been.

There is a lesson in how aggressiveness is passed from generation to generation. Any inherited propensities aside, the troublemakers as grownups acted in a way that made family life a school for aggression. As children, the troublemakers had parents who disciplined them with arbitrary, relentless severity; as parents they repeated the pattern. This was true whether it had been the father or the mother who had been identified in childhood as highly aggressive. Aggressive little girls grew up to be just as arbitrary and harshly punitive when they became mothers as the aggressive boys were as fathers. And while they punished their children with special severity, they otherwise took little interest in their children's lives, in effect ignoring them much of the time. At the same time the parents offered these children a vivid—and violent—example of aggressiveness, a model the children took with them to school and to the playground, and followed throughout life. The parents were not necessarily mean-spirited, nor did they fail to wish the best for their children; rather, they seemed to be simply repeating the style of parenting that had been modeled for them by their own parents.

In this model for violence, these children were disciplined capriciously: if their parents were in a bad mood, they would be severely punished; if their parents were in a good mood, they could get away with mayhem at home. Thus punishment came not so much because of what the child had done, but by virtue of how the parent felt. This is a recipe for feelings of worthlessness and helplessness, and for the sense that threats are everywhere and may strike at any time. Seen in light of the home life that spawns it, such children's combative and defiant posture toward the world at large makes a certain sense, unfortunate though it remains. What is disheartening is how early these dispiriting lessons can be learned, and how grim the costs for a child's emotional life can be.

ABUSE: THE EXTINCTION OF EMPATHY

In the rough-and-tumble play of the day-care center, Martin, just two and a half, brushed up against a little girl, who, inexplicably, broke out crying. Martin reached for her hand, but as the sobbing girl moved away, Martin slapped her on the arm.

As her tears continued Martin looked away and yelled, "Cut it out! *Cut it out!"* over and over, each time faster and louder.

When Martin then made another attempt to pat her, again she resisted. This time Martin bared his teeth like a snarling dog, hissing at the sobbing girl.

Once more Martin started patting the crying girl, but the pats on the back quickly turned into pounding, and Martin went on hitting and hitting the poor little girl despite her screams.

That disturbing encounter testifies to how abuse—being beaten repeatedly, at the whim of a parent's moods—warps a child's natural bent toward empathy.[11] Martin's bizarre, almost brutal response to his playmate's distress is typical of children like him, who have themselves been the victims of beatings and other physical abuse since their infancy. The response stands in stark contrast to toddlers' usual sympathetic entreaties and attempts to console a crying playmate, reviewed in Chapter 7. Martin's violent response to distress at the day-care center may well mirror the lessons he learned at home about tears and anguish: crying is met at first with a peremptory consoling gesture, but if it continues, the progression is from nasty looks and shouts, to hitting, to outright beating. Perhaps most troubling, Martin already seems to lack the most primitive sort of empathy, the instinct to stop aggression against someone who is hurt. At two and a half he displays the budding moral impulses of a cruel and sadistic brute.

Martin's meanness in place of empathy is typical of other children like him who are already, at their tender age, scarred by severe physical and emotional abuse at home. Martin was part of a group of nine such toddlers, ages one to three, witnessed in a two-hour observation at his day-care center. The abused toddlers were compared with nine others at the day-care center from equally impoverished, high-stress homes, but who were not physically abused. The differences in how the two groups of toddlers reacted when another child was hurt or upset were stark. Of twenty-three such incidents, five of the nine nonabused toddlers responded to the distress of a child nearby with concern, sadness, or empathy. But in the twenty-seven instances where the abused children could have done so, not one showed the least concern; instead they reacted to a crying child with expressions of fear, anger, or, like Martin, a physical attack.

One abused little girl, for instance, made a ferocious, threatening face at another who had broken out into tears. One-year-old Thomas, another of the abused children, froze in terror when he heard a child

crying across the room; he sat completely still, his face full of fear, back stiffly straight, his tension increasing as the crying continued—as though bracing for an attack himself. And twenty-eight-month-old Kate, also abused, was almost sadistic: picking on Joey, a smaller infant, she knocked him to the ground with her feet, and as he lay there looked tenderly at him and began patting him gently on the back—only to intensify the pats into hitting him harder and harder, ignoring his misery. She kept swinging away at him, leaning in to slug him six or seven times more, until he crawled away.

