradise (so did we) and they often drove up and enjoyed a weekend of contemplating corn and associating with large animals. On the Fourth of July, 1971, we had twenty people come for a picnic in the yard, an Olympic egg toss and gunnysack race, a softball game with the side of the barn for a right-field fence, and that night we sat around the kitchen and made pizza and talked about the dismal future.

America was trapped in Vietnam, our good country bleeding for its awful mistakes and unable to withdraw, and how could the tragedy end, if not in nuclear disaster or revolution? We were pessimists; we needed fear to make us feel truly alive. We talked about death. We put on "A Hard Day's Night," loud, and made lavish pizzas with fresh mushrooms and onions, zucchini, eggplant, garlic, green pepper, and drank beer and talked about the end of life on earth with a morbid piety that made a person sick.

"I don't see how a person can have children right now," said a pal, his mouth full. My little boy sat on my lap, surveying the three pizzas: three domes of melted cheese on three hills of hot fresh greens on three beds of fresh bread crust, executive and judicial and legislative pizzas.

"I mean it's fine if you do," he said, "but I couldn't. What right do we have to bring a kid into the world, knowing there very likely might not even be a world ten years from now? Ten years—hell, five. Three."

There was much more: about racial hatred, pesticides, radiation, television, the invincible stupidity of the government and whether Vietnam was the result of strategic mistakes or a reflection of evil in American culture—it was a conversation with concrete shoes, and while I can be as grim and pretentious as the next person, when I hear the word "culture" I reach for the doorknob. I snuck out to the screen porch with my son and sat and listened to crickets, and my friend Greg sat with us and I recall that two others joined us, all of us tired of apocalyptic politics and talk, and we walked along the driveway out of the yardlight and through the dark trees and sat down in a strip of alfalfa between the woods and the oats. ("What's that?" they said. "Oats," I replied.) And then we lay down on our backs and looked up at the sky full of stars.

The sky was clear. Lying there, looking up at the hemisphere of billions of dazzling single brilliances, made us feel we had gone away and left the farm far behind.

As we usually see the sky, it is a backdrop, the sky over our house, the sky beyond the clotheslines, but lying down eliminates the horizon and rids us of that strange realistic perspective of the sky as a canopy cantered over our heads, and we see the sky as what it is: everything known and unknown, the universe, the whole beach other than the grain of sand we live on. The sight of the sky was so stunning it made us drunk. I felt as if I could put one foot forward and walk away from the wall of ground at my back and hike out toward Andromeda. I didn't feel particularly American. Out there in the Milky Way and the world without end Amen, America was a tiny speck of a country, a nickel tossed into the Grand Canyon, and American culture the amount of the Pacific Ocean you bring home in your swimsuit. The president wasn't the president out there, the Constitution was only a paper, and what newspapers wrote about was sawdust and coffee grounds. The light I saw was from fires burning before America existed, when the Crandalls lived in Rhode Island. Looking out there, my son lying on my chest, I could imagine my grandchildren and they were more real to me than Congress.

I imagined them strong and free, curious, sensuous, indelibly cheerful and affectionate, openhanded—sympathetic to pain and misery and quick in charity, proud when insulted and modest if praised, fiercely loyal to friends, loving God and the beautiful world including our land from the California coast to the North Dakota prairie to faraway Manhattan, loving music and our American language—when you look at the stars you don't think small. You don't hope your descendants will enjoy your mutual fund portfolio, you imagine them as giants on the earth.

Between the tree line and my left elbow, a billion stars in the sky, each representing a billion we couldn't see. We lay in the grass, thinking about America and also slightly about snakes and about spiders clambering from blade to blade who might rappel down into our mouths, and looked open-mouthed up at the heavens and everything we said out loud seemed hilarious to us. Tiny us gazing up at The South Wall of The Unimaginable Everything and feeling an obligation to comment, and our most profound comments sounded like peas dropped in a big empty bucket. "It makes you feel small, doesn't it." Plink. "I used to know the names of those." Plunk. One more peabrain having to share the effect that the world is having on him. "It's beautiful, isn't it ... I remember when I was a kid—" someone said and we laughed ourselves limp—shut up, we said, laughing, we're sick of sensitive people, everything you see just reminds you of yourself! So stick it in your ear.

