EPISODE 44
BEING OF TWO MINDS

Hi there. Welcome to the end of the world. My name is Michael Folz. And this is Episode number 44 of my podcast Dial It Back Or Die. Now for the last few episodes I've been going over some of the truths about human behavior which are a direct result of us humans being hypersocial animals. So today we're going to focus on something which is true about each one of us as individuals: Namely how it is that our brains and our minds actually work.

Now obviously I can't do more than a quick survey, since a truly exhaustive description would require a podcast all its own. Just be aware, though, that even though studies of the brain are advancing at an astonishing pace, still a lot remains in flux. What's more, some of what you may read in the popular press might not always be accurate.

With that in mind, though, let's start with a few examples of just how strangely in practice our minds often work:

For instance: Suppose you are standing next to a trolley track. Coming at you is a trolley hurtling out of control. Just past you are five people who have been tied down to the track and who can't escape. But right next to you is a switch that would transfer the trolley onto a side track. Unfortunately, however, there is one person tied down to *that* track, and they would be killed as a result. Would you throw the switch?

When this dilemma has been posed to people, it has been repeatedly shown that about 90% of them would.

But now let's change the setup a little. Let's say that you are standing on a bridge overlooking the same track and the same trolley and the same five doomed people. Being of normal size, were you to be heroic and leap off of the bridge and in front of the trolley you would not stop it. But there does happen to be an extremely fat man standing right next to you. And if you pushed him over he would be

killed. But he would also stop the trolley. And those five others would be saved. Just as in the first instance, you would be performing an action so as to sacrifice one person in order to save five others.

So… Would you?

In those same tests it has been repeatedly shown that most people wouldn't.

This is the famous 'trolley problem'. Rationally it is the exact same situation. In each case we have to do something which causes the death of another. Yet for most of us our minds would instinctively throw the switch, but at the same time would instinctively recoil from pushing the fat man.

So why is that?

Okay. Here's another one: A group of people is randomly divided into two halves. Each member of the first half is given an identical ceramic souvenir mug. Now everyone in both halves is asked to say how much each mug is worth. Those who now actually own the mugs will come up with a figure about twice of what those who did not get one do.

Speaking of retail, suppose you are in a store and about to buy an item of clothing for $40. Someone tells you that the exact same item is for sale across town for $20. Half off? You'd probably hop in your car and head on over there, right?

Now suppose you are buying a big ticket item like a TV or a refrigerator for $1000. Someone tells you that the same model is for sale across town for $980. Not really worth the trouble of going all the way across town, is it?

Why not? You'd be saving the exact same $20 either way.

Or how about this: A group of Stanford students is each supplied with an identical can of name brand energy drink, which with its high amount of caffeine and sugar is thought (especially by students) to boost concentration. Half of them are charged full price, while the other half get them at a steep discount. They are then asked to do a series of word problems. The ones who paid less consistently solve 30% fewer of the problems.

Now all of us are capable of being rational. Otherwise I wouldn't be doing this podcast and you wouldn't be listening to it. At the same time most of us are aware that much of our everyday behavior,

the way we make decisions and how we interact with others, has little if anything to do with rational decision making as defined by either philosophers or economists. And I've already explained some of our social behaviors by emphasizing how we have evolved to become hypersocial animals. But now let's try to spend a little time explaining the current state of knowledge as to how our individual minds actually work.

Because a division into 'reason' and 'emotion', while real, is way too simplistic. Likewise 'conscious' and 'unconscious' doesn't begin to describe it. But it's safe to say that we now know that what's really going on is a complex interaction between different areas of the brain and among various different neurotransmitters and types of neurons. All of which evolved in an ad hoc, unplanned way over hundreds of millions of years for animals with far fewer needs and abilities than us.

In fact, the wonderment—and it's a question that so far evolutionary biology has no even halfway decent answer for—is why we should be as capable of rationality and be as smart as we are. After all, even if our brains got bigger as a result of the needs of hypersocial living, you'll no doubt remember from high school that the most popular kids usually weren't the math nerds. And up until 10,000 years ago Neolithic cultures had no need whatsoever for anything even close to something like the Pythagorean Theorem.