These children, of course, treat others as they themselves have been treated. And the callousness of these abused children is simply a more extreme version of that seen in children whose parents are critical, threatening, and harsh in their punishments. Such children also tend to lack concern when playmates get hurt or cry; they seem to represent one end of a continuum of coldness that peaks with the brutality of the abused children. As they go on through life, they are, as a group, more likely to have cognitive difficulties in learning, more likely to be aggressive and unpopular with their peers (small wonder, if their preschool toughness is a harbinger of the future), more prone to depression, and, as adults, more likely to get into trouble with the law and commit more crimes of violence.[12]

This failure of empathy is sometimes, if not often, repeated over generations, with brutal parents having themselves been brutalized by their own parents in childhood.[13] It stands in dramatic contrast to the empathy ordinarily displayed by children of parents who are nurturing, encouraging their toddlers to show concern for others and to understand how meanness makes other children feel. Lacking such lessons in empathy, these children seem not to learn it at all.

What is perhaps most troubling about the abused toddlers is how early they seem to have learned to respond like miniature versions of their own abusive parents. But given the physical beatings they received as a sometimes daily diet, the emotional lessons are all too clear. Remember that it is in moments when passions run high or a crisis is upon us that the primitive proclivities of the brain's limbic centers take on a more dominant role. At such moments the habits the emotional brain has learned over and over will dominate, for better or worse.

Seeing how the brain itself is shaped by brutality—or by love—suggests that childhood represents a special window of opportunity for emotional lessons. These battered children have had an early and

steady diet of trauma. Perhaps the most instructive paradigm for understanding the emotional learning such abused children have undergone is in seeing how trauma can leave a lasting imprint on the brain—and how even these savage imprints can be mended.

13

Trauma and Emotional Relearning

Som Chit, a Cambodian refugee, balked when her three sons asked her to buy them toy AK-47 machine guns. Her sons—ages six, nine, and eleven—wanted the toy guns to play the game some of the kids at their school called Purdy. In the game, Purdy, the villain, uses a submachine gun to massacre a group of children, then turns it on himself. Sometimes, though, the children have it end differently: it is they who kill Purdy.

Purdy was the macabre reenactment by some of the survivors of the catastrophic events of February 17, 1989, at Cleveland Elementary School in Stockton, California. There, during the school's late-morning recess for first, second, and third graders, Patrick Purdy—who had himself attended those grades at Cleveland Elementary some twenty years earlier—stood at the playground's edge and fired wave after wave of 7.22 mm bullets at the hundreds of children at play. For seven minutes Purdy sprayed bullets toward the playground, then put a pistol to his head and shot himself. When the police arrived they found five children dying, twenty-nine wounded.

In ensuing months, the Purdy game spontaneously appeared in the play of boys and girls at Cleveland Elementary, one of many signs that those seven minutes and their aftermath were seared into the children's memory. When I visited the school, just a short bike ride from the neighborhood near the University of the Pacific where I myself had grown up, it was five months after Purdy had turned that recess into a nightmare. His presence was still palpable, even though the most horrific of the grisly remnants of the shooting—swarms of bullet holes, pools of blood, bits of flesh, skin, and scalp—were gone by the morning after the shooting, washed away and painted over.

By then the deepest scars at Cleveland Elementary were not to the building but to the psyches of the children and staff there, who were trying to carry on with life as usual.[1] Perhaps most striking was how the memory of those few minutes was revived again and again by any small detail that was similar in the least. A teacher told me, for

example, that a wave of fright swept through the school with the announcement that St. Patrick's Day was coming; a number of the children somehow got the idea that the day was to honor the killer, Patrick Purdy.

"Whenever we hear an ambulance on its way to the rest home down the street, everything halts," another teacher told me. "The kids all listen to see if it will stop here or go on." For several weeks many children were terrified of the mirrors in the restrooms; a rumor swept the school that "Bloody Virgin Mary," some kind of fantasied monster, lurked there. Weeks after the shooting a frantic girl came running up to the school's principal, Pat Busher, yelling, "I hear shots! I hear shots!" The sound was from the swinging chain on a tetherball pole.

Many children became hypervigilant, as though continually on guard against a repetition of the terror; some boys and girls would hover at recess next to the classroom doors, not daring to venture out to the playground where the killings had occurred. Others would only play in small groups, posting a designated child as lookout. Many continued for months to avoid the "evil" areas, where children had died.

The memories lived on, too, as disturbing dreams, intruding into the children's unguarded minds as they slept. Apart from nightmares repeating the shooting itself in some way, children were flooded with anxiety dreams that left them apprehensive that they too would die soon. Some children tried to sleep with their eyes open so they wouldn't dream.

