

## A – Awareness

Dear: As I mentioned in the *Preface*,<sup>1</sup> when I walk in the desert I review some ideas by going through the alphabet from A to Z. With “A” (for “Awareness”), I seek a sense of who, and what, and where I am. In turn, this helps me reach “the right mood” for my “meditation”. By “the right mood”, maybe I mean a contemplative state; soon I’ll explain what I mean by ‘meditation’.

And to get a sense of who, and what, and where I am, what better way than with my senses?! Imagine how it would be if you couldn’t see, or hear, or smell, or taste, or feel. If we were devoid of all these senses since birth, what would we think? Would we be able to?

Our senses are amazing. As with most animals, most humans have five senses, each providing our brains with signals about our environment. Our eyes can detect amazingly small amounts of energy as light (the type of electromagnetic energy to which our eyes are sensitive): as someone else estimated (and as you can check), if you could add up all the energy that you could see from a faint star during a million years, it would power a 100-watt light bulb only for about a millionth of a second!<sup>2</sup>

Yet, as amazingly sensitive as our eyes are, we can’t detect all the energy that exists at the huge range of other frequencies, at higher frequencies (from ultraviolet light, through x-rays, to very energetic gamma rays) or at the slower-frequency side of the “electromagnetic spectrum” (from infrared light, past radio waves, out to very long waves). Maybe even more amazing than our sense of sight is that some humans have had the sense – the “common sense” of science! – to detect such energies at other frequencies and then provide these capabilities to other people, e.g., via radio and TV!

Similarly, our ears can detect tiny acoustic pressure-waves of quite a broad band of frequencies: below the lowest bass in a rock band to, I swear, sometimes I hear the deer whistle on our car (used to scare away deer, so the car won’t hit them). Our “touchy-feely” cells can detect even light breezes

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<sup>1</sup> Available at <http://zenofzero.net/docs/3Preface.pdf>.

<sup>2</sup> Dear: If you care to check that estimate, use the experimental result that the human eye is capable of detecting about 10 photons of blue light, each with energy  $h\nu$ , where Planck’s constant  $h \sim 6.6 \times 10^{-34}$  Joule-sec (or Watt-sec<sup>2</sup>) and  $\nu$  is the frequency of blue light, which is given by the speed of light,  $c \sim 3 \times 10^8$  meters/sec divided by blue light’s wavelength (roughly 500 nanometers or  $0.5 \times 10^{-6}$  meters).

that stimulate a single hair follicle. Also, our olfactory glands and “taste buds” (cells, principally in our tongues) can detect the presence of an enormous number of different types of molecules, even when their concentrations are, in some cases, too low to detect with chemical instruments.<sup>3</sup>

The signals from all our senses, signals that inform us what exists in our environment, are continuously available to our brains (with the signals transferred within our bodies electronically). But most of us, most of the time, ignore these signals – which probably has survival value. But on occasion, such as when I go through this “meditation scheme”, I force myself to sample each one of these signals, to become more aware of my surroundings. I invite you to do the same.

Thus, Dear, when you are “of a mind”, I hope that, wherever you are, you look again at what’s around you. What colors do you see? What patterns? What detail? What motions? Isn’t it amazing how much of which, only a moment ago, you were unaware?

And what can you hear, right now? In the desert, from early spring (sometimes as early as January) until late fall (sometimes into late November), I’m frequently treated to the glorious challenge of the meadowlark. But even if meadowlarks are absent, usually there are sounds from other birds (especially from the sassy Jays, who seem to stay all year!), the sound of leaves rustled by the wind, and unfortunately, almost invariably, the sound of various motors. That is, although I sometimes enjoy the sound of a strong motor (especially if I own it!), yet there are times when I wish they’d be silent.

Also, smell the air for odors. What do you detect? In the desert, I almost invariably indulge myself by going closer to a sagebrush, to smell its wonderful aroma. And even if you’re not eating, don’t you taste something? And what do you feel? Not just with your hands: do you feel your clothes on your skin? Can you feel the hair on your head? In the desert, I feel the

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<sup>3</sup> Actually, Dear, recent research supports the conclusion that our ability to taste is related principally to our ability to detect odors. You can confirm that conclusion by holding your breath before you “get a whiff” of something that you don’t want to eat or drink – and then do it anyway, while still holding your breath. You can also confirm it the next time you have nasal congestion, e.g., with a “head cold”. Also, you might wonder (as did a reader) why our sense of smell (or taste) is so selective. Surely the reason is related to evolution: there was little “survival value” for our ancestors to be able to detect nitrogen gas, for example (or, for that matter, Freons!), but substantial value in being able to detect even minute quantities of various, natural, noxious chemicals. Unfortunately for us, our evolved abilities to detect noxious chemicals haven’t kept up with our recent abilities to create new ones.

sand give way under my feet, the wind on my face, the warmth (or chill) of the air.

That is, in summary, be aware. And be aware not just with your senses, but also with your intellect. Where are you? In which direction are you facing right now?

When I walk in the desert on my usual trail, I'm facing either almost directly north (going out) or directly south (coming back), and what I do is look to the horizon toward various places and people I remember well. For each such place around the world, I revisit "a picture" of the place that persists in my mind. Thus, revisiting places clockwise, starting from the northeast, I remember: a walk through the trees, uphill, toward a building at Stockholm University; a lake near the Hermitage in what was then called Leningrad; attending an opera in Hamburg; in London, laughing at a comedy until my stomach hurt; a dinner table in Geneva; driving up a hill and then into a little village in Italy; walking around a parking lot, at a motel on Long Island, and along a beach in Florida; sitting on the curb outside the airport terminal in Phoenix (trying to solve a math problem!); talking to a fellow about his car's transmission in Los Alamos (I don't know why that "picture" remains in my mind!); swimming at a beach near San Diego; the forest near Corvallis; and finally in the northwest, my boyhood home on the Coast. Sometimes, instead of "revisiting" these places (in my mind), I revisit some wonderful people I have known (from Sweden, Russia, the Ukraine, England, France, Italy, Israel, India, Japan, Brazil, America, and Canada), but I'll omit identifying them here.

And when I revisit these places and people in my mind, I'm almost always amazed at the capabilities of our brains. In physics, you may have already been exposed to the evidence that suggests that nothing can travel faster than the speed of light. But our minds have no such limitation! Thus, in my mind I travel from Stockholm to San Diego in less than a millisecond, whereas it takes electromagnetic waves almost a tenth of a second for that trip. In fact, it takes my mind only a minute or so to leave our entire galaxy – as I'll now demonstrate.

That is, first I travel in my mind away from our world, seeing our beautiful blue planet from deep in the darkness of space. Next, I orientate my imagined space travel relative to the "solar plane" (the plane defined by the Sun and the Earth and the other planets; they're all in almost the same plane, which is also rather amazing), pretending that I'm traveling perpendicular to

this plane, say toward the North Star. Subsequently, I imagine seeing our entire solar system; then, I “back away”, seeing our Sun fade to the size of just another star; and then, breaking out of our galactic plane (what a treat!), in my mind I see our entire “Milky Way” galaxy below. Going farther still, our entire galaxy seems like just another star...

And galaxies together band  
To form, all tolled, a grain of sand  
Along a beach in larger land;  
And it, in turn... you understand?

Well, you won't “understand” what that stanza is about, so I'd better explain. Also, there's something “bigger”, here, which I probably should mention first.