The Revolution was launched in frustration and anger at the mess that greed and arrogance make in the world (and most of the Declaration is as angry as what was said around the kitchen table), but the Revolution was harnessed to a great idea thought by men who lay on the ground and looked up at the stars. Or so I thought, lying there in the alfalfa. Perhaps in 1776 they too were rattled by current events and

the perfect **logic of despair** and had to go out and lie in the weeds for a while. Indoors all the news is secondhand, mostly bad, and even good people are drawn into a **dreadful fascination** with doom and **demise**; their faith in extinction gets stronger; they sit and tell stories that begin with The End. But one look at heaven can restore our spirits to their **natural immensity** and **blessedness**, and we feel free, and the idea of liberty becomes larger. The sentence about equal rights does not sound small or ridiculous when you recite it while looking at the stars:

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.

The stars in the sky, my friends in the grass, my son asleep on my chest, and a fly flew in my mouth, and went deep, forcing me to swallow, **inducing** a major life change for him, from fly to simple protein, and so shall we all be changed someday, but meanwhile: Life! Liberty! and (huff huff pant pant huff huff) Happiness!

The boy is nineteen now. Almost all my friends' children are suddenly grown up, including kids of girls who I looked at the stars with while listening to Buddy Holly and the Everly Brothers and guys I ran around with including one who owned a pink '57 Oldsmobile with yards of **glittering chrome** and a custom airhorn that when you pulled a wire under the dash it made a long moo, like a singing Holstein. He and I never thought about being dads but it didn't surprise us either. Our parents told us that listening to rock 'n' roll would lead to having babies, and they were right, and you kids are them.

The day you were born, our **nostalgia** for our own youth flickered and dimmed, the book snapped shut on our **grudges** against our elders who brought us up miserably and taught us the wrong things and so badly, and we began to look forward to your life.

We lived in dread of various **unnameable calamities**—waking up at night in fear and getting up to make sure your little rear end was rising and falling in the crib, leaping out of chairs at the sound of a crash, panicking sometimes at the sound of silence or a small sound such as crunching, e.g., the time my little boy came into view **chewing a morsel** that sounded funny and turned out to be half of the carcass of a mouse dead from rat poison and we flew to the car with him and for some reason didn't drive the car straight into a tree en route to the doctor's and all die instantly—but mostly we have been hopeful and **progressive**, forward looking, anticipating your first steps, your first words, and eventually your winning your freedom from us and going bravely through the door to pursue your happiness in this free country.

And we are hopeful about the progress of liberty and believe that the idea of equal rights that Americans have struggled with for two hundred and twelve years will be more perfectly realized and understood by our children and grandchildren.

You will grow up less weighted down by fears and shame and all the rocks we carried in our pockets. You being easier about who you are will be less troubled by people who are different from you, whose names are strange, who are another colour, who speak another language, pray to a different God or don't pray at all, whose feelings and opinions seem odd and even wrong, who put pickles on their hot dogs instead of onions and mustard: you will take them in stride, as people. You will live in an America where women and men, black and white, have something like an equal chance to learn, to work, to create, and to enjoy the good things in life. You will meet each other on simple equal terms and not be afraid or ashamed, seeing that the other is as good as yourself, whether they know it or not, and as capable of comedy or grief.

What we celebrate isn't loyalty to a culture, or love of the land, or dedication to institutions of government, but love of the idea: Liberty—Equality—one and **inseparable**. We have turned our faces toward this sun since 1776 and will not turn away from it. Whitman said: "Liberty relies upon itself, invites no one, promises nothing, sits in calmness and light, is positive and composed, and knows no discouragement."

Courage. God bless the idea of America and hats off to the writers who produced this fine Declaration. I'm sorry that my family wasn't around to sign it or cheer for it, but if you pass me a rocket, I'd be happy to light it for them.