So it's certainly plausible to conceive of conscious, rational thought as merely an interesting add on. And, most certainly, it is another of those huge, qualitatively different human attributes which clearly separate us from the rest of Nature.

At the same time, though, most of the work of the brain, even the thinking brain, goes on, as it were, underground. Not that we hadn't known all along that much of what the brain does happens without our being aware of it. After all, there is all that breathing and heart beating and such. But it turns out that we have another, much larger, sort of computer silently churning away. And this one is forever processing all of our zillions of sensory inputs, choosing which ones to ignore and which ones to concentrate on, and then in various ways letting us know its conclusions.

And a good way to illustrate this process is to consider a Major League baseball player trying to hit a fastball. With the ball covering only sixty feet and moving at up to 100 mph, with the time it takes for a bat to swing, and then also including the time it takes for a message to get from the brain to the arms in order to make that swing, with all of that, the bare physics of the situation is such that it is literally impossible to consciously decide whether or not to commit. What is really going on is that, after years and years of practice, the batter's brain has learned to silently and almost instantly process

all sorts of minute cues—the angle of the pitcher's arm, the grip of his hand, the spin of the ball as it leaves it—and to then make a good guesstimate as to where the ball will be sixty feet later. The batter then 'intuitively' understands whether to go for it or not.

You and I, of course, lacking his years and years of practice, not to mention his eagle eyes and razor sharp reflexes, would just stand there stupidly as the ball whizzed by. Nor is he even necessarily aware that his eyes have been looking for angles and spin rates for all those years. He just 'knows it when he sees it'.

The same sort of unconscious-yet-thinking process is going on when as young children we learn the incredibly complex tasks of reading and of understanding language. We aren't aware of how or why the word *word* means 'word', or why it is that a certain sound that we hear or picture that we see translates into our minds as a flower that we associate with the word 'rose'. It just does. (And, similarly, 'szyrmrac' doesn't mean anything at all.) And as we get older most of what we really learn, whether it is how to be a member of society or how to paint a pretty picture, also takes place in that underground computer.

And the output that results might well be a thought that pops into our heads. More often, however, as with the ballplayer, there won't be time for that and instead we will just have an immediate 'gut' understanding of what to do. A feeling. Of fear or happiness, attraction or repulsion, of 'rightness' or 'wrongness'. All of which makes perfect evolutionary sense, since our survival as an individual and as a species depended upon quick reactions and quick decisions.

Of course, all of this takes practice. Lots and lots of it. And as you progress in life, in order to become an expert at anything, you also need to make sure that it is conscious practice, in which you go over your work and make yourself aware of your mistakes. Not to mention that there is that little je ne sais quoi thing known as talent. But if all goes well then at the end of the process you will just 'know' when to go for that high note, or what that engine sound means, or how to close that sale.

The main point here, though, is that we are never really conscious of the largest part of the learning curves that we go through in life and in the vast majority of the thoughts that go on in our head. Our minds can be thought of as icebergs, with about 10% above the consciousness waterline and the rest hulking along underneath.

Okay. Next let's quickly look at a critical component of exactly how the brain learns all this stuff.

Now a neurotransmitter is a chemical which acts as a 'messenger' that transmits signals between and among all the billions of neurons in our brain. And one of the most important of these neurotransmitters is called dopamine.

You may have heard of it. This is what makes our brains feel good in that eating-a-hot-fudge-sundae kind of way. This means dopamine is pretty synonymous with pleasure. Not with happiness, well being, wisdom, or peace and security, mind you. But definitely with pleasure. (Well, actually brain scientists currently associate dopamine with the anticipation of pleasure. But anyone who has ever done cocaine or speed knows exactly what is involved.)

And why would the brain have required the pleasure of dopamine in the first place? Mostly as a reward mechanism. For instance, it's the incentive animals (and we humans) have for desiring sex and food. After all, if you think about it, why else would anyone or anything spend so much of its time going to all the trouble of finding a mate or of finding and chewing food? Yet if we (and they) didn't, then this whole show would come to a crashing halt.