The bigger issue (maybe the biggest!) is the “mind-boggling” question: what is this universe?! As far as I know, no one has a good answer to that question. For me, none of the religious “answers” are of any value, save to stop people from thinking about the question – which, for many people, possibly has value. The Big-Bang theory, for how our universe “started”, has observational support, but it seems to address only part of the question, namely, the process by which our universe “inflated” – not what this whole “business” is “all about”. First, then, I should say: what the above stanza “is about” is the suggestion that maybe there are no boundaries to this universe; maybe there are universes within universes within universes, *ad infinitum*.

But I doubt it. That is, Dear, during the 30-or-so years since I wrote the above stanza, I've become more skeptical of the speculation that there are universes within universes, *ad infinitum* – but I've retained the stanza, for fun, claiming “poetic license” to stray from reality! One of the reasons for my rejecting the speculation is that I can't imagine how it could be tested – and when a speculation can't be tested, then it has no value.

Another reason for my rejecting the speculation (about universes within universes) is that, more recently, I've been “toying with” another idea to “explain” what this universe is “all about”. The essence of the idea is that what's here (i.e., this universe), in total, sums to totally nothing (i.e., zero) – exactly as it did before there was anything here. That's a little of what I mean in the title of this book by “Zen of Zero”; later in this chapter I'll give

you more “hints” of what I mean – but I won’t complete my explanation until I get to the **Z**-chapters, one of which is entitled “Zen of Zero.”

Now, Dear, if your immediate response to my suggestion [that “what’s here (i.e., the universe), in total, sums to totally nothing (i.e., zero)”] is to conclude that I’m saying that there’s nothing here, then my response would be not only “Gimme a break” (i.e., be a little kinder) but also “Be a little more patient: I may be dumb, kid, but I ain’t that stupid!”

Seriously though, Dear, think, first, about how much electrical charge exists. You can charge your comb by combing your hair (as the plastic in your comb strips electrons from your hair, because of differences in the way electrons are bound in the molecules of plastic vs. in the molecules of your hair), but I assume you know that, when combing your hair, you didn’t create any electrical charge – you just separated the charges. That is, in total, your comb plus your hair has exactly the same electrical charge as it had before you commenced combing, summing exactly, in total, to zero.

Similarly for all processes by which humans manipulate electrical charge, from making batteries to powering enormous electrical-transmission lines: we only separate charge; we never create it; in total, the electrical charge always sums to exactly zero. In fact, that’s a “general principle” of physics (called “the conservation of electrical charge” and based on an enormous number of experiments): electrical charge can never be created or destroyed, or equivalently, the net amount of electrical charge produced in any process is zero. Further, I doubt if there’s a single competent physicist who would disagree with the concept that, in total, the electrical charge of the universe sums to exactly zero – although it’s rather difficult to test if that hypothesis is correct! In any event and in summary, what always seems to happen with electrical charge is that the “original zero” (charge) is just separated into exactly compensating positive and negative components.

This case of separating electrical charge will, perhaps, give you a first hint of why I use the term “the Zen of Zero” – although it’s only the slightest hint. The hint is this: the idea that electrical charges can’t be created but only separated is consistent with the Ancient Chinese idea of yin and yang, defined as follows:<sup>4</sup>

*Yin and Yang*: Principle of polarity in Chinese cosmology, in which the opposite poles eventually blend and become one another in a cosmic connectedness.

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<sup>4</sup> Copied from <http://barbaria.com/god/philosophy/zen/glossary.htm>.

Now, Dear, it would take me longer to explain to you why, similarly, there appears to be, in total, no momentum in this universe. Maybe in your physics course you've already seen that momentum is always conserved during collisions in isolated systems (i.e., the total momentum is constant). Maybe you've also seen that in any explosion (a bubble bursting, the burst of a 4<sup>th</sup> of July "rocket", the explosion of a bomb, etc.), the momenta of all the fragments after any explosion similarly sum to exactly the same value as before it occurred. If you've seen that, then maybe you'll consider it to be reasonable to conclude that the total momentum in the universe, now, must be the same as "before" the Big Bang occurred, namely zero – which would be especially obvious if there was "nothing here", "before" the Big Bang!<sup>5</sup>

In the case of energy, maybe the idea that the total energy of the universe must be at least a constant won't seem too foreign to you if you've seen the first "law" (or better, the first principle) of thermodynamics, which states that energy (similar to electrical charge) can only be changed from one form to another; it can't be created or destroyed. That this constant value for the energy would be zero then follows, if initially ("before" the Big Bang) the energy was exactly zero (i.e., if the universe was created from "nothing").

And let me add, Dear, that if the above idea (that the total energy of the universe is zero) seems "weird" to you, given that you can see so many things whizzing around with so much kinetic energy, then prepare yourself for learning about even "weirder stuff" in later courses in physics. Thus, from Einstein's work, mass is actually "solidified positive-energy" (according to his  $E = mc^2$ ) and from Dirac's work, 'space' (or the vacuum) is seen to be actually "brim full" with "negative energy".<sup>6</sup>

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<sup>5</sup> Dear: Another hint about the Zen of Zero can be seen from the difficulty of using familiar words to try to describe totally foreign concepts, such as "nothing here" or "before the Big Bang" or (hint, hint), "the Tao", pronounced "Dao". Thus, as (perhaps) Lao Tzu wrote (perhaps in about 600 BCE) in the book *Tao Te Ching* ("The Book of the Way and Virtue"): "The Tao that can be spoken of, is not the true Tao; the name that can be named, is not the true Name." To try to alert you to my using familiar words (such as "nothing here", "before the Big Bang", "total nothingness", "outside our universe", etc.) to describe totally foreign concepts, I've put such words and phrases in quotation marks.

<sup>6</sup> Incidentally, Dear, although as I recall Dirac's original paper (which led to his prediction of 'anti-particles', i.e., "holes" in the negative-energy vacuum, e.g., the 'positron', and to his being awarded the 1933 Nobel Prize in Physics, along with one of the founders of quantum mechanics, Erwin Schrödinger), he stated that he didn't understand the meaning for his result showing "negative energy". Yet in his Nobel prize acceptance speech (available at [http://nobelprize.org/nobel\\_prizes/physics/laureates/1933/dirac-lecture.html](http://nobelprize.org/nobel_prizes/physics/laureates/1933/dirac-lecture.html)), he states: "We now make the assumptions that in the world as we know it, nearly all the states of negative energy for the electrons are occupied, with just one electron in each state, and that a uniform filling of all the negative-energy states is completely unobservable to us. Further, *any unoccupied negative-energy state, being a departure from uniformity, is observable and is just a positron.*"

But such details aside for now, if you can (at least for now) accept at least the possibility that, currently and in total, there's no charge, momentum, and energy in our universe, then maybe you can begin to see what I mean by suggesting that there's nothing here – and it must have been always so!<sup>7</sup>

Yet, if you're uncomfortable with the above suggestions, then maybe it would be helpful if I showed you the same idea using the simplest possible mathematics. Thus, the challenge is to try to answer the “age-old question” of how ‘something’ could have arisen from ‘nothing’ – or stated differently, how ‘nothing’ could have yielded ‘something’. Mathematically, the question is: How could ‘nothing’ (i.e., zero = 0) lead to ‘something’, say represented by the symbol S?

Well, the answer to that question is obvious:  $0 = S + (-S)$ , i.e., ‘nothing’ can obviously be separated into ‘something’ plus its negative. Alternatively, with A = (pretty much Anything), B = Bosons, C = Charge, D = Dark Matter, E = Energy, F = Fermions, G = Gluons, H = Hadrons, I = (I dunno!)... then ‘nothing’ can be separated into any number of ‘things’:

$$0 = (A - A) + (B - B) + (C - C) + (D - D) + (E - E) + \dots$$

From this, I suggest that we humans experience ‘something’ in this universe because the different parts (that sum to totally ‘nothing’) are separated. For example, the mass of all us humans is “merely” a particular arrangement of various “chunks” of positive energy, *via* Einstein's  $E = mc^2$ .