The most obvious differences between different animals are differences of size, but for some reason the zoologists have paid **singularly** little attention to them. In a large textbook of zoology before me I find no indication that the eagle is larger than the sparrow, or the hippopotamus bigger than the hare, though some **grudging admissions** are made in the case of the mouse and the whale. But yet it is easy to show that a hare could not be as large as a hippopotamus or a whale as small as a herring. For every type of animal there is a most convenient size, and a large change in size **inevitably** carries with it a change of form.

Let us take the most obvious of possible cases, and consider a giant man sixty feet high - about the height of Giant Pope and **Giant Pagan** in the illustrated Pilgrim's progress of my childhood. These monsters were not only ten times as high as Christian, but ten times as wide and ten times as thick, so that their total weight was a thousand times his, or about eighty to ninety tons. Unfortunately **the cross sections of their bones** were only a hundred times those of Christian, so that every square inch of giant bone had to support ten times the weight borne by a square inch of human bone. As the human thigh-bone breaks under about ten times the human weight, Pope and **Pagan** would have broken their thighs every time they took a step. This was doubtless why they were sitting down in the picture I remember. But it lessens ones respect for Christian and Jack the Giant Killer.

To turn to zoology, suppose that a gazelle, a **graceful** little creature with long thin legs, is to become large, it will break its bones unless it does one of two things. It may make its legs short and thick, like the rhinoceros, so that every pound of weight has still about the same area of bone to support it. Or it can compress its body and stretch out its legs **obliquely** to gain stability, like the giraffe. I mention these two beasts because they happen to belong to the same order as the gazelle, and both are quite successful mechanically, being remarkably fast runners.

Gravity, a mere nuisance to Christian, was a terror to Pope, Pagan, and Despair. To the mouse and any smaller animal it presents practically no dangers. You can drop a mouse down a thousand-yard mine shaft; and, on arriving at the bottom it gets a slight shock and walks away, provided that the ground is fairly soft. A rat is killed, a man is broken, a horse splashes. For the **resistance** presented to movement by the air is proportional to the surface of the moving object. Divide an animal's length, breadth, and height each by ten; its weight is reduced to a thousandth, but its surface only a hundredth. So the resistance to falling in the case of the small animal **is relatively** ten times greater than the driving force.

An insect, therefore, is not afraid of gravity; it can fall without danger, and can cling to the ceiling with remarkably little trouble. It can go in for elegant and **fanstastic forms** of support like that of the daddy-longlegs. But there is a force which is as formidable to

an insect as gravitation to a mammal. This is surface tension. A man coming out of a bath carries with him a film of water about one-fiftieth of an inch in thickness. This weighs roughly a pound. A wet mouse has to carry about its own weight of water. A wet fly has to lift many times its own weight and, as everyone knows, a fly once wetted by water or any other liquid is in a very serious position indeed. An insect going for a drink is in a great danger as man leaning out over a precipice in search of food. If it once falls into the grip of the surface tension of the water -that is to say, gets wet - it is likely to remain so until it drowns. A few insects, such as water-beetles, **contrive to be** unwaterable; the majority keep well away from their drink by means of a long proboscis.

Of course tall land animals have other difficulties. They have to pump their blood to greater heights than a man, and, therefore, require a larger blood pressure and tougher blood-vessels. A great many men die from burst arteries, greater for an elephant or a giraffe. But animals of all kinds find difficulties in size for the following reason. A typical small animal, say a microscopic worm or rotifer, has a smooth skin through which all the oxygen it requires can soak in, a straight gut with sufficient surface to absorb its food, and a single kidney. Increase its dimensions tenfold in every direction, and its weight is increased a thousand times, so that if it to use its muscles as efficiently as its **miniature counterpart**, it will need a thousand times as much food and oxygen per day and will **excrete** a thousand times as much of waste products.

