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# THE NEW YORKER

## CRASH

Safety advocates thought that the best way to prevent highway deaths was to build better cars. What went wrong? **Malcolm Gladwell** reports

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## WRONG TURN

*How the fight to make America's highways safer went off course.*

BY MALCOLM GLADWELL

## I. BANG

Every two miles, the average driver makes four hundred observations, forty decisions, and one mistake. Once every five hundred miles, one of those mistakes leads to a near collision, and once every sixty-one thousand miles one of those mistakes leads to a crash. When people drive, in other words, mistakes are endemic and accidents inevitable, and that is the first and simplest explanation for what happened to Robert Day on the morning of Saturday, April 9, 1994. He was driving a 1980 Jeep Wagoneer from his home, outside Philadelphia, to spend a day working on train engines in Winslow Township, New Jersey. He was forty-four years old, and made his living as an editor for the Chilton Book Company. His ten-year-old son was next to him, in the passenger seat. It was a bright, beautiful spring day. Visibility was perfect, and the roadway was dry, although one of the many peculiarities of car crashes is that they happen more often under ideal road conditions than in bad weather. Day's route took him down the Atlantic City Expressway to Fleming Pike, a two-lane country road that winds around a sharp curve and intersects, about a mile later, with Egg Harbor Road. In that final stretch of Fleming Pike, there is a scattering of houses and a fairly thick stand of trees on either side of the road, obscuring all sight lines to the left and right. As he approached the intersection, then, Day could not have seen a blue-and-gray 1993 Ford Aerostar minivan travelling between forty and fifty miles per hour southbound on Egg Harbor, nor a white 1984 Mazda 626 travelling at approximately fifty miles per hour in the other direction. Nor, apparently, did he see the stop sign at the corner, or the sign a tenth of a mile before that, warning of the intersection ahead.

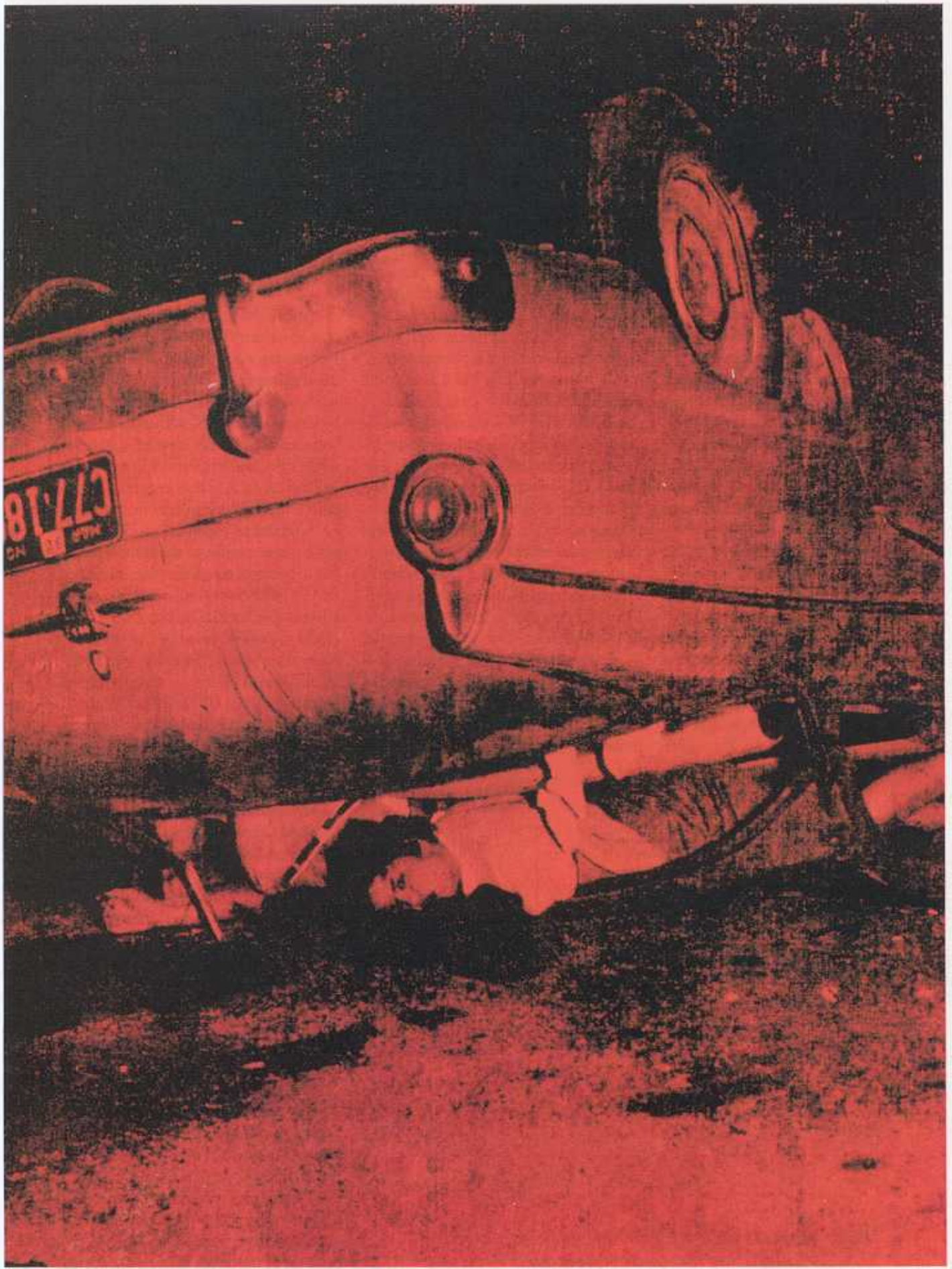
Day's son, in the confusing aftermath of the accident, told police that he was certain his father had come to a stop at the corner. But the accident's principal witness says he never saw any brake lights on the Wagoneer, and, besides, there is no way that the Jeep could have done the damage that it did from a standing start. Perhaps Day was distracted. The witness says that Day's turn signal had been on since he left the expressway. Perhaps he was looking away and looked back at the road at the wrong time, since there is an area, a few hundred yards before Egg Harbor Road, just on the near side of a little ridge, where the trees and houses make it look as if Fleming Pike ran without interruption well off into the distance. We will never know, and in any case it does not matter much. Day merely did what all of us do every time we get in a car: he made a mistake. It's just that he was unlucky enough that his mistake led him directly into the path of two other cars.

