

**From NEURONS TO NEIGHBORHOODS**  
**New Ways to Prevent and Heal Emotional-Trauma in Children and Adults**

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**NATURE AND NURTURE OF BRAIN DEVELOPMENT**  
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*From the 2003, from Neurons to Neighborhoods Conference, this is tape number 1, a keynote address by Dr. Bruce Perry on the Nature and Nurture of Brain Development, how early experience shapes child and culture.*

Thank you very much. I'm very happy to be here. This is a rare opportunity to be able to spend as much time as we will today talking about this topic. I feel somewhat like a pig actually, because I get to do most of the talking. The truth is that's not quite fair. In this room there is significant expertise beyond anything that I know or I've been educated about. Collectively I think the wisdom of this group is astounding. If you think about how many children we've all seen, how many systemic issues we've been faced with and tried to address, think about all of our collective experience, it would be pretty remarkable. I come to this presentation somewhat humbly, recognizing that there are many people in this room who have more clinical experience, who have better educations, who are more articulate, and who have a lot better ideas than I do.

However, that given the right spirit of this presentation, I do have something to contribute. What I want to do this morning, and really throughout the day, is encourage you to be active leaders in your community and effective agents of change, many of you already are. I really would like to in some regards celebrate that leadership role that you play and make you feel better about what you do. The fact is everybody in this room probably believes what's written on this screen. Yet we are living in communities and in a society and very often even within families that have lost sight of the power of influencing young children.

This presentation this morning, the second keynote too, are really, more than anything, about leadership. They're about how you can be more effective in leading an individual child in a process of growth, in a process of healing, and how you can play a more effective role in leading your colleagues and your community in understanding how to make effective systemic change.

Despite the fact that we all recognize that children are important, and that we value children, I think that we sometimes lose sight of how important this work is. The fact is that right now as I stand here in front of you, the language I speak, the clothes I wear, the style of governance that we live in in this country, and so many other aspects of my daily life and your daily life, are products of choices made hundreds of generations ago, and two generations ago, and in the last generation. The choices we now make about

how we provide environments and experiences for our young children will influence the lives of many generations. In fact, because of this remarkable organ here, because of the human brain, our species, unlike any other species on this planet, is able to store experience more efficiently and more effectively in ways that allow us to carry forward the accumulated experience and wisdom of thousands of previous generations.

Now other species do carry forward learned and acquired information. However, no other species does it as efficiently as the human being. The organ that allows us to do this is the brain. Think of it. Right now you hear sound that I'm making and you're able to take that sound and your brain is taking in the pattern, neuronal activity associated with that sound, it's buzzing it around through different parts of your brain, and it's associating it with images, objects, concepts that have been previously associated with that sound. By mutual consent, we've agreed that the sound cow means that animal over there, which all of you can see, right? I don't have you all under hypnosis yet. Words are only sounds until they become associated with a person, place, object, thing, concept and so forth.

All of these things on this slide are products of choices. They are inventions of humanity. We pass them forward, generation after generation after generation after generation. We all know in this room, everybody has been taught and heard and maybe even worked with children who were never spoken to when they were growing up and who now have speech and language problems. You take a child and you raise them in silence, they will not spontaneously speak any language. You take a child and you raise them in the absence of any systematic exposure to a religious belief, and they will not be any practicing religion. You raise a child in an environment where they're not given repetitive, systematic, cognitive experiences, that teach them to read and write, then the genetic potential that they have in their brain to learn how to read and write, will not be expressed.

Ten thousand years ago on this planet, just about every single human being born had the potential to learn how to read and write. But nobody on the planet learned how to read and write, not a single person, because we had not yet invented the written word. One hundred and fifty years ago in the United States and all throughout North America, African American children and Native American children and children who were of all kinds of different ethnicities and economic status and gender had the potential to learn how to read and write. Very few of them did, because we were not providing patterned systematic opportunities for cognitive enrichment to express that genetic potential. Many of the things that we do and so many of the things that we are products of thoughtful, deliberate choices made. Many of the things that we carry forward in time from generation to generation are products of ignorance and the lack of a conscious choice.

There are no genetics for racism. However, we pass that from generation to generation. There are no genetics for anti-Semitism, and we allow that to get passed from generation to generation. There are no genetics for misogyny. We let that get passed from generation to generation. There are no genetics that would automatically make

someone grow up and think that the major problem solving technique they should use is violence. Yet, not only do we allow this, we actually spend billions of dollars in our culture to teach out children this. By the time a child is 18, they will have seen 200,000 acts of violence as a specific problem solving technique. We allow this to happen by our inability to make choice. Now it's interesting that we spend another billion dollars a year for programs so children will unlearn some of the things that we've taught them in a different segment of our community.

It is idiocy and it is expensive, not just economically, but it's expensive in terms of what happens to human beings. None of us in this room would choose to have our children grow up feeling bad about their bodies and have self esteem problems because their breasts aren't big enough and their rumps are too big and their noses are too long and their skin's not the right color. But, we let our children grow up with those images permeating the media of perfection that they cannot conceivably reach. Everybody grows up thinking they're inadequate physically. Even people that are incredibly beautiful by our current standards feel inadequate to some degree.

This presentation is about active choice to make changes in the way we live and the way we raise our children in order to express the best in them and not to allow the worst to be expressed or allow good things to remain unexpressed. This process of social cultural evolution is fragile. The wisdom of thousands of previous generations can be lost in a catastrophic way over a course of a couple generations, such as what happened with the Native Americans. Or, it can be much more subtle, such as what we are now facing--the reasons that we even have to have early childhood programs and early childhood interventions and a Child Protective Service. Think about it. Why in the hell would you need a Child Protective Service? To keep people from hurting their children and not feeding their children and not talking to their children? What is wrong with a culture where you need that kind of an organization? The reason that we need that is that we've gone through a subtle process of social culture devolution and we've become a child illiterate culture.