Now if its shape is unaltered its surface will be increased only a hundredfold, and ten times as much oxygen must enter per minute through each square millimetre of skin, ten times as much food through each square millimetre of intestine. When a limit is reached to their absorptive powers their surface has to be increased by some special device. For example, a part of the skin may be drawn out into tufts to make gills or pushed in to make lungs, thus increasing the oxygen-absorbing surface in proportion to the animal's bulk. A man, for example, has a hundred square yards of lung. Similarly, the gut, instead of being smooth and straight, becomes coiled and develops a velvety surface, and other organs increase in complication. The higher animals are not larger than the lower because they are more complicated. They are more complicated because they are larger. Just the same is true of plants. The simplest plants, such as the green algae growing in **stagnant water** or on the bark of trees, are mere round cells. The higher plants increase their surface by putting out leaves and roots. **Comparative anatomy** is largely the story of the struggle to example, while vertebrates carry the oxygen from the gills or lungs all over the body in the blood, insects take air directly to every part of their body by tiny blind tubes called tracheae which open to the surface at many different points. Now, although their breathing movements they can renew the air in the outer part of the tracheal system, the oxygen has to penetrate the finer branches by means of diffusion. Gases can diffuse easily through very small distances, not many times larger than the average length travelled by a gas molecule between collisions with other molecules. But when such vast journeys-from the point of view of a molecule-as a quarter of an inch have to be made,

the process becomes slow. So the portions of an insect's body more than a quarter of an inch from the air would always be short of oxygen. In consequence hardly any insects are much more than half an inch thick. Land crabs are built on the same general plan as insects, but are much clumsier. Yet like ourselves they carry oxygen around in their blood, and are therefore able to grow far larger than any insects. If the insects had hit on a plan for driving air through their tissues instead of letting it soak in, they might well have become as large as lobsters, though other considerations would have prevented them from becoming as large as man.

Exactly the same difficulties attach to flying. It is an elementary principle of aeronautics that the minimum speed needed to keep an aeroplane of a given shape in the air varies as the square root of its length. If its linear dimensions are increased four times, it must fly twice as fast. Now the power needed for the minimum speed increases more rapidly than the weight of the machine. So the larger aeroplane, which weighs sixty-four times as much as the smaller, needs one hundred and twenty-eight times its horsepower to keep up. Applying the same principle to the birds, we find that the limit to their size is soon reached. An angel whose muscles developed no more power weight for weight than those of an eagle or a pigeon would require a breast projecting for about four feet to house the muscles engaged in working its wings, while to economize in weight, its legs would have to be reduced to mere stilts. Actually a large bird such as an eagle or kite does not keep in the air mainly by moving its wings. It is generally to be seen soaring, that is to say balanced on a rising column of air. And even soaring becomes more and more difficult with increasing size. Were this not the case eagles might be as large as tigers and as formidable to man as hostile aeroplanes.

But it is time that we pass to some of the advantages of size. One of the most obvious is that it enables one to keep warm. All warm-blooded animals at rest lose the same amount of heat from a unit area of skin, for which purpose they need a food-supply proportional to their surface and not to their weight. Five thousand mice weigh as much as a man. Their combined surface and food or oxygen consumption are about seventeen times a man's. In fact a mouse eats about one quarter its own weight of food every day, which is mainly used in keeping it warm. For the same reason small animals cannot live in cold countries. In the arctic regions there are no reptiles or amphibians, and no small mammals. The smallest mammal in Spitzbergen is the fox. The small birds fly away in winter, while the insects die, though their eggs can survive six months or more of frost. The most successful mammals are bears, seals, and walruses.

