several independent observations and experiments are consistent with this theory. Perhaps most exciting is the prospect of learning more about an entirely new form of mysterious energy, a property of the universe that to date has evaded all explanation.

The dark energy observed is smaller by at least 10 billion, billion, billion, billion, billion, billion times than the best theories of elementary particle physics would predict from first principles. Hence, by studying the behavior of the universe, astronomers are posing new challenges to fundamental physics. It is often the case in science that as old questions are resolved, novel, perhaps even more exciting, questions are uncovered. The next decade promises to be a fruitful one in addressing profound questions about the nature of the universe we live in.

Daniel C. Dennett

on failures of freedom & the fear of science

Allen Funt was one of the great psychologists of the twentieth century. His informal demonstrations on *Candid Camera* showed us as much about human psychology and its surprising limitations as the work of any academic psychologist. Here is one of the best (as I recall it many years later): he placed an umbrella stand in a prominent place in a department store and filled it with shiny new golf-cart handles. These were pieces of strong, gleaming stainless-steel tubing, about two-feet long, with a gentle bend in the middle, threaded at one end (to screw into a threaded socket on your golf cart) and with a handsome spherical plastic knob on the opposite end. In oth-

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er words, about as useless a piece of stainless-steel tubing as you could imagine – unless you happened to own a golf cart missing its handle. He put up a sign. It didn't identify the contents but simply said: "50% off. Today only! $5.95." Some people purchased them, and, when asked why, were quite ready to volunteer one confabulated answer or another. They had no idea what the thing was, but it was a handsome thing, and such a bargain! These people were not brain-damaged or drunk; they were normal adults, our neighbors, ourselves.

We laugh nervously as we peer into the abyss that such a demonstration opens up. We may be smart, but none of us is perfect, and whereas you and I might not fall for the old golf-cart-handle trick, we know for certain that there are variations on this trick that we have fallen for, and no doubt will fall for in the future. When a psychologist demonstrates our imperfect rationality, our susceptibility to being moved in the space of reasons by something other than consciously appreciated reasons, we fear that we aren't free after all. Perhaps we're kidding ourselves. Perhaps our approximation of a perfect Kantian faculty of practical reason falls so far short that our proud self-identification as moral agents is a delusion of grandeur.

Our failures in such cases are indeed failures of freedom – failures to respond as we would want to respond to the opportunities and crises life throws at us. They are ominous, because the ability to be moved by consciously appreciated reasons is indeed one of the varieties of free will worth wanting. Notice that Funt's demonstration would not impress us if his subjects were not people but animals – dogs or wolves or dolphins or apes. That a mere beast can be tricked into opting for something shiny and alluring but not what the beast truly wants – should truly want – is hardly news to us; we expect 'lesser' animals to live in the world of appearances. We aspire to a 'higher' ideal.

As we learn more and more about our own animal weaknesses and the way the technologies of persuasion can exploit them, it can seem as if our vaunted autonomy is an unsupportable myth. "Pick a card, any card," says the magician, and deftly gets you to pick the card he has chosen for you. Salespeople know a hundred ways to get you off the fence so that you buy that car, that dress. Lowering one's voice, it turns out, works very well: "*I see you in the green number.*" (You might want to remember that the next time a salesperson whispers at you.)

Notice that there is an arms race here, with ploy and counter-ploy balancing each other out. I've just somewhat diminished the effectiveness of the whispering trick against those of you who remember my exposure of it.

It is easy enough to discern the ideal of rationality that serves as the background for this battle: *Caveat emptor,* we declare, let the buyer beware. This policy presupposes that the buyer is rational enough to see through the blandishments of the seller, but since we know better than to believe this myth taken neat, we go on to endorse a policy of *informed consent,* prescribing the explicit representation in clear language of all the relevant conditions for one agreement or another. Then we also recognize that such policies are subject to extensive evasion – the fine-print ploy, the impressive-sounding gobbledygook – so we may go on to prescribe still further exercises in spoon-feeding information to the hapless consumer.