It's an amazing irony right now that despite the fact that we have tremendous wisdom amongst some segments of the population and in fact we know more about children than any other time in the history of our species, none of that information has filtered into our policy and practice about children. We are really foolish when it comes to creating environments for children. Despite the fact that we know that the ideal environment for a child is enriched in relationships, we turn around and we create a world for our children that's impoverished in relationships. I'll come back and talk about this more later on in this presentation.

Think about it for a minute. If you look at why we are child illiterate, what has happened? How is it that 50 percent of the people on the streets you ask, "Should you respond to a crying infant?" 50 percent of them will say, "Well you know you really shouldn't because you're spoiling that infant." What the hell is that? How ignorant is that? Or, 50 percent of the people off the street think that it's appropriate to hit a three-year-old child who is misbehaving. Literally, I've seen this at the playground. Watching,

one little boy goes over and pushes another little boy. The father goes over to the child, hits him on the rump and says don't hit.

We're a child illiterate culture. Think about how child illiterate it is. I may not be very popular for this statement, but think about how we are idiots if we think that it's a best practice that the ratio of babies to adult caregivers should be one to three. What the hell... That's crazy. We've spent 99.9 percent of the time on this planet being hunter/gatherer clans where the ratio of caregivers for every dependent child under the age of six is four to one. We think that it's an ideal child-care setting where there's one to four. That's one-sixteenth of what our brain really is designed for.

One of the reasons that we know so little about caregiving, one of the reasons that we know so little about what's really good for young children, is that we've lost the mechanism for transferring child-rearing information from generation to generation. If you grow up in an extended family model or in a hunter/gatherer clan, and you were a five-year-old child, you helped take care of the baby. If you were seven, you took care of the three-year-olds and you learned from the nine-year-old and you turned around and talked to the four-year-olds. By the time you were of child-rearing age, you knew whatever the prevailing views of your community were about child rearing. Not only did you know them, you had had hands-on experience with it. Believe me, I'm not trying to idealize all other child-rearing beliefs and practices from aboriginal hunter/gatherer clans. Some of them were stupid. But, by and large their early childhood practices were much healthier than ours are in our culture.

So what has happened? The way we've invented our modern world, the number of people in a household has shrunk significantly. Forty people in a typical hunter/gatherer clan by 1500 in the west the number of people in a living group was 20. By 1850, it was down to ten in the U.S., 1960 in that census we had, the average size of the household was five, and the last U.S. census there fewer than three people in the average American household. In that household people were watching television 30 percent of the time, they had their own bedrooms, and they didn't have family meals. When they left that home, they spent almost all of their time with a group of same age peers and one adult.

Think about how biologically disrespectful it is to choose as our method of teaching emotional, social and cognitive information to our children, to take 39 year-old children, put them in one room with one adult for seven hours. That is so biologically disrespectful it's incomprehensible. It is amazing that children even learn as much as they do. I don't mean to pander to you. I want you to recognize that we've invented ourselves into a corner. We've painted ourselves into a corner. We are now in a world where we have essentially reversed the relational social matrix in a way that has disastrous impact on our children.

I'll come back to this in a minute. You understand how important relationships are. You talk, write, and work within the whole attachment domain. You understand this. However, I want you to understand this in a slightly different perspective. What I want

you to recognize is that when a child is held in the arms of a caregiver, or when a four-year-old child comes over and spends 20 seconds with another human being in their presence and looks in their eyes, *that's physiological*. There's a *physiological* thing that happens when you look at somebody, when you touch somebody, when you sit next to somebody on the bus and you smell that other person. Literally every single one of these human contacts change your brain.

It turns out, and I'll talk about this maybe a little bit more later on, that the vast majority of these physiological interactions we have with other human beings influence the brain in positive ways. When you get touched by somebody through shaking hands, when you have a conversation that's 20 seconds long with the person who is serving you coffee at Starbucks about how amazing the weather is in L.A., each one of those little interactions, a joke about the Lakers... Well I guess I shouldn't... They're not always positive interactions. This little laugh you had, that changed your physiology. These things change your brain. And as a result of these daily interactions you have, you're strengthening your immune system.

Because of the way human beings, which I will talk about in a moment, are neurobiologically designed to be part of others, to be part of the group, you feel safest and calmest in the presence of familiar individuals. Your stress response is lower. Your stress response neurobiology has been regulated in the presence of others. When you have all these relational contacts, you feel safer, which means that the physiology in your heart and your lungs, in your gut, in your skin, is going to make those end organs healthier. When you don't have relationships, you actually have a more poorly regulated stress response system, and you're more physiologically vulnerable. You're more emotionally vulnerable, you're more cognitively vulnerable.

We've become very interested in relationships and how they physiologically shape the brain. With the absence of good psychometrics about this, we've started to develop a number of things to try and get a handle on this. I'm going to show you this one version of what we've been working with. This is a 24-hour contact map with one child over a one-day period. This is the child and this little arrow here is one contact with the family member. The inner circle here is family member. This is a group of friends. This is a group of acquaintances and this is a group of strangers. What you see with this child is throughout the day he's having lots of these little bursts of physiological interaction. This is a healthy child.

This is the best day in a week for a high-risk child. The high-risk child, this child actually had two days in this week where there wasn't one single arrow. He woke up in the morning and his mom was still sleeping. He couldn't wake her up, so he made himself breakfast and he went to the bus. He's an invisible kid, because he's a little bit of a problem. Other kids don't like him, he's marginalized, nobody sits with him on the bus, he goes to school and if he doesn't cause trouble, the teacher leaves him alone. On the days that he didn't get into trouble, nobody talked to him. Nobody touched him. Nobody did anything with him, and the truth is gee why do you think he might act out a little bit?