Thereby, Dear, the suggestion is that, “in the beginning”, there was “totally nothing”, “nowhere”, and with no “time”. This original “total nothingness” or “the original zero” had at least two options: sit there (nowhere!) and do nothing “forever” (which is meaningless, since there was no time “there”) or “start bubbling” or “fluctuating” – which, when you study quantum mechanics, you'll find that this “bubbling” is what Nature (at least in our universe) actually does!

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<sup>7</sup> Dear: I should point out that there's a concept in that sentence that (I guarantee!) you don't want me to go into – but for completeness, I should at least mention. Phrased as a question, it's: Is the total entropy of the universe also zero? I don't know the answer – and depending on how the entropy is defined, I'm not even sure if the question is even important! But in any event, at the Advanced Physics Forum (search for “The Tao of Physics and the Zen of Zero”), I've asked senior physicists for help in trying to answer the question (including how to define the entropy of the vacuum, especially if it's correct that, in the vacuum, time goes in the direction opposite from its familiar direction “out here”, on “the positive side of existence”), but so far, I've had no “takers”. Maybe they're waiting for you to answer the question!

There is (or was), however, a critical proviso for these “bubbings” or “fluctuations” in the “original nothing”. Any fluctuation could occur (consistent with what I call not the “quantum mechanics” but a more general “zigblat mechanics” of zero) provided that, when “the total nothingness” fluctuated, sampling all “states” available to it, then always-but-always the total “positive” of anything created (such as energy, spin, flavor, color, or whatever “quantum numbers” or “zigblat numbers” it “created”) was exactly balanced by corresponding “negatives”, in total summing exactly to zero, i.e., provided that always, in total, there was still totally nothing.

At least one of these fluctuations, however, apparently “broke the symmetry”, maybe permitting at least one chunk of positive energy to condense into a “string of energy” or a “particle” that “refused” to “rejoin” with its negative-energy counterpart. Once that happened, “all hell broke loose”: more and more positive energy became separated from the negative energy that we call ‘space’ or ‘the vacuum’, causing the Big Bang, starting time, creating our universe, and so on.

And though I wouldn’t be surprised if the patience of a certain grandchild is being “sorely tried”, I want to add a few comment about the importance of symmetry and about what symmetry might have been broken, leading to the Big Bang.

You’re familiar with many symmetries in nature: look at your two hands, look in the mirror to see the symmetry in your face, look again into the mirror and realize that you’re looking at a symmetrically reflected image of your face, look at a snowflake or a mushroom or a leaf, and so on – on and on. If you want to explore more, type in the words “symmetry in nature” into an internet search engine; using Google, you’ll get more than 20,000 “hits”! And if you explore still more, you’ll find substantial evidence to support the statement that the major advances in physics during the past 400 years or so [advances made by such people as Galileo (1564–1642), Newton (1642–1727), Maxwell (1831–1879), Einstein (1879–1955) – and by the way, notice the symmetry in those dates! – including recent advances in particle physics and string theory] have been, in essence, to uncover still more symmetries in nature.

To begin to appreciate the importance of symmetry for understanding nature, Dear, consider some obvious ideas. For example, consider what you’re doing while driving along the highway in a car. First, realize that any mass

(such as a car) never “possesses” any absolute momentum or (kinetic) energy – in the same way that it possesses a certain number of atoms. Thus, even though you may be driving along in a car at 50 mph relative to someone standing on the road, yet relative to you (sitting in the car), its velocity, momentum, and kinetic energy are zero. Nonetheless, even in your “stationary car” you should take extreme care, because a barricade “sitting” on the road in front of you (relative to someone standing on the road) would have an enormous amount of momentum coming right at you! That is, Dear, bodies don’t “possess” any absolute velocity, momentum, or (kinetic) energy, only relative values of these “things”.

In fact, if stationary and moving observers are to agree that in any collision (e.g., between a car and a barricade) momentum and energy are always conserved, then according to a 1915 demonstration by a brilliant but relatively unknown scientist Emmy Noether (whose name rhymes with “mother”), it’s necessary that space and time have (or space-time has) “translational symmetry”, i.e., all descriptions of nature are independent of location and velocity of the observer. This “translational symmetry” or “Galilean invariance” is one of many symmetries and associated invariances found in nature (and given such names as Lorentz invariance and gauge invariance), and Noether’s general result is that every symmetry implies a conservation law (and *vice versa*).<sup>8</sup>

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<sup>8</sup> Dear: In this book, I won’t be using any of the following information, but in case you’re interested, let me give you a “bird’s eye view” of a few of the accomplishments by the physicists already mentioned – from the perspective of symmetry. Galileo postulated translational symmetry for the equations of motion (as described by different observers moving relative to one another at a uniform relative velocity). One of Newton’s major accomplishments can be interpreted as showing that space has rotational symmetry: previous to his “universal law of gravity” and, for example, for an Earth-bound observer, there was an obvious asymmetry between up (or down) and sideways – but the asymmetry disappeared from the equations of motion when his “law” of gravity was incorporated (provided that proper account is taken for components of the gravitational force along each of the rotated axes). Maxwell’s equations were Galilean invariant, but experiments demonstrated that something was wrong: regardless of the observer’s speed, the speed of light was always the same. This led Lorentz to conclude that the Galilean transformation, itself, was correct only for speeds small compared to the speed of light, and in his special theory of relativity, Einstein showed why: since time, itself, travels only at the speed of light, then Newton’s idea about time were wrong, Lorentz’s transformations were correct, and when Einstein used them in Newton’s equations, he found that even when a mass is at rest, it has an energy,  $E$ , given by  $E = mc^2$ . Einstein then went on (in his general theory of relativity) to show that Newton’s ideas about gravity were causing an asymmetry in the description of nature by observers with different accelerations, leading him to introduce a more general (diffeomorphism) invariance, which eliminated the asymmetry for observers with different accelerations – but “at the expense” of concluding that space-time is “warped” by the presence of mass. Subsequently, particle physicists have made progress by requiring their theories to preserve even more symmetries under other groups of transformations; currently, they’re trying to determine if “supersymmetry” is correct; I’ll leave it to you to explore such topics on your own (e.g., see the electronic book *Event-Symmetric Space-Time* by P. Gibbs at <http://www.weburbia.com/press/html/gframe.htm>).

One symmetry that was expected but was found to be violated is “parity”, the discovery of which led to the award of the 1956 Nobel prize in physics to Lee and Yang. It’s common to compare “parity” to left-handedness *versus* right-handedness (which does seem to be asymmetric in humans!); it’s the expected symmetry of the “laws” of physics when they’re transformed as if written for someone in a mirror; parity was found to be violated when a particular radioactive nucleus decays. All of which I mention solely to be able to say: perhaps the original symmetry that was broken was parity – which then would explain not only why the Big Bang occurred but also why you’re right handed!

But potentially to confuse you still further, let me say that I doubt that it was parity that was the original “symmetry breaker” (or even the more general Charge-Parity or C-P symmetry, information about which you can obtain from the internet). Instead, I’d have a tendency to put my money on the possibility that some “chunk” of positive energy (maybe the fundamental chunk of energy in string theory) “got hooked on itself”, or “tied in a knot”, or bound with some other chunk of positive energy (the original “homosexual bond”!) and was thereby unavailable to “mate” with its negative counterpart, which then broke the symmetry. And I make the suggestion that it was a “chunk of positive energy” that broke the symmetry solely from the result: look around you to see how much solidified positive energy (i.e., mass) now exists!