At what point do we abandon the myth of 'consenting adults' in our 'infantalizing' of the citizenry? When we learn certain messages have been tai-

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lored to particular groups or particular individuals – each group targeted with specific images, stories, aids, and warnings – we may be tempted to condemn these tactics as paternalistic, and as subversive to the ideal of free will in which we are Kantian rational agents, responsible for our own destiny. But at the same time we should acknowledge that the environment we live in has been being updated ever since the dawn of civilization, elaborately prepared, made easy for us, with multiple signposts and alerts along the way, to ease the burdens on us imperfect decisionmakers. We lean on the prostheses that *we* find valuable – that's the beauty of civilized life – even if we tend to begrudge those that others need.

We are actually wonderfully rational. We are rational enough, for instance, to be really good at designing ploys for playing mindgames on each other, seeking out ever more subtle chinks in our rational defenses, a game of hide-and-seek with no time-out or time limit. Once we recognize that this is an arms race, an evolving culture of manipulative ploys and enlightened counter-ploys, we can fend off the absolutism that sees only two possibilities: either we are perfectly rational – or we are not rational at all. That absolutism fosters the paranoid fear that science might be on the verge of showing us that our rationality is only an illusion, however benign the illusion from some perspectives. That fear in turn lends spurious attractiveness to any doctrine that promises to keep science at bay, our minds sacrosanct and mysterious.

For example, how do we manage to get here (rational, moral agency) from there (the amoral unfreedom of an infant)? A sane answer will not postulate a miraculous leap of self-creation; instead, it will invoke the Darwinian themes of luck, environmental scaffolding, and gradualism: with a little bit of luck, and a little help from your friends, you put your considerable native talent to work, and bootstrapped your way to moral agency, inch by inch. A proper human self is the largely unwitting creation of an interpersonal design process in which we encourage small children to become communicators and in particular to join our practice of asking for and giving reasons, and then reasoning about what to do and why.

For this to work, you have to start with the right raw materials. You won't succeed if you try it with your dog, for instance, or even a chimpanzee, as we know from a series of protracted and enthusiastic attempts over the years. Some human infants are also unable to rise to the occasion. The first threshold on the path to personhood, then, is simply whether or not one's caregivers succeed in kindling a communicator. Those whose fires of reason just won't light for one reason or another are consigned to a lower status, uncontroversially. It's not their fault, it's just their bad luck.

While we're on the topic of luck, let's first try to calibrate our scales. Every living thing is, from the cosmic perspective, incredibly lucky simply to be alive. Most – 90 percent and more – of all the organisms that have ever lived have died without producing viable offspring, but not a single one of your ancestors, going back to the dawn of life on Earth, suffered that normal misfortune. You spring from an unbroken line of winners going back billions of generations, and those winners were, in every generation, the luckiest of the lucky, one of a hundred or a thousand or even a million. So however unlucky you may be on some occasion today, your presence on the planet testifies to the role luck has played in your past.

Above the first threshold, people exhibit a wide diversity of further talents, for thinking and talking, and for self-control. Some of this difference is 'genetic' – due mainly to differences in the particular set of genes that compose their genomes – and some of it is congenital but not directly genetic (due to their mother's malnutrition or to fetal alcohol syndrome, or drug addiction, for instance). And some of it has no cause at all, the result of chance. None of these differences in your legacy are factors within your control, of course, since they were in place before you were born. And it is true that the foreseeable effects of some of them are inevitable, but not all – and less and less each year.

It is also not in any way your own doing that you were born into a specific milieu – rich or poor, pampered or abused, given a head start or held back at the starting line. And these differences, which are striking, are also diverse in their effects: some inevitable and some evitable, some leaving lifelong scars and others evanescent in effect. Many of the differences that survive are, in any event, of negligible importance to what concerns us here: a second threshold, the threshold of moral responsibility – as contrasted, say, with artistic genius. Not everybody can be a Shakespeare or a Bach, but almost everybody can learn to read and write well enough to become an informed citizen.