It's the only way he gets touched. It's the only way he gets somebody to look at him. It's the only way he gets somebody to talk to him.

On these days when nothing happened, and he was "good" in the eyes of the teacher, he got no physiological bursts from human interaction. Went home, mom was gone out drinking, didn't come back. He made himself macaroni and cheese and went to bed. Not one single human contact on that day. We've created a world that allows individuals who are living in these socially and emotionally isolated environments to have poverty relationship. Further, we've created a world where children who aren't being abused and neglected, children who are in mainstream "healthy" families, have one-fourth the number of social emotional interactions that a child in a hunter/gatherer clan would have. And, that's kids who are healthy.

I'll come back and talk about this in a minute in more detail. What I would like to do is start a new paragraph and have you think a little bit about the brain. Now most of us are trained and learn about relationships. We don't usually think about physiology, but I want you to think about the physiology of the brain in context of relationships. The brain is this remarkable organ. When you have a good thought, that's your brain. When you move your little finger, it's your brain. When you have a bad thought, that's your brain. When you say something funny, it's your brain. When you fall in love, it's your brain. When your heart gets broken, it's your brain, not your heart that's getting broken. It's true. So, in comparison to those other boring organs in your body, like your heart that does nothing but pump blood, it's a pretty boring organ actually, the brain is remarkably complex, fascinating, interesting. It does zillions of things. It's remarkably complex.

I don't want to go on and on about the hundred billion neurons and the ten times as many cells and the trillions and trillions of synaptic connections, which are in a continuous dynamic process of activity, always changing. I don't want to talk about that. I want you to appreciate that this complexity is organized in ways that are sensible. Your brain is organized from the bottom to the top and in general the functions that are mediated by these different areas and systems in these areas, go from simple to more complex in the same way that your brain does. The higher you get in the brain, the more complex the function and the more complex the organization.

The reason I'm pointing this out is that I want you to appreciate that there can be in the life of a child a set of experiences which lead to the healthy normal development of all of this part of the brain and all of this part of the brain, but not this part of the brain. For example... And I'll talk about children who have had that...they've had experiences that have helped them develop healthy motor functioning and healthy self regulation capabilities and healthy cognitive experiences, but they have not had enough social emotional interactions to fully express their potential to be connected in healthy ways and to be humane.

There are children on the other hand who have developed wonderful capabilities to be connected and for a variety of reasons may not have the cognitive capabilities to fully be cognitively mature and advanced. That may be from a developmental problem, it may

be from genetics, it may be from some sort of experienced-based deprivation, but there are different ways in which parts of the brain can be well organized, while other parts can be poorly organized and dysfunctional. This is very important, because clinically one of the things that you run into all the time, and I have to try to explain to parents all the time is gee Tommy is so smart, I don't understand why he would go and do that certain behavior. Why does he go over and take that toy from another child? He's so smart. Well the part of his brain that regulates the interaction with other children is different from the part of your brain that makes you solve math problems. This is important for people to understand. It's important because you can't just prepare children for school by doing cognitive drills.

The current federal push to leave no child behind is way too cognitively focused. The problem we're having in our culture right now isn't that we don't have enough cognitive enrichment for our children. The problem, as I will point out later on, is that we're not getting enough social emotional enrichment. If anything, we need to spend more time helping our children form healthy relationships rather than learn how to solve math problems.

Again I don't mean to pander, but this is basic neurobiology. The brain develops from the bottom to the top. The healthy organization of this part of the brain depends upon the healthy organization of this part of the brain. And the healthy organization of this part of the brain depends upon the healthy organization of this part of the brain. And the healthy organization of that part of the brain depends upon the healthy organization of this part of the brain. The brain grows like a layer cake. You've got to go from the bottom to the top. If we're doing all of these things to enrich this part of the brain, but we leave this part of the brain behind, we're going to have a lot of very smart people who don't care about anyone else, and they'll end up being like these Enron execs. If you want a world full of people that are very, very smart but don't care about others, then you focus on cognitive things with three-year-old children.

All right, so let me talk about how important this relational stuff is. Again I know I'm sort of preaching to the choir, but I want to arm you with some stuff that you can take back in your leadership positions and convince other people about how important relationships are. Relationships are so important that you cannot become a human being, you cannot survive, you cannot procreate, you cannot protect and nurture dependents, you can't do any of the essential things that our brain has to do for our species to exist without forming relationships. Think about it. The species, our brain, our body exists to promote the survival of the species. I don't want to go on to any philosophical thing. The bottom line is biologically speaking, if we didn't have the capability to do these three things, our species would be gone.

Our brain has built into our heads very, very sophisticated and important systems to do all three of these things: to stay alive, to procreate, and to protect and nurture dependents. The major strategy that we use for each one of these is to form relationships. Human beings in the natural world are slow. We're weak, we have no natural body weapons or armor. We are meat on feet. As Richard Leaky said it, in a

much more eloquent way, “A single primate is a dead primate.” That’s what we are. We need each other. In order for us to survive, we need to form alliances and relationships and clearly in order for us to procreate, we need to form relationships.

In order for us to take care of the infants that are born, we have to have some really interesting neurobiological things take place in our brains. In fact, we have to sort of trick ourselves into taking care of little ones. Eighteen hours of excruciating pain, you pass an eight-pound object through a small orifice and then you pick up this little thing and smile and feel pleasure. Now that’s twisted. It is. But, it’s the way your brain tricks you into doing the right thing for the species. The truth is, if we were designed for only self-interest you would never take the energy and the calories and the time and make yourself vulnerable by taking care of a baby. In order for us to do that we literally have to be tricked into wanting to do it. The way that happens is that in the human brain, under healthy circumstances, when a child is in a healthy early care giving interaction, with a loving caregiver or a set of loving caregivers, and they hold this infant in their arms, and they respond to their needs, there are physiological things that are happening in the brain of the caregiver and the brain of the baby.