But dopamine is also critical for the whole process of learning. Think of it as the gold star that the brain gives itself for successfully creating a new pathway or response that helps the organism successfully adapt to the cruel world outside. And in us higher human organisms this is why you experience a little burst of pleasure when you grasp a new concept, solve a math problem, or come across a particularly well written sentence.

So dopamine, dopamine receptors, and the pleasure they produce certainly have their perfectly valid place in the grand scheme of life. But you don't have to be a brain scientist in order to understand that things might not work out all that well once we higher organisms start messing around with something as powerful and consuming as this particular feedback loop.

Then there are all the various brain structures. And there are lots of those.

For at least some of them we have a pretty good idea of what's going on. For instance, the olfactory bulb is (pretty obviously) connected to the sense of smell. Broca's area is involved with the processing of language. The hippocampus is crucial to memory formation.

But in terms of how it is that we actually *think,* it turns out that there is usually a complex interaction among all sorts of disparate areas in the brain.

For example, take the amygdala. This almond shaped structure appears to serve all sorts of functions. It is central to the consolidation of memories. A larger amygdala is correlated with more social interactions. Stimulating it seems to increase both sexual and aggressive behavior.

Most commonly, though, the amygdala is associated with fear and anxiety, and specifically how those emotions affect our memories, thoughts, and decision making. It has been linked to post traumatic stress, obsessive compulsive disorder, social phobias, and psychopathy. It is what is affected when one sees a frightening face or a scary movie. In fact, whenever any mammal feels threatened its amygdala becomes hyperactive. (On the contrary, incapacitating the amygdala makes an animal fearless. Which probably isn't a good idea, say, for a mouse facing a cat.)

Then let's briefly consider two other areas of the brain: The insula and the nucleus accumbens. (By the way, you're not required to remember any of these names.) It turns out that whenever you see something that you might wish to purchase, a tug of war of sorts breaks out between these two structures. The nucleus accumbens, which is connected to the dopamine reward system, gets all excited by what it hopes about the pleasure that this new possession will give it. On the other hand, the insula gets all worked up over the cost of the item.

Clearly a decision then needs to be made.

Which brings us finally to the prefrontal cortex. This is the part of the brain which is most associated with consciousness, rationality, and executive function, otherwise known as decision making. And it was the great evolutionary expansion of this area which was responsible for our brains and heads getting so big, and for separating us from those chimps and gorillas and such.

Generally speaking, it is here where we exist, where we sort out truth from untruth, and where we think all those wonderful thoughts that we think. It is here where we can sort of access the results of that inner computer which is always working away. It is here where whether to buy something or not can be decided. It is here where the fear expressed by the amygdala can be overridden. It is here where those dopamine desires can be tamped down.

Can be, mind you.

Because, as the last episode pointed out, we all have different levels of ability at performing all those functions. What's more, as individuals our abilities can vary when confronted with different sorts of fears or desires or whatever.

But all of our minds are also subject to certain limitations which arise from the fact that the interactions and pathways of all of these areas, chemicals, and systems arose in that ad hoc evolutionary fashion. Most importantly, we are all subject to a critical limitation of the prefrontal cortex itself. Namely, that it seems to be hardwired so that it can't hold more than seven pieces of data in it at any given time. This is the primary reason why most of our thinking and processing goes on at the bottom of that iceberg without our awareness of it. And this is also why we have evolved so as to make decisions through the use of heuristic devices.

Now 'heuristic' is just a fancy way of saying that, instead of carefully analyzing how to react to each and every new situation, our minds usually automatically resort to using rules of thumb. And these rules of thumb usually work. Which is why the brain uses them. Thus, for instance, if you are in a large unknown city, and you are looking for a certain type of store, you will probably head for the larger shopping district rather than the smaller one, since you assume that a greater selection will yield a greater probability of success.

But mental shortcuts can also lead us astray. Such as: What if you were looking for a needle lost within two haystacks, a larger and a smaller one. You would probably start looking through the smaller one, right? Not because there was any sort of higher probability, but because it was the easier thing to do. And therein lies the first of many, many problems.