The driver of the Ford Aerostar was Stephen Capoferri, then thirty-nine. He worked in the warehouse of Whitehall Laboratories, in southern New Jersey. He had just had breakfast with his parents and was on his way to the bank. The driver of the Mazda was Elizabeth Wolfrum. She was twenty-four. She worked as the manager of a liquor store. Her eighteen-year-old sister, Julie, was in the passenger seat; a two-year-old girl was in the back seat. Because of the vegetation on either side of Fleming Pike, Capoferri did not see Day's vehicle until it was just eighty-five feet from the point of impact, and if we assume that Day was travelling at forty miles per hour, or fifty-nine feet per second, that means that Capoferri had about 1.5 seconds to react. That is scarcely enough time. The average adult needs about that long simply to translate an observation ("That car is

*Detail from Andy Warhol's "Five Deaths." Advocates like Ralph Nader focussed on the second collision, inside the car: "A crash without an injury. That idea was very powerful."*







"FIVE DEATHS" (1963) ©2001 ANDY WARHOL FOUNDATION/ARS, NY



going awfully fast") into an action ("I ought to hit my brake"). Capoferri hit Day broadside, at a slight angle, the right passenger side of the Aerostar taking most of the impact. The Jeep was pushed sidewise, but it kept going forward, pulling off the grille and hood of the Aerostar, and sending it into a two-hundred-and-seventy-degree counterclockwise spin. As the Jeep lurched across the intersection, it slammed into the side of Wolfrum's Mazda. The cars slapped together, and then skidded together across the intersection, ending on the grass on the far, southeastern corner. According to documents filed by Elizabeth Wolfrum's lawyers, Wolfrum suffered eighteen injuries, including a ruptured spleen, multiple liver lacerations, brain damage, and fractures to the legs, ribs, ankles, and nose. Julie Wolfrum was partially ejected from the Mazda and her face hit the ground. She subsequently underwent seventeen separate surgical procedures and remained in intensive care for forty-four days. In post-crash photographs, their car looks as if it had been dropped head first from an airplane. Robert Day suffered massive internal injuries and was pronounced dead two hours later, at West Jersey Hospital. His son was bruised and shaken up. Capoferri walked away largely unscathed.

"Once the impact occurred, I did a spin," he remembers. "I don't recall doing that. I may have blacked out. It couldn't

have been for very long. I wanted to get out. I was trying to judge how I was. I was having a little trouble breathing. But I knew I could walk. My senses were gradually coming back to normal. I'm pretty sure I went to Day's vehicle first. I went to the driver's side. He was semi-conscious. He had blood coming out of his mouth. I tried to keep him awake. His son was in the passenger seat. He had no injuries. He said, 'Is my father O.K.?' I seem to remember looking in the Mazda. My first impression was that they were dead, because the driver's side of the vehicle was very badly smashed in. I think they needed the 'jaws of life' to get them out. There was a little girl in the back. She was crying."