Remember repetition every time a child gets a little bit hungry. What does it feel like when you’re really, really, really hungry and you have a good meal? What does that feel like? It’s pleasure. It causes pleasure. When you get really, really, really thirsty, or your bladder gets really, really, really full, and you relieve yourself. You will all know about this soon. Every time the child’s needs, sense of discomfort rises for any variety of reasons, and the caregiver comes and responds to that, it gives pleasure. Little by little the neurobiological systems that are responsible for reward and pleasure, get weaved into the neurobiological systems that are responsible for forming and maintaining human relationships. The association between pleasure and this caregiver get weaved together, so ultimately over time human beings come to be physiologically linked to other human beings because they get pleasure from it.

From a young toddler and from a young child growing up, there’s no more reinforcing interaction than the positive regard and attention of a loved one. That’s the most powerful reward you can give. It’s much more powerful than a star or a candy or these stupid behavioral things that people use. It’s the attention and approval of an adult, particularly a loved and needed adult. There is no more significant overwhelming consequence than the disapproval or inattention of one of these loved ones. Everybody’s probably had the experience with a little two-year-old when they think they’re doing something right and they come to you and you sort of inadvertently go, “No.” They get crushed. They fall to the floor sometimes. It’s so powerful. All of you know how you feel when somebody you trust, somebody you respect, somebody you care for shows disapproval with you, it really upset. You need to make it right. It makes you feel uncomfortable, out of sync, dis-equilibrated.

There’s nothing more powerful than the attention and approval of somebody you love, if the neurobiology of attachment and reward got really well weaved into the neurobiology of social affiliation. Now, unfortunately in some cases there are children who have

caregivers who are overwhelmed, caregivers who are distressed, caregivers who are in a domestic violence setting, and who are isolated and who are not able to provide that kind of continuous responsive caregiving. You know what happens? They don't get that powerful connection between reward and human social affiliation. As they get older, and a preschool teacher says, "No, don't do that," it doesn't bother them. Or, the preschool teacher says, "That's really good, that's good work," it doesn't give them much reward.

It's so much harder to shape the behavior of a child who has got what we end up calling attachment problems than it is a child who doesn't. The major tool for care giving, the major tool for therapy, the major tool for education is the person. It's not any of these other things that people are trying to sell. It's all because the lowest divisible unit of our species is the clan. We are not neurobiologically isolated entities. We are not biologically capable of surviving independently. We need each other. The lowest divisible unit of our species is the group. Because we live in the west, because we focused so much on individual rights, individual physiology, individual psychotherapy, individual this, individual that, most of us have to re-learn the importance of relationships and the importance of groups.

Let me tell you how important relationships are. Let me use the example of violence to illustrate the power of relationships and the importance of relationships in understanding a range of human conditions—all the way from individual physical health up to huge public policy issues that involve foreign policy. This is the murder rate in Amsterdam in 1450. It was 45 per 100,000. That's higher than the murder rate in New York City right now. Higher than the murder rate in New York City about ten years ago when they had even more significant problems with violence. Four hundred years later, the murder rate was down to three per 100,000. Why did that happen? Do you think that they put a school-based, anti-violence program into the schools? Not that I want to go after school-based, anti-violence programs, but what I would like to point out is that in Amsterdam in 1450 there was no violence on television. There were no oozies, there was no crack cocaine, but there was something that was making these people kill each other at an incredible rate. A mere 400 years later there was something that made these people much less violent. This points out something that I think we have to continue to look at in every generation.

What is it about the way we raise our children in one environment that leads to bright, humane, abstract, creative, giving people, and in other environments we can end up with children who are impulsive, aggressive, concrete, who are hateful, destructive. It is amazing the range of behaviors that come out of the same species. As I sort of alluded to, I don't think that the people in Amsterdam consciously cared or even were aware of the changes they were making that led to decreases in violence. It was an epi phenomenon because what happened in Amsterdam was related to the deterioration of what people call social fabric. When they say social fabric, what I want you to think of is this: The sociological term social fabric is nothing more than the opportunity for an individual to make a relationship. So, all of these things that are factors associated with social fabric I want you in your brain to think ah these are opportunities for people to be in proximity with each other. These are opportunities for people to have these little

physiological bursts of interaction: Someone who belongs to a healthy community where people know neighbors, they're going to have more relationships. If they belong to a community of faith and they go to that community of faith, then they're going to have more relationships. If they go to a workplace where they are employed and they're not going to be isolated, they're going to be around people. There's a whole host of these things that have to do with social fabric that bring people together along some common basis and increase the probability that they will have an interaction.

So, in Amsterdam what happened? Western Europe is a rural agrarian population. People live generation after generation after generation in tiny little farming hamlets. They work the fields and make enough food for this year and save up a little bit for planting for next year and maybe have a little bit extra to buy a few things. Really the bottom line is they were just sort of making it year after year. The Black Plague comes and it kills one-third of the population. They can no longer work the fields. They can't make food. They starve. Their belief system is completely shattered. How could this happen? We've been doing the right thing, how could God do this to us. They become more hopeless, and the people who are strong enough to go look or work for food move to the city.

Now what happens when they leave the community is that they've left their past. They've left people that know them, and they're now going into an environment where instead of having things that weave social fabric, instead of having things that bring you together in some common way, you have things where you're competing with other individuals. You're competing for limited resources. You are more stressed because everything is novel. Your brain responds to this disconnection by increasing your arousal system, and the more people get threatened, the more reactive they get, the more impulsive they get, the more regressed they get and they end up killing each other.