All of these reactions are well known to psychiatrists as among the key symptoms of post-traumatic stress disorder, or PTSD. At the core of such trauma, says Dr. Spencer Eth, a child psychiatrist who specializes in PTSD in children, is "the intrusive memory of the central violent action: the final blow with a fist, the plunge of a knife, the blast of a shotgun. The memories are intense perceptual experiences—the sight, sound, and smell of gunfire; the screams or sudden silence of the victim; the splash of blood; the police sirens."

These vivid, terrifying moments, neuroscientists now say, become memories emblazoned in the emotional circuitry. The symptoms are, in effect, signs of an overaroused amygdala impelling the vivid memories of a traumatic moment to continue to intrude on awareness. As such, the traumatic memories become mental hair triggers, ready to sound an alarm at the least hint that the dread moment is about to happen once again. This hair-trigger phenomenon is a hallmark of

emotional trauma of all kinds, including suffering repeated physical abuse in childhood.

Any traumatizing event can implant such trigger memories in the amygdala: a fire or an auto accident, being in a natural catastrophe such as an earthquake or a hurricane, being raped or mugged. Hundreds of thousands of people each year endure such disasters, and many or most come away with the kind of emotional wounding that leaves its imprint on the brain.

Violent acts are more pernicious than natural catastrophes such as a hurricane because, unlike victims of a natural disaster, victims of violence feel themselves to have been intentionally selected as the target of malevolence. That fact shatters assumptions about the trustworthiness of people and the safety of the interpersonal world, an assumption natural catastrophes leave untouched. Within an instant, the social world becomes a dangerous place, one in which people are potential threats to your safety.

Human cruelties stamp their victims' memories with a template that regards with fear anything vaguely similar to the assault itself. A man who was struck on the back of his head, never seeing his attacker, was so frightened afterward that he would try to walk down the street directly in front of an old lady to feel safe from being hit on the head again.[2] A woman who was mugged by a man who got on an elevator with her and forced her out at knifepoint to an unoccupied floor was fearful for weeks of going into not just elevators, but also the subway or any other enclosed space where she might feel trapped; she ran from her bank when she saw a man put his hand in his jacket as the mugger had done.

The imprint of horror in memory—and the resulting hypervigilance—can last a lifetime, as a study of Holocaust survivors found. Close to fifty years after they had endured semistarvation, the slaughter of their loved ones, and constant terror in Nazi death camps, the haunting memories were still alive. A third said they felt generally fearful. Nearly three quarters said they still became anxious at reminders of the Nazi persecution, such as the sight of a uniform, a knock at the door, dogs barking, or smoke rising from a chimney. About 60 percent said they thought about the Holocaust almost daily, even after a half century; of those with active symptoms, as many as eight in ten still suffered from repeated nightmares. As one survivor said, "If you've been through Auschwitz and you don't have nightmares, then you're not normal."

HORROR FROZEN IN MEMORY

The words of a forty-eight-year-old Vietnam vet, some twenty-four years after enduring a horrifying moment in a faraway land:

> I can't get the memories out of my mind! The images come flooding back in vivid detail, triggered by the most inconsequential things, like a door slamming, the sight of an Oriental woman, the touch of a bamboo mat, or the smell of stir-fried pork. Last night I went to bed, was having a good sleep for a change. Then in the early morning a storm front passed through and there was a bolt of crackling thunder. I awoke instantly, frozen in fear. I am right back in Vietnam, in the middle of the monsoon season at my guard post. I am sure I'll get hit in the next volley and convinced I will die. My hands are freezing, yet sweat pours from my entire body. I feel each hair on the back of my neck standing on end. I can't catch my breath and my heart is pounding. I smell a damp sulfur smell. Suddenly I see what's left of my buddy Troy … on a bamboo platter, sent back to our camp by the Vietcong.… The next bolt of lightning and clap of thunder makes me jump so much that I fall to the floor.[3]

This horrible memory, vividly fresh and detailed though more than two decades old, still holds the power to induce the same fear in this ex-soldier that he felt on that fateful day. PTSD represents a perilous lowering of the neural setpoint for alarm, leaving the person to react to life's ordinary moments as though they were emergencies. The hijacking circuit discussed in Chapter 2 seems critical in leaving such a powerful brand on memory: the more brutal, shocking, and horrendous the events that trigger the amygdala hijacking, the more indelible the memory. The neural basis for these memories appears to be a sweeping alteration in the chemistry of the brain set in motion by a single instance of overwhelming terror.[4] While the PTSD findings are typically based on the impact of a single episode, similar results can come from cruelties inflicted over a period of years, as is the case with children who are sexually, physically, or emotionally abused.