Capoferri has long black hair and a beard and the build of a wrestler. He is a thoughtful man who chooses his words carefully. As he talked, he was driving his Taurus back toward the scene of the accident, and he was apologetic that he could not recall more details of those moments leading up to the accident. But what is there to remember? In the popular imagination—fuelled by the car crashes of Hollywood movies, with their special effects and complicated stunts—an accident is a protracted sequence, played out in slow motion, over many frames. It is not that way in real life. The time that elapsed between the collision of Capoferri and Day and Day and Wolfrum was probably no more than twenty-five mil-

liseconds, faster than the blinking of an eye, and the time that elapsed between the moment Capoferri struck Day and the moment his van came to a rest, two hundred and seventy degrees later, was probably no more than a second. Capoferri said that a friend of his, who lived right on the corner where the accident happened, told him later that all the crashing and spinning and skidding sounded like a single, sharp explosion—*bang!*

## II. THE PASSIVE APPROACH

In the middle part of the last century, a man named William Haddon changed forever the way Americans think about car accidents. Haddon was, by training, a medical doctor and an epidemiologist and, by temperament, a New Englander—tall and reed-thin, with a crewcut, a starched white shirt, and a bow tie. He was exacting and cerebral, and so sensitive to criticism that it was said of him that he could be "blistered by moonbeams." He would not eat mayonnaise, or anything else subject to bacterial contamination. He hated lawyers, which was ironic, because it was lawyers who became his biggest disciples. Haddon was discovered by Daniel Patrick Moynihan, when Moynihan was working for Averell Harriman, then the Democratic governor of New York State. It was 1958. Moynihan was chairing a meeting on traffic safety, in Albany's old state-executive-office chambers, and a young man at the back of the room kept asking pointed questions. "What's your name?" Moynihan eventually asked, certain he had collared a Republican spy. "Haddon, sir," the young man answered. He was just out of the Harvard School of Public Health, and convinced that what the field of traffic safety needed was the rigor of epidemiology. Haddon asked Moynihan what data he was using. Moynihan shrugged. He wasn't using any data at all.

Haddon and Moynihan went across the street to Yezzi's, a local watering hole, and Moynihan fell under Haddon's spell. The orthodoxy of that time held that safety was about reducing accidents—educating drivers, training them, making them slow down. To Haddon, this approach made no sense. His goal was to reduce the injuries that accidents caused. In particular, he did not believe in safety measures that depended on changing the behavior of the driver, since he considered



*"Would you mind elaborating on this section of the résumé, which claims that you're my love child?"*

the driver unreliable, hard to educate, and prone to error. Haddon believed the best safety measures were *passive*. "He was a gentle man," Moynihan recalls. "Quiet, without being mum. He never forgot that what we were talking about were children with their heads smashed and broken bodies and dead people."

Several years later, Moynihan was working for President Johnson in the Department of Labor, and hired a young lawyer out of Harvard named Ralph Nader to work on traffic-safety issues. Nader, too, was a devotee of Haddon's ideas, and he converted a young congressional aide named Joan Claybrook. In 1959, Moynihan wrote an enormously influential article, articulating Haddon's principles, called "Epidemic on the Highways." In 1965, Nader wrote his own homage to the Haddon philosophy, "Unsafe at Any Speed," which became a best-seller, and in 1966 the Haddon crusade swept Washington. In the House and the Senate, there were packed hearings on legislation to create a federal regulatory agency for traffic safety. Moynihan and Haddon testified, as did a liability lawyer from South Carolina, in white shoes and a white suit, and a Teamsters official, Jimmy Hoffa, whom Claybrook remembers as a "fabulous" witness. It used to be that, during a frontal crash, steering columns in cars were pushed back through the passenger compartment, potentially impaling the driver. The advocates argued that columns should collapse inward on impact. Instrument panels ought to be padded, they said, and knobs shouldn't stick out, where they might cause injury. Doors ought to have strengthened side-impact beams. Roofs should be strong enough to withstand a rollover. Seats should have head restraints to protect against neck injuries. Windshields ought to be glazed, so that if you hit them with your head at high speed your face wasn't cut to ribbons. The bill sailed through both houses of Congress, and a regulatory body, which eventually became the National Highway Traffic Safety Administration, was established. Haddon was made its commissioner, Claybrook his special assistant. "I remember a Senate hearing we had with Warren Magnuson," Nader recalls. "He was listening to a pediatrician who was one of our allies, Seymour Charles, from New Jersey, and Charles was showing how there were two cars that collided, and one



*"But when Mel Brooks makes fun of everything and everybody the critics cheer!"*

had a collapsible steering column and one didn't, and one driver walked away, the other was killed. And, just like that, Magnuson caught on. 'You mean,' he said, 'you can have had a crash without an injury?' That's it! A crash without an injury. That idea was very powerful."