This happens in every single era in history and this has happened in every single ethnicity. Examples are Mogadishu in the modern era, things that have happened in the Balkans, for example, the Hutus and the Tootsies. When social fabric deteriorates because of some broad economic or social or geographic disaster, it leads to disconnection to isolation to fragmentation. Look what's happened to the Native Americans. To this day they live with more violence, suicide, mental illness, health problems, because social fabric was completely dissolved, and they've had a very difficult time trying to reweave it back. Now it's an interesting thing. I worked in Alberta where there are about 53 different bands of Native American who are of different stages of reweaving social fabric. There's a linear relationship between the degree to which they've been able to recapture the old ways and reweave community and all of these factors—violence, suicide, mental health problems, etc., etc. Some of the most important work that will be coming out in the next 20 years will be the relationship between physical health and emotional health and community health factors.

The people that are doing most of this work, they're not neurobiologists and they don't know anything about development. Part of what we have to do from our perspective is

help them understand and appreciate that these broad public health issues and perspectives and the power of relationships are intimately related to how the brain develops. A person's capacity to be a healthy member of the community, to form healthy relationships, has its roots in early childhood. It's very, very difficult for somebody who doesn't know how to form a relationship with another person in a healthy way to be an effective member of a community. It's very hard to do. It's hard to be an effective student, it's hard to be an effective co-worker, it's hard to be an effective caregiver. The roots of all of this, all of those problems, all of our social ills, start in the first years of life because of the way the brain organizes.

The brain in all this remarkable complexity, with all this amazing capacity to do all these things, actually organizes primarily in the first five years after conception. In the first nine months following conception in utero, there are remarkable changes that are taking place in the brain, remarkable physical transformations, remarkable processes that are environmentally sensitive, that are shaping how the brain will function. After birth, that process continues to be very, very, very active. When you are born, you're using about 65 percent of your calories in your brain. Right now you're using about 18 percent of your calories in your brain. Those of you who have had caffeine may be using 19 percent, and those of you who haven't, a little lower. Your brain is tremendously, tremendously active in these developmental processes and in growth in the first years of life.

One of the most important guiding principles of how the brain organizes and becomes functional is activity-dependent neuronal differentiation. The brain changes in a dependent way. The more any neural system is activated, the more it will make the physical changes, including sprouting dendrites and making more synapses and making strong synapses. Those physical changes end up making a functional neural network. This process is so remarkable and so rapid that I have a very hard time sometimes even describing it. I always use this little bit of an analogy here. This is a just-fertilized egg, and two years later this is what you get. But, to go physically from this point to this little one here over a two-year period of time, would be the equivalent of me growing to be the size of Iowa.

This process is guided by genetics and by experience. There will be people who will want to trap you into this little argument about nature or nurture. Is this a genetic thing or is this not a genetic thing? Is this learned or is this experience? You need to just walk away from those arguments. They're meaningless. They mean nothing. You cannot have anything without a combination of genetics and experience. Period. You just can't. Genes without a microenvironment won't be expressed. The microenvironment is influenced by experience. Just walk away from those arguments. It's like arguing with a teenager. You won't win. It's conceptually flawed. I do want you to appreciate this: that in the brain the changes that are taking place actually will shift over the lifetime with regards to the, if you will, the balance or the power of which of these is having most influence on change. If you think about that just-fertilized egg that I showed you, the majority of changes that are taking place over the next several weeks are guided by genetics.

Now there are some microenvironmental things that can influence that process, but by and large a genetic plan will cause the unfolding of changes in those systems. However, in your brain right over here, the majority of change taking place in your brain right now is because of experience. The books you read, the movies you go to, and the people you see, these are all non-genetically mediated changes in your brain. Even by the end of the first trimester, experience is beginning to play a major role in shaping how the brain works. Some of the intrauterine experiences that are very, very important, which I'll talk about later on, not in the keynote but in the training, is maternal heart rate for example, plays a major organizing sensory input for the brainstem. When you touch someone, there's a chain of neural activity that goes up into your brain that lets you know that you're being touched. When you look someone in the eyes, and they smile, there's a chain of neural activity that goes from your eyes up into certain parts of your brain that tell you what this image is, that interpret the expression, that interpret the context. We have these chains of neural systems in motor, social, and cognitive domains that help us make sense of the external world. Most of these neural chains, most of these systems are organized in the first years of life.

Physical growth of the body from birth to 20 is linear. Physical growth of the brain plateaus at about four years of age. It doesn't mean that the brain of a four-year-old is the same as the brain of an adult. It is analogous to building a huge skyscraper where you'll take 90 percent of your materials and 90 percent of your effort and put in the foundation, the super structure, the wiring, the plumbing, and the flooring and nobody is occupying the building, right? It's not functional yet. The job you did in putting in the foundation and the wiring and the plumbing is going to determine for the life of the building how well it works. This is what is happening in the brains of young children as a function of their experiences in the first five years of life. The foundational neural systems that you use for the rest of your life for relationships are laid and changed by experiences in those first years of life. Again, bonding, forming relationships, and attachment, all of these things are products of the physical experiences of infancy. I emphasize physical, because I want you to appreciate this. You've got a six-week-old baby lying over there in the crib. You're on your computer e-mailing your family about how wonderful the baby is. You wave at the baby and say, "I love you so much." You may love the child, but that means nothing to the child. To an infant, love is behavior. It is action, it is touch, it is scent, it is rocking, and it is sound. In a very interesting way, you could have a situation, and I've been involved in these, where there's an individual who truly affectively loves the infant but doesn't provide loving experiences, and there are people who don't love the infant who provide the appropriate loving experiences.

Love is behavior. To the infant they need this somatisensory bath, they need the rocking, the touching, the eye contact, because when this happens this information is translated into patterned neuronal activity that goes up into specific parts of the brain that will ultimately be responsible for forming and maintaining relationships. Time after time when the child gets into a level of discomfort from hunger, fear, pain, or just wants to be touched, they will express that in their crying or their moving or their gesturing. An attuned responsive caregiver will come and provide more somatisensory input that over time allows the child to make an association between these things that are co-occurring.