Because, once again, this episode isn't about an exhaustive explanation of how the brain functions. That would be hopeless to attempt in such a short space. Rather it is about some of the many ways that the brain misfunctions. Especially in a modern world which is utterly different from the simple world of nature-and-survival decision making that the brain evolved in through those millions of years of ad hoc evolution. And especially since clever people in this modern world have figured out all sorts of ways to profit from all those misfunctions.

So here is the fun part, where we go over some of the wacky ways that we mis-think and we mis-behave. (Although bear in mind throughout that, since the brain's systems are so interdependent, there is a certain arbitrary nature to it all.)

Now one of the two main shortcomings of the 'thought computer' that we have been set up with is that the whole gut/feeling response system only works if you have actually done all that practice, thoroughly learned and internalized correct responses, and become an expert in the subject. As I noted,

if you or I were standing at the plate at a major league ballpark we would be utterly useless. Likewise we would feel pretty stupid and incompetent if we were suddenly in the cockpit of a 747 or sitting at the piano in a giant concert hall.

But at least we would know that we didn't know. Far worse is the situation where someone only knows a little but trusts their gut nonetheless. A lot of money can be lost in the stock market that way. A lot of stupid wars can be started that way.

And the second main shortcoming is that even when a gut response is correct in an evolutionary way, it might well not be the smart thing to do. For instance, if you were to come across a bear in the woods your first reaction would probably be to run for your life. That, however, would be really dumb, since a bear will react by then assuming that you are prey and chasing you. And there's no way that you can outrun a bear. If your prefrontal cortex is in control, however, what you would hopefully have already learned is to just calmly stand there, and then to ever so slowly back away.

(On the other hand, should you come across a cougar, hopefully you would have already learned that here the proper response is to make your body appear as big as possible and to act as aggressively as possible. Either way, though, your 'intuition' would have killed you.)

And then there are the myriad problems with dopamine. The most obvious one is the addiction caused by artificially created drugs like cocaine and methamphetamine, which make the brain release vast amounts of dopamine, thereby giving it a huge rush of pleasure, thereby making it depleted, thereby requiring more drug, and so on. In fact, dopamine is so powerful that, if test animals' brains are properly stimulated, they will just sit there in their cages in a dopamine rush, not eating or doing anything else, until they die.

Actually all addictions are connected to the dopamine reward system becoming hijacked in some way. And it doesn't have to involve the direct psycho-chemical route, as with cocaine or (less efficiently) alcohol. Nor does it need to involve our inborn biological pleasures, such as sex or eating. It can also arise from a corrupted learning feedback loop.

For instance, anything new or unusual gives our brains a little jolt of dopamine. The evolutionary purpose is so that our consciousness is alerted and we then try to find any relevant patterns which might help us in our future lives. But so long as it is new, even if there is nothing relevant or useful to be learned, we will still get that jolt. That is why we like surprises! This is why

we like receiving brightly colored wrapped presents so much. This is why we become addicted to checking our email or sending and receiving text messages. I wonder what will be next??!!

Video games, with their colorful graphics and constant action, are a perfect example of this phenomenon, and they represent another example of high tech addiction. For most of us, though, their only danger is the huge amount of time they waste. Much worse are slot machines. With their constantly whirring oranges and lemons, not to mention all the bells and whistles, they can mechanically affect dopamine levels in the same way that cocaine does it chemically. Worse, a perversion of the learning process itself is also involved. Because although all those oranges and lemons are being randomly generated, the poor brain is constantly looking for patterns which by definition can't exist. Which is why some people will sit there for hours and hours blindly putting quarter after quarter into the machine.

After all, finding patterns is another one of those 'killer apps' that make our brains and our resultant humanity so special. It is the basis for common sense and, in its more streamlined form, of science itself. In fact, our brains are so absorbed in finding patterns that sometimes they see them when they aren't there. Which may be mildly entertaining when we perceive the shape of an object or a person in a cloud. But probably not so much when gamblers think that they can predict lottery numbers or roulette wheel spins. Or when day traders sitting in their homes think that they can predict short or medium term fluctuations in individual stocks on Wall Street.