That is, my guess is that our universe was created by a fluctuation in “the original zero” in which some form of “positive” energy “precipitated”, thereby unable to dissolve back with its “negative” partner to reform zero, leading to  $0 = E - E$  (or in better notation,  $0 \rightarrow E^+ + E^-$ ) and then to the Big Bang. And now, billions of years after that first “quantum-like, symmetry-breaking fluctuation in the total void”, here we are living in what we’re pleased to call “the positive side of something” (e.g., as a form of the positive energy we call ‘mass’), while all about us is “the negative side of something” (namely, “the negative energy” of what we call ‘space’). Thus, the answer to the “age-old question” (about how ‘something’ could have been created from ‘nothing’) seems to be that the assumption contained in the question (that there’s ‘something’ here) is wrong. Instead, what’s here still sums to ‘nothing’.<sup>9</sup>

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<sup>9</sup> And let me add some additional speculations. Thus, if ever the “two sides of nothing” (or “the two sides of existence”) ever “get back together again” [i.e., the reunion of “our side” (in which energy is positive and time “goes” in the familiar direction) and “the vacuum’s side” (in which energy is negative and in which time may go in the opposite direction – an idea that, as you can find on the internet, John G. Cramer of the University of Washington suggests can resolve quandaries in quantum mechanics that even Einstein

Now, Dear, if I've managed to totally confuse you with the above, then I'd recommend that you just ignore it! On the other hand, if you're left with the general idea that your old grandfather suggests that the universe created itself from "total nothingness", then that much will be quite adequate for now.<sup>10</sup> And if you've also picked up some idea that everything in the universe still sums to exactly zero, exactly as it did before the Big Bang, then so much the better. For then, maybe you won't conclude (when your old grandfather suggests that there's nothing here) that even he's barely here – not to suggest that you won't reach that same conclusion, but at least that you'll base your assessment on different evidence!

Besides, Dear, if you're beginning to think that your old grandfather has "really gone around the bend", I'd point out to you that, subsequently, I've found myself to be in good company. For example, in his article entitled "Is the Universe a Vacuum Fluctuation", which I found only recently but which was published in *Nature* in 1973 (*vol. 248*, pp. 396-397), Edward P. Tryon (Department of Physics, City College of New York) demonstrated from available data that the total energy of our universe appears to be zero, "to within a factor of order unity", depending on his assumption of the mass density in the universe. In his paper, Tryon mentions that P. Bergmann earlier presented "a more sophisticated argument" that our universe must have exactly zero energy. Further, near the end of his paper, Tryon concludes the following [to which I've added the italics and some notes in "square brackets", such as these!]:

If it is true that our Universe has a zero net value for all conserved quantities [such as electrical charge, momentum, and total energy], then it [our Universe] may simply be a fluctuation of the vacuum [i.e., the original "zero" or "total nothingness"], the

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and Feynman couldn't understand)], then I wouldn't be surprised if the result were the formation of (the original) "total nothing" (which maybe occurs within Black Holes). Further, I wouldn't be surprised if our universe is still exploding into the "total nothingness" that exists "outside" our universe, which may help explain why our universe seems to be expanding; i.e., space, itself, is expanding. Maybe, however, "other verses" (multiverses!) have also created themselves "out there" in "total nothingness". But even if so, I don't know of any reason why these "other verses" would be anything similar to ours, including even having the same "dimensions". Other verses may even be "right here", in different dimensions – in which case "here" would also be a meaningless concept! All those ideas, however, are just speculations – and until methods are found to test them experimentally (e.g., maybe by looking through the "holes" in the vacuum that are called 'anti-particles', which thereby may give us glimpses of "nothingness"), then like the god idea, they should be treated as what they are: mere speculations.

<sup>10</sup> And on the third hand (!), Dear, if after you earn your Ph.D. in physics and want to talk about the Big Bang being caused by a collision of a couple of the infinite number of (mem-)branes in eleven-dimensional space, then my first response would be "You talk; I'll listen" and maybe my final response would be "Why don't you tell me about the rest of it 'when I'm older – and when some data are available'!"

vacuum of some larger space [which stretches the meanings of the words “vacuum” and “space”] in which our Universe is imbedded. *In answer to the question of why it happened, I offer the modest proposal that our Universe is simply one of those things [that] happen from time to time.*

Another example is the following quotation from p. 129 of the 1988 book *A Brief History of Time* by Stephen Hawking (who holds the same chair at Cambridge University that Newton held). In this quotation, I’ve again added the italics and some notes in brackets.

... that... raises the question of where the energy [in the universe] came from. The answer is that the total energy of the universe is exactly zero [although maybe Hawking should have written something similar to “seems to be exactly zero” or “theoretically must be exactly zero” or even “by the first principle of thermodynamics must remain zero, if initially zero”].

The matter in the universe is made out of positive energy. However, the matter is all attracting itself by gravity. Two pieces of matter that are close to each other have less energy than the same two pieces a long way apart, because you have to expend energy to separate them against the gravitational force that is pulling them together. Thus, in a sense, the gravitational field has negative energy. In the case of a universe that is approximately uniform in space, one can show that this negative gravitational energy exactly cancels the positive energy represented by the matter. [I assume that, with his use of the word ‘exactly’, Hawking is referring to Bergmann’s theory rather than Tryon’s calculation.] So the total energy of the universe is zero.

Now twice zero is also zero. Thus, the universe can double the amount of positive matter energy and also double the negative gravitational energy without violation of the conservation of energy... During the inflationary phase [of the early universe], the universe increases its size by a very large amount. Thus, the total amount of energy available to make particles becomes very large. As Guth has remarked, *“It is said that there’s no such thing as a free lunch. But the universe is the ultimate free lunch.”*

In the above quotation, the fellow that Hawking quotes, Alan Guth, is in the Physics Department at M.I.T. and is famous for his “Inflationary Theory” of the universe. I like his line, “the universe is the ultimate free lunch”, which I interpret to mean that we humans sure got a lot for nothing – or maybe better, “from nothing”!

Still another example is available in a recent paper coauthored by Guth and published in a Special Section of *Science* entitled **Einstein’s Legacy** (on “the centennial of Albert Einstein’s most important year of scientific innovation”). In their paper entitled “Inflationary Cosmology: Exploring the Universe from the Smallest to the Largest Scales” (*Science* **307**, 11 Feb. 2005, pp. 884–890), Alan Guth and David Kaiser include comments about

“string theory” (which suggests that the fundamental “positive-energy unit” in our universe is not “elementary particles” but vastly smaller “strings of energy”) and state the following [to which I’ve added a couple of notes in brackets]:

A key feature of the constructions of inflating states or vacuum-like states in string theory is that they are far from unique. The number might be something like  $10^{500}$  ... forming what Susskind has dubbed the “landscape of string theory.” [That is, Dear, the number of other “verses”, “out there”, “outside our universe”, could be the mind boggling number 1,000,000... and keep on writing until you get to 500 zeros!] Although the rules of string theory are unique, the low-energy laws that describe the physics that we can in practice observe would depend strongly on which vacuum state [or “nothingness state”] our universe was built upon. Other vacuum states [or “nothingness states”] could give rise to different values of “fundamental” constants, or even to altogether different types of “elementary” particles, and even different numbers of large spatial dimensions...! [And thus, Dear, maybe you see why I concocted the term “zigblat mechanics”: who knows what “natural laws” might apply in those other ‘verses’?!]