Human characteristics: The eyes, the nose, the scent of this caregiver and the feeling of being satisfied.

Over time what is forming in the brain of this child is a memory. A complex set of memories that make the child begin to associate human beings with positive things. Human beings are responsive, they're warm, they meet my needs, they keep me safe, and they're good things. Human beings are good. This becomes the template against which all subsequent incoming information about human beings is judged. For the first year, let's say the first six weeks, seven weeks, this child has had these wonderful experiences that have resulted in her making a healthy association between human attributes and good things. Then along comes Uncle Joe, who bounces you a little differently and who smells differently and has got a louder voice. But, he has enough of those human attributes that you are willing to give him a break. In the mind of this infant you're going well you're a little bit like her but you're different. What happens is that the original set of primary caregiving relationships become the root system and the trunk of your relational tree. Over time your granny, auntie, siblings, teachers, and your co-workers become the branches of this relational tree. When that process, as I have said, goes well, that's excellent. When that process goes badly, it leads to problems.

When someone is worried about whether or not they're going to get beaten by their partner, it's very hard for them to provide this Johnson & Johnson idealized interaction with babies. Or, if they're a single caregiver and there are multiple children, all who have different needs, how are you going to meet the needs? You're a single caregiver. How are you going to meet the needs of the five-year-old and the three-year-old and your newborn? You're the only person there and you don't have extended family and you don't know the neighbors. You have nobody around to help. You can't. The problem is the more overwhelmed you are, the more fragmented this attuned caregiving is. We all know that if the child gets distressed, it's okay to get a little bit. In fact it's important to get a little bit of your comfort zone, a little bit out. But if you get up way out of your comfort zone for too long, you end up activating your stress response systems in a prolonged fashion, and you're hard to regulate over time.

If sometimes a caregiver is present and able to meet your needs and other times not, your brain isn't making these associations in a way that makes you think human beings are safe, predictable, and consistent. You think human beings are sometimes there, they're sometimes not, I don't know what to make of them. Sometimes they come and actually they're kind of mean to me and sometimes they come and they yell at me and sometimes they come and they're really good. It's confusing. You grow up and your template for human beings are when you meet Uncle Joe, instead of giving him the benefit of the doubt, you freak out. It's like oh god, go away.

These internal templates become very, very important. Let me talk about how this plays out with regards to relationships. Let's start out with the child who has a good internal template about human beings, has had great early caregiving, and has had multiple invested caregivers over the course of the first three years of life. This little child, this is a true story and I tell this all the time. I apologize to those of you who have heard this

before, but I love this story. I was traveling and it was a terrible travel day and all the planes were cancelled and the gates were getting more and more crowded and people were hot and obnoxious. It was just gross. Everybody was unhappy. This business traveler, a gentleman in a suit, goes over to the clerk at the gate and starts to yell at her. He is very, very inappropriate, very loud, very rude, and so loud that everybody is watching and just thinking what a jerk. This lady can't control the weather. He comes over and sits down. While this was going on, there was a little girl, a little toddler who has just sort of wandered over and was watching this guy with the look of like what the hell. You could see her brain going well you seem to have these human attributes but... She's just really curious about this guy, so he went over and sat down. He sat down and she went right over and stood right in front of him and smiled, and he took his paper and didn't smile back at her and put the paper up. Most of us kind of went what a jerk. She just stood there for a second and took her hand and pulled the paper down. I jumped. I was like oh my gosh and I was thinking I'm a mandatory reporter, what am I going to do? Everybody thought that he was going to be really inappropriate. He scowled at her to start with, but she just smiled, because she's thinking people are good. Finally he smirked back at her and when he smiled, she went off and got a piece of garbage and came over and, you know how little ones give, said, "here." He took the garbage, put it on his lap, and five minutes later, he's got his coat off, he's on his hands and knees and she's riding him.

This story is such a great example of how this internal template of the way you think human beings are that comes from your original relationships can ultimately elicit the best from people. What happens is the world becomes a self-fulfilling prophecy for this child. Now the sad thing is we work mostly with high-risk kids in our group so their internal template isn't that way, and they also elicit from the world what they expect. They'll come into a pre-K situation and the loving pre-K teacher will come to give them a hug and say, "Welcome to the class," and the child will shy away and not make eye contact. What happens there is that the teacher doesn't get much of a reward from the interaction. The teacher gets a reward from the other children who smile back at her, make her feel good and what will happen is no matter how wonderful she is, little by little she ends up spending more time with those other children and less time with this other child. After a few weeks the child will feel a little bit more comfortable and feel like she can actually leave her comfort zone and she'll raise her hand, "I want a little help, I want a little help, I want a little help." She'll look over and see the teacher preoccupied with another child and she'll just put her hand down and she says, "I was right. They don't care about me. I'm stupid. I'm not worthy. People are not predictable." Despite the fact that there were 20 attempts to engage her, that one time when she ventured out of the comfort zone and tried to do it and nobody was there, and reinforced her world view. These internal templates are very important. Unfortunately many, many children have experiences of neglect which lead to inappropriate underdevelopment or abnormal organization of some of these internal neural systems that lead to profound dysfunction.

There are, of course, many, many ways to neglect children. I don't want to use any of the legalistic definitions of neglect. You can have cognitive neglect, motor neglect, social emotional neglect, and you can have a whole range or combination of those

things. The neglect can be from experiences that are mis-timed developmentally. It could be from a complete sensory deprivation, which is very rare, but I'll talk about that in a minute. It can be from chaos. For example, the majority of children who have speech and language delay in our culture as a result of neglect, it's not because their brain didn't hear sound. It's because the sounds they heard were television and radio and yelling and fighting. Nobody got down on the floor with them and said, "This is a nose, and this is an ear." It's that chaos of noise that's played a role in disorganizing how their brain grew.