Take it a little further and you can understand how being slavishly devoted to the dopamine rush is responsible for much of the thrill seeking, risk taking personality's existence. Again it's bad enough that risky behavior such as a love of speed boats or downhill ski racing can lead to broken bones or sometimes worse. But when formerly staid, conservative occupations such as banking and finance get taken over by risk takers then the entire economy can and will be taken down.

Even most of us who are fortunate enough both not to have addictive personalities and to be satisfied by moderate thrills still, to a greater or lesser extent, have issues over self control. And the same stupid little dopamine feedback loop is why it is so hard for us to follow through on our well thought out rational plans to lose weight, get in shape, tackle that household repair, or get back to writing that chapter. After all, the immediate pleasure of eating that piece of chocolate cake, watching the ball game, or checking the email once again is always way more enjoyable than is the long slog of concentrating and/or exercising self control.

And all of this because of a neurotransmitter.

Now I already gave you one example of the fight that goes on between and among the various brain areas, which was the conflict between the insula and the nucleus accumbus which goes on whenever we are in the marketplace and trying to decide whether to make a deal or not. Throw in all the fear of the amygdala, and now we have a great example of how this particular intrabrain conflict causes virtually all of us to act irrationally.

It's call loss aversion.

Experiments have repeatedly shown that we fear loss almost exactly twice as much as we value gain. For instance, if you ask people whether they would rather a) outright lose $100 or b) have a 50/50 chance of either breaking even or losing $200, they will generally take the gamble. This is opposed to what happens when you ask people whether they would rather a) receive $100 or b) have a 50/50 chance of getting $200 or getting nothing. Then they usually want the sure thing. In other words, they so hate losing that they'd rather roll the dice on losing twice as much so long as there is the possibility that they won't lose anything.

In a subtler form this is also why a severely ill patient who is told that an operation has an 80% success rate will probably choose to go for it, whereas a patient who is told that there is a 20% chance that they will die will not. It is why, to get to the same end price, merchants will raise the original price to a high level and then offer a discount rather than keep the old price and add a surcharge. It is why a product is labeled as 90% Fat Free! rather than 10% Fat!

Another associated phenomenon covers our attitudes about possessions that we already have. Called the endowment effect, this is why those people who were given the ceramic mugs placed twice as much of a supposedly 'objective' value on them than did those who didn't get one.

You'll note that this has nothing to do with our emotional attachment to our particular possessions. Because remember that these people had just been given those mugs, and that they hadn't even been attracted to them beforehand. And while we're on the subject let me point out that all of the experiments presented so far have strenuously tried to keep emotions out of the decision making process. No one was asked how they would respond if their mother was one of the people tied up on the trolley track. All of these mental exercises were ostensibly asking for the rational solution.

Which brings us back to the prefrontal cortex. And all of its misperceiving problems. For it turns out that all those heuristic devices, all those rules of thumb, can be fooled oh so very easily.

Some of these ways in which human motivation and human behavior differ from strict rationality have been acknowledged for so long that it is uncommon to think of them as failures of heuristics. For example, you probably don't value that fourth hot fudge sundae as much as you did the first one. And you'd probably rather have one today than one five years from now. Unless programmed to act more 'human', however, a computer would not see the difference.

Then there's the idea of 'fair price', which goes back at least to Thomas Aquinas: If a snow shovel regularly costs $20 we all feel ripped off if a store raises the price after a big storm. Basic economic theory about supply and demand, however, says that the store owner is acting perfectly legitimately, since now there is much more demand for snow shovels after a storm.

There are other concepts that you no doubt ran across if you happened to take Econ 101. Sunk cost, for instance. This is the understanding that our future decisions about something shouldn't be influenced by the money that we've already irretrievably sunk into it. Let's say you just spent $3000 to fix the transmission on your clunker car. And then immediately afterward the engine dies. In theory your decision whether to go ahead with another $2000 repair job shouldn't be influenced by the money that you've already spent. But it usually is.