Similarly, the eye is a rather inefficient organ until it reaches a large size. The back of the human eye on which an image of the outside world is thrown, and which corresponds to the film of a camera, is composed of a mosaic of "rods and cones" whose diameter is little more than a length of an average light wave. Each eye has about a half a million, and for two objects to be distinguishable their images must fall on separate rods or cones. It is obvious that with fewer but larger rods and cones we

should see less distinctly. If they were twice as broad two points would have to be twice as far apart before we could distinguish them at a given distance. But if their size were diminished and their number increased we should see no better. For it is impossible to form a definite image smaller than a **wave-length of light**. Hence a mouse's eye is not a small-scale model of a human eye. Its rods and cones are not much smaller than ours, and therefore there are far fewer of them. A mouse could not distinguish one human face from another six feet away. In order that they should be of any use at all the eyes of small animals have to be much larger in proportion to their bodies than our own. Large animals on the other hand only require relatively small eyes, and those of the whale and elephant are little larger than our own. For rather more recondite reasons the same general principle holds true of the brain. If we compare the brain-weights of a set of very similar animals such as the cat, cheetah, leopard, and tiger, we find that as we quadruple the body-weight the brain-weight is only doubled. The larger animal with **proportionately** larger bones can **economize on brain, eyes, and certain other organs**.

Such are a very few of the considerations which show that for every type of animal there is an **optimum size**. Yet although Galileo demonstrated the contrary more than three hundred years ago, people still believe that if a flea were as large as a man it could jump a thousand feet into the air. As a matter of fact the height to which an animal can jump is more nearly independent of its size than proportional to it. A flea can jump about two feet, a man about five. To jump a given height, if we neglect the resistance of air, requires an **expenditure of energy proportional to the jumper's weight**. But if the jumping muscles form a constant fraction of the animal's body, the energy developed per ounce of muscle is independent of the size, provided it can be developed quickly enough in the small animal. As a matter of fact an insect's muscles, although they can contract more quickly than our own, appear to be less efficient; as otherwise a flea or grasshopper could rise six feet into the air.

And just as there is a best size for every animal, so the same is true for every human **institution**. In the Greek type of democracy all the citizens could listen to a series of orators and vote directly on questions of **legislation**. Hence their philosophers held that a small city was the largest possible democratic state. The English invention of representative government made a democratic nation possible, and the possibility was first realized in the United States, and later elsewhere. With the development of broadcasting it has once more become possible for every citizen to listen to the political views of **representative orators**, and the future may perhaps see the return of the national state to the Greek form of democracy. Even the referendum has been made possible only by the institution of daily newspapers.

To the biologist the problem of **socialism** appears largely as a problem of size. The extreme socialists desire to run every nation as a single business concern. I do not suppose that Henry Ford would find much difficulty in running Andorra or Luxembourg on a socialistic basis. He has already more men on his **pay-roll** than their population. It is conceivable that a **syndicate of Fords**, if we could find them, would make Belgium

Ltd or Denmark Inc. pay their way. But while nationalization of certain industries is an obvious possibility in the largest of states, I find it no easier to picture a completely socialized British Empire or United States than an elephant turning somersaults or a hippopotamus jumping a hedge.

The Death of the Moth

Virginia Woolf

Moths that fly by day are not properly to be called moths; they do not **excite** that pleasant sense of dark autumn nights and ivy-blossom which the commonest yellow-underwing asleep in the shadow of the curtain never fails to rouse in us. They are **hybrid** creatures, neither gay like butterflies nor sombre like their own species. Nevertheless the present specimen, with his narrow hay-coloured wings, fringed with a tassel of the same colour, seemed to be content with life. It was a pleasant morning, mid-September, mild, **benignant**, yet with a keener breath than that of the summer months. The plough was already **scoring the field** opposite the window, and where the share had been, the earth was pressed flat and gleamed with moisture. Such vigour came rolling in from the fields and the down beyond that it was difficult to keep the eyes strictly turned upon the book. The rooks too were keeping one of their annual festivities; soaring round the tree tops until it looked as if a vast net with thousands of black knots in it had been cast up into the air; which, after a few moments sank slowly down upon the trees until every twig seemed to have a knot at the end of it. Then, suddenly, the net would be thrown into the air again in a wider circle this time, with the utmost **clamour and vociferation**, as though to be thrown into the air and settle slowly down upon the tree tops were a tremendously exciting experience.