There is no question that the improvements in auto design which Haddon and his disciples pushed for saved countless lives. They changed the way cars were built, and put safety on the national agenda. What they did not do, however, is make American highways the safest in the world. In fact—and this is the puzzling thing about the Haddon crusade—the opposite happened. United States auto-fatality rates were the lowest in the world *before* Haddon came along. But, since the late nineteen-seventies, just as the original set of N.H.T.S.A. safety standards were having their biggest impact, America's safety record has fallen to eleventh place. According to calculations by Leonard Evans, a longtime General Motors researcher and one of the world's leading experts on traffic safety, if American traffic fatalities had declined at the same rate as Canada's or Australia's

between 1979 and 1997, there would have been somewhere in the vicinity of a hundred and sixty thousand fewer traffic deaths in that span.

This is not to suggest, of course, that Haddon's crusade is responsible for a hundred and sixty thousand highway deaths. Traffic safety is the most complex of phenomena—fatality rates can be measured in many ways, and reflect a hundred different variables—and in this period there were numerous factors that distinguished the United States from places like Canada and Australia, including different trends in drunk driving. Nor is it to say that the Haddonites had anything but the highest motives. Still, Evans's figures raise a number of troubling questions. Haddon and Nader and Claybrook told us, after all, that the best way to combat the epidemic on the highways was to shift attention from the driver to the vehicle. No other country pursued the passive strategy as vigorously, and no other country had such high expectations for its success. But America's slipping record on auto safety suggests that somewhere in the logic of that approach there was a mistake. And, if so, it necessarily changes the way we



*"I want to use our tax savings to buy a pair of boot-cut trousers."*

think about car crashes like the one that happened seven years ago on the corner of Fleming Pike and Egg Harbor Road.

"I think that the philosophical argument behind the passive approach is a strong one," Evans says. A physicist by training, he is a compact, spry man in his sixties, with a trace in his voice of his native Northern Ireland. On the walls of his office in suburban Detroit is a lifetime of awards and certifications from safety researchers, but, like many technical types, he is embittered by how hard it has been to make his voice heard in the safety debates of the past thirty years. "Either you can persuade people to boil their own water because there is a typhoid epidemic or you can put chlorine in the water," he went on. "And the second, passive solution is obviously preferred to the first, because there is no way you can persuade everyone to act in a prudent way. But starting from

that philosophical principle and then ignoring reality is a recipe for disaster. And that's what happened. Why?" Here Evans nearly leaped out of his chair. "Because there isn't any chlorine for traffic crashes."

### III. THE FIRST COLLISION

Robert Day's crash was not the accident of a young man. He was hit from the side, and adolescents and young adults usually have side-impact crashes when their cars slide off the road into a fixed object like a tree, often at reckless speeds. Older people tend to have side-impact crashes at normal speeds, in intersections, and as the result of error, not negligence. In fact, Day's crash was not merely typical in form; it was the result of a common type of driver error. He didn't see something he was supposed to see.

His mistake is, on one level, difficult to

understand. There was a sign, clearly visible from the roadway, telling him of an intersection ahead, and then another, in bright red, telling him to stop. How could he have missed them both? From what we know of human perception, though, this kind of mistake happens all the time. Imagine, for instance, that you were asked to look at the shape of a cross, briefly displayed on a computer screen, and report on which arm of the cross was longer. After you did this a few times, another object, like a word or a small colored square—what psychologists call a critical stimulus—flashes next to the cross on the screen, right in front of your eyes. Would you see the critical stimulus? Most of us would say yes. Intuitively, we believe that we "see" everything in our field of vision—particularly things right in front of us—and that the difference between the things we pay attention to and the things we don't is simply that the things we focus on are the things we become aware of. But when experiments to test this assumption were conducted recently by Arien Mack, a psychologist at the New School, in New York, she found, to her surprise, that a significant portion of her observers didn't see the second object at all: it was directly in their field of vision, and yet, because their attention was focussed on the cross, they were oblivious of it. Mack calls this phenomenon "inattention blindness."

Daniel Simons, a professor of psychology at Harvard, has done a more dramatic set of experiments, following on the same idea. He and a colleague, Christopher Chabris, recently made a video of two teams of basketball players, one team in white shirts and the other in black, each player in constant motion as two basketballs are passed back and forth. Observers were asked to count the number of passes completed by the members of the white team. After about forty-five seconds of passes, a woman in a gorilla suit walks into the middle of the group, stands in front of the camera, beats her chest vigorously, and then walks away. "Fifty per cent of the people missed the gorilla," Simons says. "We got the most striking reactions. We'd ask people, 'Did you see anyone walking across the screen?' They'd say no. Anything at all? No. Eventually, we'd ask them, 'Did you notice the gorilla?' And they'd say, 'The what?'" Simons's experiment is one of those psychological studies which are impossible to believe in the abstract: if you



look at the video (called "Gorillas in Our Midst") when you know what's coming, the woman in the gorilla suit is inescapable. How could anyone miss that? But people do. In recent years, there has been much scientific research on the fallibility of memory—on the fact that eyewitnesses, for example, often distort or omit critical details when they recall what they saw. But the new research points to something that is even more troubling: it isn't just that our memory of what we see is selective; it's that seeing itself is selective.