What, then, determined the vacuum state for our observable universe? Although many physicists (including the authors) hope that some principle can be found to understand how this choice was determined, there are no persuasive ideas about what form such a principle might take. It is possible that inflation helps to control the choice of state, because perhaps one state or a subset of states expands faster than any others. Because inflation is generically eternal, the state that inflates the fastest, along with the states that it decays into, might dominate over any others by an infinite amount. [A form of Darwinian “natural selection” for ‘verses’!] Progress in implementing this idea, however, has so far been *nil*, in part because we cannot identify the state that inflates the fastest, and in part because we cannot calculate probabilities in any case. If we could calculate the decay chain of the most rapidly inflating state, we would have no guarantee that the number of states with significant probability would be much smaller than the total number of possible states.

Another possibility, now widely discussed, is that nothing determines the choice of vacuum for our universe; instead, the observable universe is viewed as a tiny speck within a multiverse that contains every possible type of vacuum [or “nothingness”]. If this point of view is right, then a quantity such as the electron-to-proton mass ratio would be on the same footing as the distance between our planet and the sun. Neither is fixed by the fundamental laws, but instead both are determined by historical accidents, restricted only by the fact that if these quantities did not lie within a suitable range, we would not be here to make the observations. This idea – that the laws of physics that we observe are determined not by fundamental principles, but instead by the requirement that intelligent life can exist to observe them – is often called the anthropic principle [from the Greek word *anthropos* meaning ‘human’]. Although in some contexts this principle might sound patently religious, the combination of inflationary cosmology and the landscape of string theory gives the anthropic principle a scientifically viable framework.

And if you could generally follow the above, Dear (although it certainly isn't necessary for purposes of this book!), then maybe you'll accrue a couple of other advantages.

As an example, maybe you won't be so surprised (as you otherwise might be) upon reading statements in news reports such as the following (from a Reuter news story by Jeremy Lovell dealing with the 2006 annual meeting of the British Association for the Advancement of Science and with the Large Hadron Collider to be opened in 2007 at CERN); in this report, the physicist Brian Cox of Manchester University is quoted as saying:

It could be that there is a whole new universe a millimeter away from our heads but at right-angles to the three dimensions that are here.

As another example, one from which you might gain a hint about how such ideas can influence our lives, there's Einstein's tremendous comment:

Once you can accept the universe as matter expanding into nothing that is something, [then] wearing stripes with plaid comes easy.

I'd even suggest that, if you can perceive that our universe may be nothing (which is now something) expanding into nothing (which is not yet something), then you'll gain an entirely different outlook on life – which could be called the Zen of Zero!

But enough of such talk about “nothing” – at least until later chapters. Now, let me return to describing the source of the stanza quoted earlier – which sent me off on the above tangent, to nowhere, dealing with nothing!

Thirty-or-so years ago, when I started to develop my “meditation scheme”, I also wrote some “poems”, which summarized some of my thoughts. I put the word ‘poems’ in quotation marks, because I came to appreciate my incompetence as a poet. In good poetry, the words paint pictures; I'm afraid that, at best, my poems just convey ideas (for which prose is usually better than poetry). But fragments of these “poems” still remain in my mind – such as the stanza quoted earlier. And so, to explain my meditation scheme more completely (not to subject you to poor poetry!), let me show you more of this “poem”, entitled *Awareness*. I've added a few footnotes to the poem, hoping that they explain what otherwise might confuse – and which would be unnecessary if I had written prose rather than “poetry”.

## AWARENESS

With Earth we spin by right-hand rule,  
 Our Sun consumes itself as fuel,  
 Our galaxy's a spiral jewel,  
 And soon our universe will cool, <sup>11</sup>

Or so it's said. But just for fun,  
 Suppose we think in ways not done:  
 Electron Earth is where we run;  
 This atom's center is our Sun!

And galaxies together band  
 To form, all tolled, a grain of sand,  
 Along a beach in larger land,  
 And it in turn... you understand?

And look below, at smaller scales,  
 Each grain of sand, what it entails:  
 Electrons swept with rain and gales,  
 On some there's life, on some it fails.

And on some grain, deep down inside,  
 A "person" walks with thoughtful stride  
 Along a beach by waterside  
 And wonders what his sand grains hide! <sup>12</sup>

There's so much life, so near yet far,  
 With beams we set their worlds ajar;  
 To some our probe's a shooting star,  
 While others pray to Gods we are! <sup>13</sup>

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<sup>11</sup> Dear: in case you haven't yet learned the "right-hand rule" (e.g., giving the direction of the magnetic field about an electric current, or the spin of the Earth about its axis, or similar – all of which are probably better called "conventions" rather than rules), then its application here is as follows. If you orientate the thumb of your right hand towards north, then your curled fingers will point in the direction of the Earth's spin. Also, the phrase "our sun consumes itself as fuel" is the idea that the Sun's energy (sunlight) originates from transforming some of its mass into energy (in its production of carbon from helium). As for the expanding universe "cooling", that's consistent with the hypothesis that our universe "started" with the Big Bang and now continues to expand – although I'm not convinced that this is correct: it may be that, at the "edge" of our universe, the "total nothingness", "there", is being transformed into "positive" and "negative" components, i.e., perhaps space and mass are being created "there", just as "in the beginning".

<sup>12</sup> Although I wrote this while walking in the desert sand, I pretended that it was ocean sand.

<sup>13</sup> I was thinking, here, about an old concern of mine: do we know what we're doing in our studies in nuclear and high-energy physics? Just what are we disturbing with our electron, neutron, and other beams?!

The cowards up to heaven sing,  
 The meek to me repentance bring,  
 The fools they think that God's a king;  
 I am a process, not a thing.<sup>14</sup>

A simple process, Nature's way,  
 To watch our wavy ocean play,  
 To feel the moistened sand give way,  
 And think up funny words to say!

With words we sail from unknown's dock,  
 And Nature's secrets can unlock,  
 But like some anchor caught in rock,  
 They chain our minds to word-bound talk.

Such talk can be quite dangerous;  
 Though words are never serious,  
 "To be" MUST BE mysterious,  
 And "Why?" defies all tries at "Thus".<sup>15</sup>

Meanwhile we face a life-long dare:  
 To feel around, to smell what's there,  
 To hear each sound, to taste new fare,  
 To see all sights – to be aware.

Thus, listen for each type of sound,  
 Next, smell the odors all around,  
 Then, feel the warmth of sunlit ground,  
 And view all things your eyes have found.

Then, be aware of seagulls crying,  
 Of clouds that grow, and others dying,  
 Of sky and space and stars still shining,  
 Of you – as Universe's "I'ing".

So quiet now, let words go free;  
 Put mind at ease; just try to be;  
 Let pictures form, so you can see  
 The shifting sands and waving sea.<sup>16</sup>

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<sup>14</sup> I used personal pronouns in this stanza, because previously I performed such studies, bombarding nuclei with neutrons; therefore, I would have been "God" to inhabitants of those nuclei!

<sup>15</sup> Well, it'll take a while to explain what I meant by that! For example, I'll come back to "Why" when dealing with "Questions" in Q. If I were forced to try to put the meaning in a "nutshell", I'd try this: "to be" can't be defined in other words because of the limitation of words; "why" can never be answered because the series of "why's" is infinite – as all mothers of four-year-olds know only too well!

Well, Dear, I think I'd better explain what I mean about these "pictures" and the "Universe's 'I'ing" – and these explanations will take too long to fit in footnotes!