The same energy which inspired the rooks, the ploughmen, the horses, and even, it seemed, the lean bare-backed downs, sent the moth fluttering from side to side of his square of the window-pane. One could not help watching him. One was, indeed, conscious of a queer feeling of pity for him. The possibilities of pleasure seemed that morning so enormous and so various that to have only a moth's part in life, and a day moth's at that, appeared a hard fate, and his **zest** in enjoying his meagre opportunities to the full, **pathetic**. He flew vigorously to one corner of his compartment, and, after waiting there a second, flew across to the other. What remained for him but to fly to a third corner and then to a fourth? That was all he could do, in spite of the size of the downs, the width of the sky, the far-off smoke of houses, and the romantic voice, now and then, of a steamer out at sea. What he could do he did. Watching him, it seemed as if a fibre, very thin but pure, of the enormous energy of the world had been thrust into his frail and **diminutive body**. As often as he crossed the pane, I could fancy that a thread of vital light became visible. He was little or nothing but life.

Yet, because he was so small, and so simple a form of the energy that was rolling in at the open window and driving its way through so many narrow and intricate corridors in my own brain and in those of other human beings, there was something marvellous as well as pathetic about him. It was as if someone had taken a tiny bead of pure life and decking it as lightly as possible with down and feathers, had set it dancing and zig-zagging to show us the true nature of life. Thus displayed one could not get over the strangeness of it. One is apt to forget all about life, seeing it humped and bossed and garnished and cumbered so that it has to move with the greatest circumspection and dignity. Again, the thought of all that life might have been had he been born in any other shape caused one to view his simple activities with a kind of pity.

After a time, tired by his dancing apparently, he settled on the window ledge in the sun, and, the queer spectacle being at an end, I forgot about him. Then, looking up, my eye was caught by him. He was trying to resume his dancing, but seemed either so stiff or so awkward that he could only flutter to the bottom of the window-pane; and when he tried to fly across it he failed. Being intent on other matters I watched these futile attempts for a time without thinking, unconsciously waiting for him to resume his flight, as one waits for a machine, that has stopped momentarily, to start again without considering the reason of its failure. After perhaps a seventh attempt he slipped from the wooden ledge and fell, fluttering his wings, on to his back on the window sill. The helplessness of his attitude roused me. It flashed upon me that he was in difficulties; he could no longer raise himself; his legs struggled vainly. But, as I stretched out a pencil, meaning to help him to right himself, it came over me that the failure and awkwardness were the approach of death. I laid the pencil down again.

The legs agitated themselves once more. I looked as if for the enemy against which he struggled. I looked out of doors. What had happened there? Presumably it was midday, and work in the fields had stopped. Stillness and quiet had replaced the previous animation. The birds had taken themselves off to feed in the brooks. The horses stood still. Yet the power was there all the same, massed outside indifferent, impersonal, not attending to anything in particular. Somehow it was opposed to the little hay-coloured moth. It was useless to try to do anything. One could only watch the extraordinary efforts made by those tiny legs against an oncoming doom which could, had it chosen, have submerged an entire city, not merely a city, but masses of human beings; nothing, I knew, had any chance against death. Nevertheless after a pause of exhaustion the legs fluttered again. It was superb this last protest, and so frantic that he succeeded at last in righting himself. One's sympathies, of course, were all on the side of life. Also, when there was nobody to care or to know, this gigantic effort on the part of an insignificant little moth, against a power of such magnitude, to retain what no one else valued or desired to keep, moved one strangely. Again, somehow, one saw life, a pure bead. I lifted the pencil again, useless though I knew it to be. But even as I did so, the unmistakable tokens of death showed themselves. The body relaxed, and instantly grew stiff. The struggle was over. The insignificant little creature now knew death. As I looked at the dead moth, this minute wayside triumph of so great a

force over so mean an antagonist filled me with wonder. Just as life had been strange a few minutes before, so death was now as strange. The moth having righted himself now lay most decently and uncomplainingly composed. O yes, he seemed to say, death is stronger than I am.