This is a common problem in driving. Talking on a cell phone and trying to drive, for instance, is not unlike trying to count passes in a basketball game and simultaneously keep track of wandering animals. "When you get into a phone conversation, it's different from the normal way we have evolved to interact," David Strayer, a professor of psychology at the University of Utah, says. "Normally, conversation is face to face. There are all kinds of cues. But when you are on the phone you strip that away. It's virtual reality. You attend to that virtual reality, and shut down processing of the here and now." Strayer has done tests of people who were driving and talking on phones, and found that they remember far fewer things than those driving without phones. Their field of view shrinks. In one experiment, he flashed red and green lights at people while they were driving, and those on the phone missed twice as many lights as the others, and responded far more slowly to those lights they did see. "We tend to find the biggest deficits in unexpected events, a child darting onto the road, a light changing," Strayer says. "Someone going into your lane. That's what you *don't* see. There is a part of driving that is automatic and routine. There is a second part of driving that is completely unpredictable, and that is the part that requires attention." This is what Simons found with his gorilla, and it is the scariest part of inattention blindness. People allow themselves to be distracted while driving because they think that they will still be able to pay attention to anomalies. But it is precisely those anomalous things, those deviations from the expected script, which they won't see.

Marc Green, a psychologist with an accident-consulting firm in Toronto, once worked on a case where a woman hit a bicyclist with her car. "She was pulling into a gas station," Green says. "It

was five o'clock in the morning. She'd done that almost every day for a year. She looks to the left, and then she hears a thud. There's a bicyclist on the ground. She'd looked down that sidewalk nearly every day for a year and never seen anybody. She adaptively learned to ignore what was on that sidewalk because it was useless information. She may actually have turned her eyes toward him and failed to see him." Green says that, once you understand why the woman failed to see the bicyclist, the crash comes to seem almost inevitable.

It's the same conclusion that Haddon reached, and that formed the basis for his conviction that Americans were spending too much time worrying about what happened before an accident and not enough time worrying about what happened during and after an accident. Sometimes crashes happen because people do stupid things that they shouldn't have done—like drink or speed or talk on their cell phone. But sometimes people do stupid things that they *cannot* help, and it makes no sense to construct a safety program that does not recognize human fallibility. Just imagine, for example, that you're driving down a country road. The radio is playing. You're talking to your son, next to you. There is a highway crossing up ahead, but you can't see it, nor can you see any cars on the roadway, because of a stand of trees on both sides of the road. Maybe you look away from the road, for a moment, to change the dial on the radio, or something catches your eye outside, and when you glance back it happens to be at the very moment when a trick of geography makes it look as if your road stretched without interruption well off into the distance. Suddenly, up ahead, right in front of your eyes looms a bright-red anomalous stop sign—as out of place in the momentary mental universe that you have constructed for yourself as a gorilla in a basketball game—and, precisely because it is so anomalous, it doesn't register. Then—*bang!* How do you prevent an accident like that?

#### IV. THE SECOND COLLISION

One day in 1968, a group of engineers from the Cleveland-based auto-parts manufacturer Eaton, Yale & Towne went to Washington, D.C., to see William Haddon. They carried with

them a secret prototype of what they called the People Saver. It was a nylon air cushion that inflated on impact, and the instant Haddon saw it he was smitten. "Oh, he was ecstatic, just ecstatic," Claybrook recalls. "I think it was one of the most exciting moments of his life."

The air bag had been invented in the early fifties by a man named John Hetrick, who became convinced, after running his car into a ditch, that drivers and passengers would be much safer if they could be protected by some kind of air cushion. But how could one inflate it in the first few milliseconds of a crash? As he pondered the problem, Hetrick remembered a freak accident that had happened during the war, when he was in the Navy working in a torpedo-maintenance shop. Torpedoes carry a charge of compressed air, and one day a torpedo covered in canvas accidentally released its charge. All at once, Hetrick recalled years later, the canvas "shot up into the air, quicker than you could blink an eye." Thus was the idea for the air bag born.