To start, the concept of the Universe's "I'ing" is one (or, better, "another") described well by Alan Watts, whom I thank for how he helped me along the way, by sharing his thoughts with me in his publications.<sup>17</sup> The concept that each of us is the Universe "I'ing" is rather trivial to understand and has probably been known for as long as humans could think. The modern trick is only in how to re-introduce the idea. Alan Watts did it well; I'll roughly follow his method – that is, as I remember his method, without refreshing my memory by re-reading what he wrote, in whatever book of his it's in!

Dear, what are you? Or maybe start even more simply: from what are you made? Look at the fingernail on the smallest finger of your left hand. What's it made from? Some hydrogen, carbon, oxygen, a smattering of metals such as calcium, potassium... Where did they come from? Sure, the calcium came from milk and the metals from vegetables, but where did they come from? Sure, from the soil, but where did the Earth get them? Almost certainly, the metals are the remnants of a star that exploded, later collecting to form this and other planets. And the carbon in your fingernail was almost certainly made in a star as it consumed helium to produce its starlight. Also, the hydrogen in your fingernail is almost certainly a remnant of the original creation of matter in this universe, which for want of a better hypothesis at the moment, we can call the Big Bang. So, Dear, your fingernail is a small part of this universe – and so, too, the rest of you.

And each moment, what are you doing, while you are thinking, breathing, seeing, hearing, smelling, tasting, touching? You're breathing in more of the universe's oxygen, exhaling the carbon that you ingested when you ate your food (from animals that got their hydrocarbons from eating other animals or plants, and in turn the plants made the hydrocarbons by converting the Sun's energy into carbohydrates, such as sugar, and then you used this Sun's energy to do such things as think, and breath, and...). With your eyes,

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<sup>16</sup> William Burroughs, in *The Ticket That Exploded*, stated a similar challenge: "Try halting your sub-vocal speech. Try to achieve even ten seconds of inner silence. You will encounter a resisting organism that forces you to talk. That organism is the word."

<sup>17</sup> Incidentally, Dear, I don't plan to identify specific books by Alan Watts, because I hope you'll read many of them. One you might want to start with is *Cloud Hidden, Whereabouts Unknown*; one of his best is *This Is It!*

you're intercepting electromagnetic waves emitted by other objects, which obtained their energy to emit radiation directly from the Sun or maybe from a light bulb (which got its energy from burning coal or falling water, i.e., from the Sun, or from "burning" nuclear fuel, which in turn is from uranium, a metal created in dying stars); and so on, for all the other things you are doing. So, what are you really doing? You (a part of the universe) are interacting with other parts of the Universe!

With his amazing skill with words (with whose enormous limitations he was painfully aware), Alan Watts would say that you are the Universe "I'ing". That "I'ing" is a new word he created: "I'ing" is similar to "laughing", "crying", "living", "dying" .... You're the Universe experiencing itself. Through you, the Universe is laughing, crying, seeing... In you – and in everyone – the Universe is "I'ing"! Without Watts' new word, "I'ing", we could say (quite accurately) that we are the Universe living; that is, we're the part of the Universe that's alive.

Rolf Edberg summarized similar thoughts in the following manner (and I will be forever grateful to a Swedish friend for reading my words praising Edberg at his funeral in Stockholm):

On a little speck in the universe, there is a species in which billions of years of evolution have led up to a mind through which the cosmos can experience itself, and nature can investigate her own nature.

What a wonderful statement! Please, Dear, read those words of Edberg again – which provides still another hint of what I mean by "Zen of Zero". That is, I have no doubt that a "Zen master" would conclude that Rolf Edberg (and Alan Watts, similarly) had reached the ultimate "enlightenment" or "awakening" (or "satori", in Japanese; "wu" in Chinese): not only to be able to eliminate division between oneself and some object, but to eliminate distinction between oneself and the entire universe!

Earlier, Einstein wrote something similar. I'll quote it immediately below – except that I've taken the liberty to change a few words to make it more "politically correct" (i.e., I've changed "he" to "we", and similar):

We humans are part of a whole, called by us the 'Universe,' a part limited in time and space. We experience ourselves, our thoughts and feelings, as something separated from the rest – a kind of optical delusion of our consciousness. This delusion is a kind of prison for us, restricting us to our personal desires and to affection for a few persons nearest us. Our task must be to free ourselves from this prison by widening our circles of compassion to embrace all living creatures and the whole of nature in

its beauty... What I see in Nature is a magnificent structure that we can comprehend only very imperfectly and that must fill a thinking person with a feeling of ‘humility.’ This is a genuinely religious feeling that has nothing to do with mysticism.

The Greek philosopher Epicurus (381–270 BCE) similarly saw this “genuinely religious feeling”, but Christian clerics destroyed essentially all of his writings. His Roman disciple, Lucretius (99–55 BCE), however, almost certainly had access to Epicurus’ writings, and Lucretius’ summary is:<sup>18</sup>

...true piety (*vera pietas*) does not consist in the frequent and meticulous performance of superstitious rites, “but rather in the power to contemplate everything (*omnia*) with tranquil mind (*pacata mente*).”

I don’t know who first recognized this idea that each of us is the Universe’s “I’ing” – and it really doesn’t matter if the source isn’t known! Certainly there are hints of this same idea in the writings of Watts, Edberg, Einstein, Bertrand Russell, Robert Ingersoll, and Spinoza, as well as some Ancient Roman and Greek authors, including Marcus Aurelius, Lucretius, Epicurus, and others. And actually, there are hints of the same idea even in the “religion” of the Native Americans, suggesting that the idea is essentially as old as humanity. In later chapters, I’ll return to this distinction between “genuinely religious feeling” (e.g., *via* “the Zen of Zero”) and mysticism (which is at the core of essentially all organized religions), but for now, let me turn to what I meant in the poem by “pictures”.

First, Dear, I should mention that I went through a number of stages developing my “meditation scheme” – and the first two were done before I learned that what I was doing was “meditating”! In the first stage, all I was doing was trying to fight various pains. I’ll skip some of the personal stuff and just outline the method. If you ever want to try this, Dear, you should lie down in a relatively comfortable position and shut your eyes. Then, focus your mind on a specific part of your body – maybe the little toe of your left foot. Keep doing this until you can really “feel” your little toe; that is, really be aware of your little toe. For me, I know “I’m there” when I feel a “funny” sensation (maybe it’s a little extra warmth; it’s as if a light were shining there, or maybe more like an electrical charge) at the center of my attention. Then what I do is move that focus – that “warmth” – slowly around my entire body, finally going to my pain (e.g., in the back of my

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<sup>18</sup> This quotation is from the Inaugural Lecture entitled “LUCRETIUS ON RELIGION”, which is available on the internet and which was delivered by Prof. ITALO RONCA on Thursday 22 March 1979 in the Senate Hall of the University of South Africa.

neck), where I “massage” the muscles with this “warmth” until the pain subsides. I still do this “meditation” to ease pain.

Actually, many years after I had developed this scheme (which I developed solely from focusing on some pains), I learned that this technique (or variations of it) is a fairly well-known method in “alternative medicine”. I mention that because it gives more support to an observation that I’ve made and will be referring to again: I’m impressed how much each of us knows “intuitively”, if we can just learn to “listen” to ourselves (i.e., become more aware). In fact, or at least according to D.T. Suzuki, this “listening to oneself” is the essence of Zen. In his 1949 book *An Introduction to Zen Buddhism*, Suzuki writes:

If I am asked, then, what Zen teaches, I would answer, Zen teaches nothing. Whatever teachings there are in Zen, they come out of one’s own mind. We teach ourselves; Zen merely points the way. Unless this pointing is teaching, there is certainly nothing in Zen purposely set up as its cardinal doctrines or its fundamental philosophy... Do not imagine, however, that Zen is nihilism. All nihilism is self-destructive; it ends nowhere. Negativism is sound as method, but the highest truth is an affirmation. When it is said that Zen has no philosophy, that it denies all doctrinal authority, that it casts aside all so-called “sacred literature” as rubbish, we must not forget that Zen is holding up in this very act of negation something quite positive and eternally affirmative.