Or take the 'Chivas Regal', or luxury goods, effect. According to the most basic of economic ideas, namely that of supply and demand, if the price of an object is lowered then more people will buy it. But on many luxury goods raising the price, sometimes excessively, will make it appear to be much more valuable and consumption will therefore rise. And this phenomenon, in a slightly altered form, is why those students who had paid full price for their energy drink valued it more and therefore solved more problems than those who had paid less.

Somehow mainstream economics accepted all of these blatant exceptions to basic economic theory without ever questioning its basic assumption that all of our 'marketplace' decisions arise from rational calculation. Nowadays, though, a new branch of the field, known as behavioral economics, has discovered all sorts of other ways in which those rules of thumb lead to irrationality.

For instance, take the idea of transaction utility. Say you are at the beach on a hot day, a friend is going back to a fancy hotel for something, and he asks if you want him to get you a beer. Knowing that such places overcharge, you say that you are willing to pay $7, but no more. He comes back with a beer and says that he paid $7. But he also says that he bought it at a tiny store in town, and you know that those corner markets usually charge $3. It's the same beer, but now you feel totally cheated.

This is an example of mental accounting. And it's why we buy things on sale that we don't really need or even want. Or why we don't buy something that we would have really enjoyed just because its price was just over our mental cutoff point.

And I've already told you about the anchoring effect. But here's another example: A group of MIT grad students were asked to write down the last two digits of their Social Security number. Then they were asked to 'bid' on a range of items like a bottle of wine or a cordless keyboard. Even though they were told not to pay attention to whatever number they had written down, those with the lowest numbers (01-20) made an average bid of $16. Whereas those with the highest numbers (80-99) made an average bid of $56. Again, these were MIT grad students, who supposedly were smarter and more rational than your average citizen.

Then there is decision fatigue. It has been shown that judges, even though their own perception is that they are being fair and impartial throughout, give much lighter sentences at the start of each work day and much harsher ones right before quitting time. For the exact same offenses.

These last two instances help illuminate what is going on in the prefrontal cortex, and reinforce our understanding of why it needs those heuristic devices in the first place. Remember that hard wired preset limit of seven pieces of data at a time. And then factor in all the energy which is required to keep the brain going, and you can see how easy it is for it to get tired out. So that even under the best of conditions, said cortex just isn't smart enough and strong enough to deal with all the many, many niggly and not so niggly decisions it has to come up with each and every day.

Unfortunately the modern world just so happens to be the worst of conditions. After all, it is usually better to have a choice of more than one brand or version of a product. But research has shown that once the number of choices goes above three or four the brain tends to shut down in decision overload. And although it's a nice fantasy to think that you can multi-task, the actual reality is that you can't. Flitting around from one cognitive task to another invariably makes us all much less efficient at any and all of them.

And there are so many other examples of how irrational we are in everyday life. On the plus side, for instance, there is the placebo effect. If we are told that a sugar pill will cure a headache or soothe our pain, it often will. Sometimes it can even cure cancer.

Or take optimism. It has been shown that, even when the situation is innately depressing and hopeless, those people with an (irrationally) optimistic outlook will usually end up in better circumstances.

On the other hand being overly optimistic and overconfident is why people invest money into idiotic schemes. Or even sometimes start wars. And the 'more is better' approach that almost all of our dopamine addled brains have is pretty self-destructive when restaurants serve us larger and larger portions, and we all end up getting fatter and fatter.

So to summarize: Yes, we are all capable of rational thought. And rationality itself is the most wonderful of gifts. Even more amazing, though, is the huge amount of thinking and processing which goes on beyond the purely conscious realm. But unless we recognize all of the inherent flaws in the jerry rigged system which is our thinking and decision making apparatus we are going to find ourselves in big trouble.

And—as pertains to this podcast—it should be somewhat more than obvious that the simplistic 18th Century 'Age of Reason' ideas as to how the brain works and how thoughts process were little better than were those primitive notions about how the Earth rested on a giant tortoise.

And I'll be taking up some of the consequences of relying on simplistic Age of Reason ideas in the next episode.

For this episode, however, once again I would like to thank you so much for so far having listened.