In its earliest incarnation, the air bag was a crude device; one preliminary test inadvertently killed a baboon, and there were widespread worries about the safety of detonating what was essentially a small bomb inside a car. (Indeed, as a result of numerous injuries to children and small adults, air bags have now been substantially depowered.) But to Haddon the People Saver was the embodiment of everything he believed in—it was the chlorine in the water, and it solved a problem that had been vexing him for years. The Haddonites had always insisted that what was generally called a crash was actually two separate events. The first collision was the initial contact between two automobiles, and in order to prevent the dangerous intrusion of one car into the passenger compartment of another, they argued, cars ought to be built with a protective metal cage around the front and back seats. The second collision, though, was even more important. That was the collision between the occupants of a car and the inside of their own vehicle. If the driver and his passengers were to survive the abrupt impact of a crash, they needed a second safety system, which carefully and gradually decelerated their bodies. The logical choice for that task was seat belts, but Haddon, with his background in public

health, didn't trust safety measures that depended on an individual's active cooperation. "The biggest problem we had back then was that only about twelve per cent of the public used seat belts," Claybrook says. "They were terribly designed, and people didn't use them." With the air bag, there was no decision to make. The Haddonites called it a "technological vaccine," and attacked its doubters in Detroit for showing "an absence of moral and ethical leadership." The air bag, they vowed, was going to replace the seat belt. In "Unsafe at Any Speed," Nader wrote:

The seat belt should have been introduced in the twenties and rendered obsolete by the early fifties, for it is only the first step toward a more rational passenger restraint system which modern technology could develop and perfect for mass production. Such a system ideally would not rely on the active participation of the passenger to take effect; it would be the superior *passive* safety design which would come into use only when needed, and without active participation of the occupant. . . . Protection like this could be achieved by a kind of inflatable air bag restraint which would be actuated to envelop a passenger before a crash.

For the next twenty years, Haddon, Nader, and Claybrook were consumed by the battle to force a reluctant Detroit to make the air bag mandatory equipment. There were lawsuits, and heated debates, and bureaucratic infighting. The automakers, mindful of cost and other concerns, argued that the emphasis ought to be on seat belts. But, to the Haddonites, Detroit was hopelessly in the grip of the old paradigm on auto safety. His opponents, Haddon wrote, with typical hauteur, were like "Malinowski's natives in their approaches to the hazards out the reef which they did not understand." Their attitudes were "redolent of the extranatural, supernatural and the pre-scientific." In 1991, the Haddonites won. That year, a law was passed requiring air bags in every new car by the end of the decade. It sounded like a great victory. But was it?

## V. HADDON'S MISTAKE

When Stephen Capoferri's Aerostar hit Robert Day's Jeep Wagoneer, Capoferri's seat belt lay loose across his hips and chest. His shoulder belt probably had about two inches of slack. At



impact, his car decelerated, but Capoferri's body kept moving forward, and within thirty milliseconds the slack in his seat belts was gone. In the language of engineers, he "loaded" his restraints. Under the force of Capoferri's onrushing weight, his belts began to stretch—the fabric giving by as much as six inches. As his shoulder belt grew taut, it dug into his chest, compressing it by another two inches, and if you had seen Capoferri at the moment of maximum forward trajectory his shoulder belt around his chest would have looked like a rubber band around a balloon. Simultaneously, within those first few milliseconds, his air bag exploded and rose to meet him at more than a hundred miles per hour. Forty to fifty milliseconds after impact, it had enveloped his face, neck, and upper chest. A fraction of a second later, the bag deflated. Capoferri was thrown back against his seat. Total time elapsed: one hundred milliseconds.

Would Capoferri have lived without an air bag? Probably. He would have stretched his seat belt so far that his head would have hit the steering wheel. But his belts would have slowed him down enough that he might only have broken his nose or cut his forehead or suffered a mild concussion. The other way around, however, with an air bag but not a seat belt, his fate would have been much more uncertain. In the absence of seat belts, air bags work best when one car hits another squarely, so that the driver pitches forward directly into the path of the oncoming bag. But Capoferri hit

Day at a slight angle. The front-passenger side of the Aerostar sustained more damage than the driver's side, which means that without his belts holding him in place he would have been thrown away from the air bag off to the side, toward the rearview mirror or perhaps even the front-passenger "A" pillar. Capoferri's air bag protected him only because he was wearing his seat belt. Car-crash statistics show this to be the rule. Wearing a seat belt cuts your chances of dying in an accident by forty-three per cent. If you add the protection of an air bag, your fatality risk is cut by forty-seven per cent. But an air bag by itself reduces the risk of dying in an accident by just thirteen per cent.