But, Dear, if that quotation doesn’t adequately explain for you what Zen is, then don’t worry about it; I expect it’ll become clear as the book progresses. For me, a synonym for Zen is “Awareness”. As Suzuki wrote: “Unless it grows out of yourself, no knowledge is really yours; it is only a borrowed plumage.” For now, let me say just: if you become aware of the possibility that this universe is “something expanding into nothing”, at least entertain the idea that this “something” still sums to totally nothing, and far more importantly, realize that you are the universe “I’ing”, then I essentially guarantee you that you’ll refuse to go through life wearing any “borrowed plumage” – especially any plumage borrowed from any organized religion.

But anyway, Zen aside for now, in the second stage of my investigations into “meditation” (again, before I knew that what I was doing was meditating!), what I was trying to do was resolve some difficult problems (some in science; some, personal). If you want to try this scheme, Dear, again it would help if you’d first lie down comfortably (so that body aches don’t distract). Also, NEVER do this while you’re doing something else (such as driving a car), because it’s very easy to fall asleep while you’re doing it!

Now, you may have difficulty getting into this mediation without a problem, so maybe it would be best if I just described my own experiences. During the course of our lives, our brains have, of course, processed a huge amount of information. And no doubt we can fairly easily organize these thoughts in our minds into categories, e.g., rational, emotional, intuitive, . . . . When I work on a problem, I commonly try to organize my thoughts that way, trying to distinguish rational thoughts from emotional responses, etc. In a later chapter, I'll explain this in more detail. But for now, all I want to do is explain the "meditation scheme" that evolved.

What I found myself doing was holding a "Board Meeting" in my brain. The picture that evolved (in my mind, of course) was of a large office complex (probably derived from my work environment), with a long hallway and a boardroom at the end of the hall. I'll add that this "Board Room" is large (perhaps 30 feet high) and luxurious (with all walls totally filled with beautifully bound books on gorgeous mahogany shelves). In my mind, at least, I don't need to skimp!

Then, when I had to tackle a problem, I'd call a meeting of the Board. As needed (depending on the type of problem), I'd have a mathematician, physicist, chemist, meteorologist, etc. come from his (or her!) office to attend the meeting, or I'd have a philosopher, a pragmatist, an artist, and so on. At the Board Meeting, "I" would listen to all their opinions and then decide what to do, where I'm not sure who the "I" was – except that "I" was definitely the Chairman of the Board!

And I'd like to add another incidental, here, because it will support what I wrote earlier. At some meetings of the Board, the discussions would become so intense (or confusing or . . .), that I (the Chairman) would call a recess. Then, I'd walk up a flight of stairs at the back of the Board Room (at the "back" of my brain!) to a door that opened out into a balcony overlooking an utterly fantastic view of a lake in the mountains, with the mountains covered with trees and capped with some beautiful cumulus clouds. I'd just sit on the balcony, enjoying the view. I add this because, years later, I read somewhere that this was a commonly recommended way to relax: again suggesting to me how much we know, if only we would become more aware of ourselves.

Now, finally, this business about "pictures", mentioned in the poem. One picture with which I became very familiar was the scene from "my balcony", mentioned above. Then, upon reading about this method of relaxation, I

finally made the connection that what I was doing had something to do with “meditation”, a word with which I had no familiarity. I then read a few books on meditation, and started trying one of the methods recommended in one of the books.

In this method, which has been known from antiquity and is closely affiliated with essentially all religious activities, you are to “numb” the “conscious part” of your brain by repeating some “mind-numbing phrase”, such as the Hindu chant (“OM, OM...”), or some prayer or phrase from a prayer (“Hail Mary, mother of Grace...”), or (what I do) is just count while breathing: “one... two” (while inhaling); “three... four” (while exhaling), over and over again.<sup>19</sup>

If you do this counting while breathing, Dear (especially the first few times you try it), no doubt your mind will wander to the thousand-and-one other thoughts in your mind. To succeed in the method – to reach the “meditative state” (which seems to be a numbing of one’s conscious mind) – you must relentlessly and firmly (but kindly) pull your mind back to focus only on the counting and the breathing, feeling the air entering and leaving your body. The first few times I did this, it might have taken me 15 minutes of effort to suppress my thoughts; now, it’s not uncommon for me to succeed in much less than a minute (provided that any problem I’m having isn’t too severe).

The “masters” of this type of meditation (known as “masters” in various eastern religions) apparently use this method to reinforce desired behavior patterns – a type of self-hypnosis. I’ve read about how to do this, but was never particularly interested in it. Instead, why I do this meditation – to this day – is just to look at the pictures!

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<sup>19</sup> Dear: If you want to learn more about relationships between religious (and similar) ritual and brain activity, I’d encourage you to start by reading an excellent summary article by Sharon Begley entitled “Religion and the Brain”, which was published in the 7 May 2001 issue of *Newsweek* and which is available at many locations on the web (e.g., at <http://www.cognitiveliberty.org/neuro/neuronewswk.htm>). Two illustrative paragraphs from her article are the following:

Even people who describe themselves as nonspiritual can be moved by religious ceremonies and liturgy. Hence the power of ritual. Drumming, dancing, incantations – all rivet attention on a single, intense source of sensory stimulation, including the body’s own movements. They also evoke powerful emotional responses. That combination – focused attention that excludes other sensory stimuli, plus heightened emotion – is key...

The result is that certain regions of the brain are deprived of neuronal input. One such deprived region seems to be the orientation area, the same spot that goes quiet during meditation and prayer. As in those states, without sensory input the orientation area cannot do its job of maintaining a sense of where the self leaves off and the world begins.

That is, Dear, for me what happens (when finally my “conscious” or “analytical” or “left-hand side” of my brain is quieted) is this: absolutely stunning pictures appear, in absolutely unbelievable detail, always in three dimensions, usually in color, almost always in motion. These are totally realistic, beautifully detailed “pictures” of trees (which seem to be the favorite pictures in my mind), or ocean waves, or hillsides, or... Maybe sometimes I can choose the picture, by previously thinking of a word (e.g., ‘tree’), but by far the most common is just for the “pictures” to come by themselves, without my having any (conscious!) idea of what they will be or why they appear. Sometimes the “pictures” are of people, with absolutely stunning detail in faces – but usually, people I don’t recognize: it’s as if I’m walking down a city street, crowded with strangers, seeing more detail in every face than I’ve ever seen in reality.

Well – so – anyway, that’s what I meant by the “pictures” in the above poem. Maybe it all sounds strange. I’ve never read or heard about anyone else experiencing this.<sup>20</sup> I invite you to try. But again, Dear, never, NEVER, NEVER, try doing this when you’re doing something else, such as driving a car: this scheme frequently puts me to sleep – in fact, very commonly I use it to put myself to sleep!