Consider, for instance, the affliction known as *not knowing a word of Chinese*. I suffer from it, thanks entirely to environmental influences early in my childhood (my genes had nothing – nothing directly – to do with it). If I were to move to China, however, I could soon enough be 'cured,' with some effort on my part, though I would no doubt bear deep and unalterable signs of my deprivation, readily detectable by any native Chinese speaker, for the rest of my life. But I could certainly get good enough in Chinese to be held responsible for actions I might take under the influence of Chinese speakers I encountered.

When W. T. Greenough and F. R. Volkmar in their classic 1972 article for *Science* first demonstrated that rats given a rich environment of toys and exercise gear and opportunities for vigorous exploration had measurably more neural connections, and larger brains, than rats raised in a bare, restrictive environment, some parents and educators went overboard in their eagerness to herald this important discovery, and then began to worry themselves sick over whether junior was getting enough of the right kinds of crib toys. In fact we've known forever that a child raised alone in a bare room with no toys at all will be seriously stunted, but nobody has yet shown that the difference between having two toys and having twenty toys or two hundred toys makes any noticeable long-term difference in how the infant's brain develops. It would be extremely hard to show because so many confounding intervening influences, some planned and some fortuitous, would do and undo the crucial effect a hundred times a year as each child matured.

Still, we should do the difficult research as best we can, since it is *possible* that one condition or another is playing a larger role than suspected – and hence is a more appropriate target at which to aim our efforts of avoidance. But we can already be quite sure that most if not all of these differences in starting conditions vanish into the statistical fog as time passes. Like coin tosses, there may be no salient causation to be discerned in the outcomes. Once we have disentangled these factors to the extent that this is possible with careful scientific study, we will be able to say with some

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deserved confidence which interventions are apt to counteract which shortcomings, and only then will we be in a good position to make the value judgments that everybody is aching to make.

In his recent book *Hooking Up,* Tom Wolfe deplores the use of Ritalin (methylphenidate) and other methamphetamines to counteract attention deficit hyperactivity disorder in children. He does this without pausing to consider the mass of evidence that indicates that *some* children have a readily correctable – evitable – dopamine imbalance in their brains that gives them a handicap in the self-control department just as surely as myopia does:

> ...an entire generation of American boys, from the best private schools of the Northeast to the worst sludge-trap public schools of Los Angeles and San Diego, was now strung out on methylphenidate, diligently doled out to them every day by their connection, the school nurse. America is a wonderful country! I mean it! No honest writer would challenge that statement! The human comedy never runs out of material! It never lets you down!
>
> Meantime, the notion of a self – a self who exercises self-discipline, postpones gratification, curbs the sexual appetite, stops short of aggression and criminal behavior – a self who can become more intelligent and lift itself to the very peaks of life by its own bootstraps through study, practice, perseverance, and refusal to give up in the face of great odds – this old-fashioned notion (what's a *boot*strap, for God's sake?) of success through enterprise and true grit is already slipping away, slipping away...slipping away....

I wonder if Wolfe would commend a bracing regimen of eye exercises and courses in Learning to Live with Short-Sightedness in lieu of eyeglasses for the myopic. He ends up declaiming the twenty-first-century version of that old chestnut: if God had meant us to fly, he would have given us wings. So rattled is he by the imaginary bogey of genetic determinism that he cannot see that the bootstrapping he yearns to protect, the very fount of our freedoms, is enhanced, not threatened, by demythologizing the self.

Scientific knowledge is the royal road – the only road – to evitability. Perhaps here we see the outlines of a secret fear that lies behind some of the calls to keep science at bay: not that science will take away our freedom, but that it will give us too much freedom. If your child doesn't have as much 'true grit' as your neighbor's child, perhaps you can buy him some artificial grit. Why not? It's a free country, and self-improvement is one of our highest ideals. Why should it be important that you do all your self-improvement the old-fashioned way?

These are very important questions, and their answers are not obvious. They should be addressed directly, not distorted by ill-advised attempts to smother them.