That the effectiveness of an air bag depended on the use of a seat belt was a concept that the Haddonites, in those early days, never properly understood. They wanted the air bag to replace the seat belt when in fact it was capable only of supplementing it, and they clung to that belief, even in the face of mounting evidence to the contrary. Don Huelke, a longtime safety researcher at the University of Michigan, remembers being on an N.H.T.S.A. advisory committee in the early nineteen-seventies, when people at the agency were trying to come up with statistics for the public on the value of air bags. "Their estimates were that something like twenty-eight thousand people a year could be saved by the air bags," he recalls, "and then someone pointed out to them that there weren't that many driver fatalities

in frontal crashes in a year. It was kind of like 'Oops.' So the estimates were reduced." In 1977, Claybrook became the head of N.H.T.S.A. and renewed the push for air bags. The agency's estimate now was that air bags would cut a driver's risk of dying in a crash by forty per cent—a more modest but still implausible figure. "In 1973, there was a study in the open literature, performed at G.M., that estimated that the air bag would reduce the fatality risk to an unbelted driver by eighteen per cent," Leonard Evans says. "N.H.T.S.A. had this information and dismissed it. Why? Because it was from the automobile industry."

The truth is that even today it is seat belts, not air bags, that are providing the most important new safety advances. Had Capoferri been driving a late-model Ford minivan, for example, his seat belt would have had what is called a pretensioner: a tiny explosive device that would have taken the slack out of the belt just after the moment of impact. Without the pretensioner, Stephen Kozak, an engineer at Ford, explains, "you start to accelerate before you hit the belt. You get the clothesline effect." With it, Capoferri's deceleration would have been a bit more gradual. At the same time, belts are now being designed which cut down on chest compression. Capoferri's chest wall was pushed in two inches, and had he been a much older man, with less resilient bones and cartilage, that two-inch compression might have been enough to fracture three or four ribs. So belts now "pay out" extra webbing after a certain point: as Capoferri stretched forward, his belt would have been lengthened by several inches, relieving the pressure on his chest. The next stage in seat-belt design is probably to offer car buyers the option of what is called a four-point belt—two shoulder belts that run down the chest, like suspenders attached to a lap belt. Ford showed a four-point prototype at the auto shows this spring, and early estimates are that it might cut fatality risk by another ten per cent—which would make seat belts roughly five times more effective in saving lives than air bags by themselves. "The best solution is to provide automatic protection, including air bags, as baseline protection for everyone, with seat belts as a supplement for those



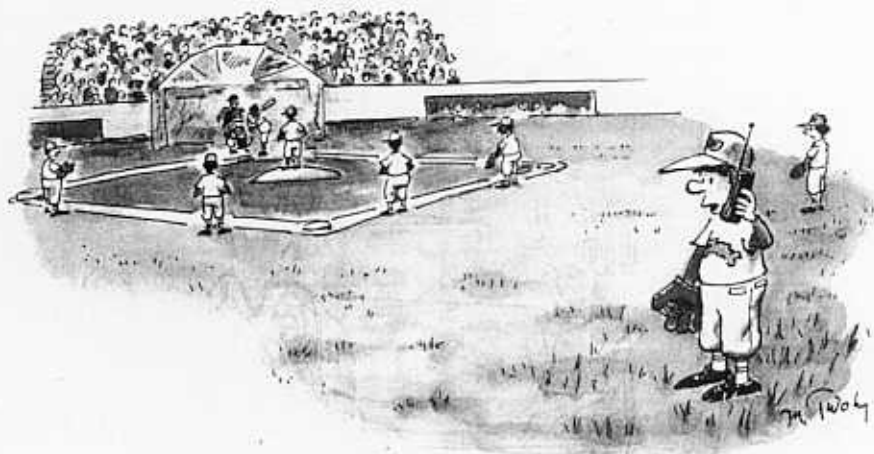
"It's for you."

who will use them," Haddon wrote in 1984. In putting air bags first and seat belts second, he had things backward.

Robert Day suffered a very different kind of accident from Stephen Capoferri's: he was hit from the side, and the physics of a side-impact crash are not nearly so forgiving. Imagine, for instance, that you punched a brick wall as hard as you could. If your fist was bare, you'd break your hand. If you had a glove with two inches of padding, your hand would sting. If you had a glove with six inches of padding, you might not feel much of anything. The more energy-absorbing material—the more space—you can put between your body and the wall, the better off you are. An automobile accident is no different. Capoferri lived, in part, because he had lots of space between himself and Day's Wagoneer. Cars have steel rails connecting the passenger compartment with the bumper, and each of those rails is engineered with what are called convolutions—accordion-like folds designed to absorb, slowly and evenly, the impact of a collision. Capoferri's van was engineered with twenty-seven inches of crumple room, and at the speed he was travelling he probably used about twenty-one inches of that. But Day had four inches, no more, between his body and the door, and perhaps another five to six inches in the door itself. Capoferri hit the wall with a boxing glove. Day punched it with his bare hand.