And maybe I should mention another “experience” that I’ve read about. This is the “out-of-body experience” that many people have apparently experienced when near death, e.g., seeming to float away from their body, left lying on a table in the emergency room of a hospital. I have experienced that many times while lying down (not in a hospital room; just lying quietly on my own bed), but it’s been quite a while since it last occurred, I don’t know how it occurred, and I’ve never explored how I might more easily reach that state. It’s interesting, but nowhere near so enjoyable as looking at my pictures! What I think this “out-of-body experience” might be is not the numbing of one’s left brain (permitting me to see right-brain pictures), but the decoupling of one’s “conscious” brain (left and right hemispheres) from

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<sup>20</sup> Ha! But at least I’m learning as I go along (☺). Now, in 2010 (!), I’ve learned that such “pictures” or “hallucinations” are well known; they even have the impressive name “hypnogogic hallucinations” [from the Greek words for ‘sleep’, *hupnos*, and ‘leading’, *agōgos*; so, they’re sleep-leading (or sleep-inducing!) hallucinations]. You can find much about them on the internet. For example, the following is from an article entitled “All-Nighters: Failing to Fall” by Siri Hustvedt in the 3 March 2010 issue of *The New York Times*: “In sleep we leave behind the sensory stimulation of the outside world. A part of the brain called the thalamus, involved in the regulation of sleeping and waking, plays a crucial role in shutting out somatosensory stimuli and allowing the cortex to enter sleep. One theory offered to explain hypnogogic hallucinations is that the thalamus deactivates before the cortex in human beings, so the still active cortex manufactures images, but this is just a hypothesis.”

one's "unconscious" brain (the autonomous parts that regulate our body's organs). But that's only a guess.<sup>21</sup>

Finally for this chapter, I want to mention the following. Sometimes, rather than counting my breathing ("one, two... three, four"), I repeat with the same rhythm: "L'autre moi... what do you see?" [Where, in case you haven't learned the French yet, Dear, "l'autre moi" means "the other me".] I picked up that expression from one of the books I had read on meditation; in the next chapter (**B**), I'll explain why the expression seems to be appropriate.

## Summary

Well, Dear, that took a lot longer to describe than the time it takes me to get through "A" when I'm walking – normally, just a couple of minutes! To close this chapter, what I thought I should do (in part as a summary) is show you what I really do with "A", hoping that, thereby, the length of this chapter won't discourage you. But because I'm afraid I still haven't described "A" well, I'll add [in brackets such as these] some brief notes of explanation.

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### *A – Awareness*

#### *I'm on this big old Earth, spinning, spinning...*

[Here, Dear, I pause to think about the direction of the Earth's spin and where I am on the Earth; then, mentally I go around the Earth to visit places and people I remember well, as I already described.]

#### *If I back away from the Earth, I see this beautiful blue planet; then farther away from our solar system, the Sun becomes just another star...*

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<sup>21</sup> Well, Dear, it looks like that was a pretty poor guess! A good description of the "out-of-body experience" is contained in an article entitled "Out-of-Body Experience? Your Brain Is to Blame" by Sandra Blakeslee in the 3 October 2006 issue of *The New York Times*. In turn, she relies on an article by Olaf Blanke in the 21 September 2006 issue of *Nature*. The summary statements in *The New York Times* article are: "When otherwise normal people experience bodily delusions, Dr. Blanke said, they are often flummoxed [i.e., 'perplexed' or 'bewildered']. The felt sensation of the body is so seamless, so familiar, that people do not realize it is a creation of the brain, even when something goes wrong and the brain is perturbed. Yet the sense of body integrity is rather easily duped, Dr. Blanke said. And while it may be tempting to invoke the supernatural when this body sense goes awry, he said the true explanation is a very natural one, the brain's attempt to make sense of conflicting information."

*Then, back off from this entire galaxy... break away from this galactic plane... look back at our beautiful galaxy: the brightness below; the blackness beyond... Then watch our galaxy fade in size until it's like a single star... see the other galaxies of similar size...*

*And galaxies together band  
To form, all tolled, a grain of sand,  
Along a beach in larger land,  
And it in turn... you understand?*

*... Or maybe it all still sums to zero...*

*And look below, at smaller scales,  
Each grain of sand, what it entails:  
Electrons swept with rain and gales,  
On some there's life, on some it fails.*

*And on some grain, deep down inside,  
A "person" walks with thoughtful stride  
Along a beach by waterside  
And wonders what his sand grains hide.*

*There's so much life, so near yet far,  
With beams we set their worlds ajar,  
To some our probe's a shooting star,  
While others pray to Gods we are!*

*The cowards up to heaven sing,  
The meek to me repentance bring,  
The fools they think that God's a king;  
I am a process, not a thing.*

*A simple process, Nature's way,  
To watch our wavy ocean play,  
To feel the moistened sand give way,  
And think up funny words to say!*

*With words we sail from unknown's dock,  
And Nature's secrets can unlock,  
But like some anchor caught in rock,  
They chain our minds to word-bound talk.*

*So quiet, now, let words go free...*

[What I do, then, Dear, is just go through my senses, one at a time, being aware of each signal coming to me, plus (as I already mentioned) I usually approach a sage brush to give my sense of smell a special treat.]

And then, Dear, what I usually do is something I didn't describe above: I commonly "talk" to "Mother Nature" and "Father Sun". I usually start with "Mother: How are you? You're beautiful today." (And then maybe I "talk" to her about the soil moisture, or the new grass, or the returning birds or...). And turning to the Sun (cloudy or not, and if not, of course not looking directly at the Sun), I almost always start by thanking "him" (the Sun) for his constancy. I then ask them both how they think I am doing and how I might improve. It was they, by the way, who advised me to abandon my other book for you and to write this one. Of course, they have been urging me to write this book for years (in hopes of helping others), and I know that they just used my promise to you as leverage to finally get me moving!

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**Endnote:** Maybe you wouldn't mind if an old grandfather added a little story, even though, at first blush, it may seem unbelievable.

You know that, as with all birds, the meadowlark's song is a territorial claim. (Would that the human animal would claim territory so beautifully!) As a result, especially during spring mornings in the desert, there's usually an echoing chorus of songs, with each bird answering claims with his own. (I assume that it's the males that make these claims, but I don't know). Where I usually walk, sometimes in the spring there are about a dozen birds in the chorus, and you might think that they'd become confused about who's answering whom!

Anyway, Dear, one day it happened. Two meadowlarks, one on each side of me and each about 100 yards away, sang simultaneously: I heard the meadowlark's song in stereo! If I were a "Native American" (although apparently there is no such thing as a truly "Native American"; we're all immigrants!), surely I could have claimed that event as my "awakening". Maybe my name would then be Meadowlark (*Sturnella*)!

But I would be unfaithful to my training in science – and to my "faith" in the value of science – if I didn't try (however crudely) to estimate the probability of such an event. Some results from this estimate are the following.

The probability of hearing two meadowlarks in stereo (assuming that you're already in a field in which the concentration of meadowlarks is quite dense and assuming that hearing the songs from a meadowlarks, on either side of you, to within 0.1 seconds is sufficient to claim that they are "in stereo") is actually quite large: you should hear two in stereo about once every 100 hours or so (within a factor of 10 or so!). If you want, Dear, someday I'll show you the details of this estimate – but for here and now, they're not important. Yet, I do want to add that if you obtained more data, then you could estimate this probability better than your old grandfather.

Also, Dear, I want to add some comments that I hope you'll consider.

- The essence of science is simple, but the details can be complicated.

- People can speculate all they want, but if they want to understand something, data are essential.
- Take care that the observer doesn't skew the data: meadowlarks may sing more because the observer is intruding!
- If someone makes a claim that's potentially important to you, then check it out yourself!

Of course, the potential of hearing two meadowlarks in stereo may or may not be important to you – but that's for you to decide for yourself.