Let me give you a couple examples of neglect that we've run into. Remember at the outset I said that you can have experiences that actually end up with the development of significant cognitive capabilities but are deprived of social emotional interactions? This next situation illustrates that pretty well. There was a 17-year-old boy I was called to see, because he had arranged the gang rape of a retarded girl as part of his small senior class party. His family attorney felt that he might be able to avoid criminal charges if he could be declared depressed, so the family being very wealthy contacted their friends on the board of trustees who contacted the president of the university who contacted the dean who contacted my chairman who contacted me, and I got to go see this child. What a fun experience that was. I interviewed him, sat down with him. He was sort of put out that I was even there. Taking his time, he had things to do. At one point he said, "We did this girl a favor. I don't know what the big deal is." I said, "How do you figure you did her a favor?" "Well, she would have never gotten laid any other way." Clearly he had no remorse for what he did, but he had regret that he got caught.

I went and I met the mother and did a developmental history, which I think is sort of the key to understanding all of these things, and what I found out was that this was the mother's first child, she had a normal pregnancy and delivery, there were no problems that might account for any of this. He was immediately put into the care of a nanny. This was a very wealthy family and the nanny was fired after about eight weeks. I said, "Why did you fire the nanny?" The mother said, "My baby was showing more preference for the nanny rather than me." I said, "Oh." I can see where we might be on a really rough road here. By the time he was three, to make a long story short, he had had 18 primary caregivers. Now we all know that that's not good. I want you to know explicitly why that's not good from a neural developmental perspective.

Remember when I've been talking about making associations between these human characteristics and all these other things satisfying your needs, that ultimately lead to developing healthy attachment? Well, your brain literally is so sophisticated that it can make a distinction between the neural pattern of one person's voice and the neural pattern from another person's voice. The neural pattern associated with someone walking at a certain frequency and a different person walking a slightly different way. The neural pattern associated with the scent of one person and another person. Literally one caregiver has a distinct set of this neuronal pattern that's creating these memories that will form the basis of your attachment capability. It's very similar to language. If you look at all the elements of French, Spanish, and Italian, they have tremendous commonalities, but they're each different.

Take a moment and let's walk through this because I think it's useful to use when you are trying to teach people how to understand the importance of good childcare ratios, particularly with young kids. Use this example. If you want a child to learn a language and you raise them in a typical household, by the time they're three, they'll speak that language. If you speak two languages in that household, they'll speak both languages at age three. If you speak three languages, one third, one third, one third, by the time they're three, they'll sort of understand all three languages but they won't be as advanced. They'll be a little bit behind. If you speak five languages to that child, one fifth, one fifth, one fifth, one fifth, one fifth, each language is good, right? There's nothing wrong with any one of those languages. By the time they're three, they won't speak any of those languages. If you speak ten languages, one tenth, one tenth, one tenth, one tenth, they won't have a clue. They won't know anything.

It's the same thing with relationships. If you want your child to have ten healthy relationships when they're ten, you start out if you divided their early childhood experiences one tenth, one tenth, one tenth, one tenth, with all these ten loving people, each one of them is well intended and doing the right thing and being responsive. The fact is they still will not have that unique pattern of signals associated with one person in order to make sufficient associations required for healthy attachment. That's why particularly the first year of life you need to have relatively few primary caregivers. Once you do build in this foundational capability, once you learn your first language or two, once a child really does learn the rules and everything about Italian, they've learned 85 percent of Spanish and they've learned 85 percent of Portuguese, it's so much easier. It's like that with relationships. Once you make these foundational attachments, neurobiological networks, once they're built in, you've got 85 percent of what you need to actually be a good friend. You've got 85 percent of what you need to be a good co-worker. You've got 85 percent of what you need to be a good spouse. The trunk and the root system of your relational capabilities are put in place.

Early in life you need that consistent, predictable, repetitive opportunity for creating those associations. There are lots of different ways to neglect kids. One of the ways that we've learned a lot about is in primary sensory deprivation. This is that relatively rare group of children who have some form of significant sensory deprivation in the first three years of life. This would be an example of that. This is a drawing by an eight-year-old boy who spent the first three years of his life in an eastern European orphanage. We have some videotape from that orphanage, and they're very proud of this place, because it's clean and they always make sure that the kids get food. The videotape shows a caregiver coming in on one end and a caregiver coming in on the other end and there's 80 cribs in the room. They feed and diaper, feed and diaper and feed and diaper, and they spend about nine to 12 minutes per day with each child. These children had significant relational deprivation, significant cognitive deprivation, and significant tactile motor deprivation.

This child was adopted at age three by a loving family that provided tremendous, tremendous resources to try and help him catch up. He did catch up a little bit, but you can see he's still profoundly delayed. This is one of the reasons why that happens.

Relationships, touch, sight, sound and the things that go with relationships, with young children, are nutritional. They're just as nutritional as a calorie. They're even more important than calories in creating the foundational physical signals to shape healthy neural systems. When a child doesn't get these things, when there's poverty of experience, there's abnormalities in the way the brain grows.

This is the brain of a healthy three-year-old child. The brain circumference is in the 50th percentile, an average brain. This is a child who was raised in the United States in a cage, large ventricles and cortical atrophy. You can see that this is profoundly abnormal. This is a completely different child. This child on the right, this is a different cut of the brain, but what you can see, obviously these are bigger spaces here, these are ventricular spaces, and all the paraventricular brain areas are abnormally organized and have abnormally grown. This child was raised in a house where there were two other healthy children, two parents, pillars of the community, and the mother was part of a fundamentalist Christian sect. She got a postpartum depression. They didn't believe in mental health treatment, so she thought her child was possessed by the devil, and she went to the church elders and they sanctioned her raising this child separate from the family. They kept the child in the basement. When he started to walk around and get into stuff, they put a dog collar and a chain around his neck and kept him chained to an iron bed in his room downstairs. Believe it or not, that child was returned to those parents after six months of parent training.