The most detailed work on these brain changes is being done at the National Center for Post-Traumatic Stress Disorder, a network of research sites based at Veterans' Administration hospitals where there are large pools of those who suffer from PTSD among the veterans of Vietnam and other wars. It is from studies on vets such as these that most of our knowledge of PTSD has come. But these insights apply as well to children who have suffered severe emotional trauma, such as those at Cleveland Elementary.

“Victims of a devastating trauma may never be the same biologically,” Dr. Dennis Charney told me.[5] A Yale psychiatrist, Charney is director of clinical neuroscience at the National Center. “It does not matter if it was the incessant terror of combat, torture, or repeated abuse in childhood, or a one-time experience, like being trapped in a hurricane or nearly dying in an auto accident. All uncontrollable stress can have the same biological impact.”

The operative word is *uncontrollable*. If people feel there is something they can do in a catastrophic situation, some control they can exert, no matter how minor, they fare far better emotionally than do those who feel utterly helpless. The element of helplessness is what makes a given event *subjectively* overwhelming. As Dr. John Krystal, director of the center’s Laboratory of Clinical Psychopharmacology, told me, “Say someone being attacked with a knife knows how to defend himself and takes action, while another person in the same predicament thinks, ‘I’m dead.’ The helpless person is the one more susceptible to PTSD afterward. It’s the feeling that your life is in danger *and there’s nothing you can do to escape it*—that’s the moment the brain change begins.”

Helplessness as the wild card in triggering PTSD has been shown in dozens of studies on pairs of laboratory rats, each in a different cage, each being given mild—but, to a rat, very stressful—electric shocks of identical severity. Only one rat has a lever in its cage; when the rat pushes the lever, the shock stops for both cages. Over days and weeks, both rats get precisely the same amount of shock. But the rat with the power to turn the shocks off comes through without lasting signs of stress. It is only in the helpless one of the pair that the stress-induced brain changes occur.[6] For a child being shot at on a playground, seeing his playmates bleeding and dying—or for a teacher there, unable to stop the carnage—that helplessness must have been palpable.

PTSD AS A LIMBIC DISORDER

It had been months since a huge earthquake shook her out of bed and sent her yelling in panic through the darkened house to find her four-year-old son. They huddled for hours in the Los Angeles night cold under a protective doorway, pinned there without food, water, or light while wave after wave of aftershocks tumbled the ground

beneath them. Now, months later, she had largely recovered from the ready panic that gripped her for the first few days afterward, when a door slamming could start her shivering with fear. The one lingering symptom was her inability to sleep, a problem that struck only on those nights her husband was away—as he had been the night of the quake.

The main symptoms of such learned fearfulness—including the most intense kind, PTSD—can be accounted for by changes in the limbic circuitry focusing on the amygdala.[7] Some of the key changes are in the locus ceruleus, a structure that regulates the brain's secretion of two substances called *catecholamines:* adrenaline and noradrenaline. These neurochemicals mobilize the body for an emergency; the same catecholamine surge stamps memories with special strength. In PTSD this system becomes hyperreactive, secreting extra-large doses of these brain chemicals in response to situations that hold little or no threat but somehow are reminders of the original trauma, like the children at Cleveland Elementary School who panicked when they heard an ambulance siren similar to those they had heard at their school after the shooting.

The locus ceruleus and the amygdala are closely linked, along with other limbic structures such as the hippocampus and hypothalamus; the circuitry for the catecholamines extends into the cortex. Changes in these circuits are thought to underlie PTSD symptoms, which include anxiety, fear, hypervigilance, being easily upset and aroused, readiness for fight or flight, and the indelible encoding of intense emotional memories.[8] Vietnam vets with PTSD, one study found, had 40 percent fewer catecholamine-stopping receptors than did men without the symptoms—suggesting that their brains had undergone a lasting change, with their catecholamine secretion poorly controlled.[9]

Other changes occur in the circuit linking the limbic brain with the pituitary gland, which regulates release of CRF, the main stress hormone the body secretes to mobilize the emergency fight-or-flight response. The changes lead this hormone to be oversecreted—particularly in the amygdala, hippocampus, and locus ceruleus—alerting the body for an emergency that is not there in reality.[10]

As Dr. Charles Nemeroff, a Duke University psychiatrist, told me, "Too much CRF makes you overreact. For example, if you're a Vietnam vet with PTSD and a car backfires at the mall parking lot, it is the triggering of CRF that floods you with the same feelings as in the original trauma: you start sweating, you're scared, you have chills