This is a child who was raised in a Romania orphanage, cortical atrophy--significant abnormality of the brain. Early life experiences literally shape the brain. Later life experiences can change the brain, but early experiences literally determine how the brain organizes.

This is a drawing by a 14-year-old boy. This is abnormal. It is a family portrait. This child was brought into our clinic after a long, long history of mental health problems. I want to tell you this story because I think it illustrates how important it is for us to begin to change the way people understand children, because I think many, many problems like this could be avoided. He had all kinds of problems—didn't like to be touched, didn't establish eye contact, didn't have good relationships. He only had one relationship that was of any significance. It was really his dyadic relationship with his mother. He was a mess. He came to us on lots of medications, had had dozens of previous evaluations, had been given a diagnosis of ADHD, bipolar disorder, Asburgers, PDD, schizophrenia, autism, and whatever. You pick anyplace in the DSM, that's what he had.

We, as we always do, started with the developmental history. Here's what I found out. When I do developmental histories, I start with the history of the caregivers, because the way a parent raises a child is very often going to be reflective of the way they were raised. This mother was a single child living in a family away from her extended family. She went to an American public school. The reason all those things are important was obviously being a single child, she didn't spend much time with other kids. Being raised in an American public school meant that she didn't get any training about children, because we don't value that in our public schools. We teach state capitols and

geography and geometry and things that children will never use. Things that everybody will use and is important for everybody's health and welfare, we choose not to teach. Hopefully that will be changing all the time. She didn't learn anything about children. She met somebody, they fell in love, got married, moved to Texas, started a family business, and it was very successful. They decided they wanted to have a child. This was a wanted pregnancy, great prenatal care, normal delivery and she was faced with the childcare dilemma. She said, "I'm not going to just entrust my child to anybody. I want somebody to come to my home that I can trust so my child can form this good, healthy relationship with one person," because she had read enough of those books to figure out that was pretty important. Her cousin had just moved to town and needed work, so she said, "Listen, do you want to do this?" The cousin said, "Great

The cousin started taking care of her baby. Fourteen years later she relates to me, "The first two weeks were really hard, but after that I knew my baby was really content with this, and I felt a lot better." I said, "Well, how did you know your baby was content?" "Well, because he stopped crying." I said, "Oh, well what do you mean? Stopped crying when you would leave or..." "No, no, he just stopped crying completely." Of course my alarm bells are going uho. She goes on to sort of tell almost with pride, "You know there's one time I actually stuck him with a safety pin and it was in there and he didn't even make a peep. He didn't even know I stuck him with a safety pin." So, here she is, 14 years later, still not understanding that that's abnormal. I said, "Okay, how long did this childcare situation last?" She said, "At 18 months I actually came home and I started to take care of my child." I said, "Okay, any reason why you did that?" She said, "Well, I came home from work once because I got sick, so I came home about 2:00 in the afternoon and walked into my house and it was dark. I thought they were off in the park taking a walk. I walked down the hall to my room and there was a smell coming from my baby's room. I thought maybe they left a diaper in the hamper, so I went in there. I pushed the door open and it was dark and here's my child sitting in the dark in the crib with no music on, no nothing, just sitting all by himself."

I'm of course thinking how horrible for the deprivation part of this, and she says right as I'm thinking this, "What if there'd been a fire?" She's concerned about his physical safety, not even aware enough that this is really a bad thing for a baby. She confronts the cousin as the cousin comes back about 4:00 and said, "What are you doing? How could you leave my child like this? What if there had been a fire?" The cousin said, "You know, I'm really sorry, and I've been meaning to tell you this, but about two weeks after I got this job working with you, I got another job." Every day she'd come in in the morning and she'd feed and diaper this baby and leave the baby all day long in the crib. About 40 minutes before the parents would come home she would change the diaper and feed the child. Both of them were so child ignorant that they didn't think that was bad. The cousin's major concern was the child might get diaper rash. The parent's major concern was gee what if there had been a fire.

This parent did not know that this was that bad. About a year later when this child is really manifesting significant problems, she goes in to sort of a developmental pediatrician and really fails to give this part of the history. The developmental

pediatrician, being very, very overburdened because of needing to do high volume work, does sort of a cursory developmental history, doesn't get this information, and this child goes from treater to treater to treater to treater. Nobody ever finds this out. Clearly big problems with the way our systems are structured, the way we educate our caregivers.

One last slide before I stop, and I continue with this this afternoon when we talk about how we're going to make a change. Let me just show this one slide because it I think illustrates the importance again of early childhood. If you take all of these 200 or more children that we've worked with who had severe sensory deprivation neglect, and they were all removed from these neglectful environments at different ages. If they were removed in the first year of life, they had the small head circumference, basically indicative of a small brain. One year later, after being placed in regular foster care, this does not include services at all, there's improvement. If they were in that environment for two years and removed, again small brain, one year later without any intervention except just being put in a regular foster placement, there was improvement but less improvement. Three years, same thing. If they were in that environment and removed in the fourth year of life, one year later without any special intervention, no change. Now this doesn't mean that these kids can't change. It just means that the longer they're in that environment, the more resistant their problems are, the more pervasive their problems are, and the more professional and developmentally sensitive the clinicians need to be to try and coax improvement and progress. I think all of you can appreciate that this is a very, very difficult thing to find in this day and age, a developmentally sensitive treatment team who is willing to work for under the current medical economic model to provide what's required to help these kids get better. When we come back, I'll continue with this and talk a little bit more about some of the things that you can do to hopefully address some of these problems. Thank you.

THANK YOU, DR. PERRY.