Day's problems were compounded by the fact that he was not wearing his seat belt. The right-front fender of Capoferri's Aerostar struck his Wagoneer squarely on the driver's door, pushing the Jeep sidewise, and if Day had been belted he would have moved with his vehicle, away from the onrushing Aerostar. But he wasn't, and so the Jeep moved out from under him: within fifteen milliseconds, the four inches of space between his body and the side of the Jeep was gone. The impact of the Aerostar slammed the driver's door against his ribs and spleen.

Day could easily have been ejected from his vehicle at that point. The impact of Capoferri's van shattered the glass in Day's door, and a Wagoneer, like most sports-utility vehicles, has a low belt line—meaning that the side windows are so large that with the glass gone there's a hole big enough for an unre-



*"I am standing up straight!"*

strained body to fly through. This is what it means to be "thrown clear" of a crash, although when that phrase is used in the popular literature it is sometimes said as if it were a good thing, when of course to be "thrown clear" of a crash is merely to be thrown into some other hard and even more lethal object, like the pavement or a tree or another car. Day, for whatever reason, was not thrown clear, and in that narrow sense he was lucky. This advantage, however, amounted to little. Day's door was driven into him like a sledgehammer.

Would a front air bag have saved Robert Day? Not at all. He wasn't moving forward into the steering wheel. He was moving sidewise into the door. Some cars now have additional air bags that are intended to protect the head as it hits the top of the door frame in a side-impact crash. But Day didn't die of head injuries. He died of abdominal injuries. Conceivably, a side-impact bag might have offered his abdomen some slight protection. But Day's best chance of surviving the accident would have been to wear his seat belt. It would have held him in place in those first few milliseconds of impact. It would have preserved some part of the space separating him from the door, diminishing the impact of the Aerostar. Day made two mistakes that morning, then, the second of which was not buckling up. But this is a point on which the Haddonites were in error as well, because the companion to their obsession with air bags was the equally false belief that encouraging drivers to wear their

seat belts was a largely futile endeavor.

In the early nineteen-seventies, just at the moment when Haddon and Claybrook were pushing hardest for air bags, the Australian state of Victoria passed the world's first mandatory seat-belt legislation, and the law was an immediate success. With an aggressive public-education campaign, rates of seat-belt use jumped from twenty to eighty per cent. During the next several years, Canada, New Zealand, Germany, France, and others followed suit. But a similar movement in the United States in the early seventies stalled. James Gregory, who headed the N.H.T.S.A. during the Ford years, says that if Nader had advocated mandatory belt laws they might have carried the day. But Nader, then at the height of his fame and influence, didn't think that belt laws would work in this country. "You push mandatory belts, you might get a very adverse reaction," Nader says today of his thinking back then. "Mindless reaction. And how many tickets do you give out a day? What about back seats? At what point do you require a seat belt for small kids? And it's administratively difficult when people cross state lines. That's why I always focussed on the passive. We have a libertarian streak that Europe doesn't have." Richard Peet, a congressional staffer who helped draft legislation in Congress giving states financial incentives to pass belt laws, founded an organization in the early seventies to promote belt-wearing. "After I did that, some of the people who worked for Nader's organization went





*"I want to start dating other zblubs."*

after me, saying that I was selling out the air-bag movement," Peet recalls. "That pissed me off. I thought the safety movement was the safety movement and we were all working together for common aims." In "Auto Safety," a history of auto-safety regulation, John Graham, of the Harvard School of Public Health, writes of Claybrook's time at the N.H.T.S.A.:

Her lack of aggressive leadership on safety belt use was a major source of irritation among belt use advocates, auto industry officials, and officials from state safety programs. They saw her pessimistic attitudes as a self-fulfilling prophecy. One of Claybrook's aides at N.H.T.S.A. who worked with state agencies acknowledged: "It is fair to say that Claybrook never made a dedicated effort to get mandatory belt-use laws." Another aide offered the following explanation of her philosophy: "Joan didn't do much on mandatory belt use because her primary interests were in vehicle regulation. She was fond of saying 'it is easier to get twenty auto companies to do something than to get 200 million Americans to do something.'"

Claybrook says that while at the N.H.T.S.A. she mailed a letter to all the state governors encouraging them to pass mandatory seat-belt legislation, and "not one governor would help us." It is clear that she had low expectations for her efforts. Even as late as 1984, Claybrook was still insisting that trying to encourage seat-

belt use was a fool's errand. "It is not likely that mandatory seat belt usage laws will be either enacted or found acceptable to the public in large numbers," Claybrook wrote. "There is massive public resistance to adult safety belt usage." In the very year her words were published, however, a coalition of medical groups finally managed to pass the country's first mandatory seat-belt law, in New York, and the results were dramatic. One state after another soon did likewise, and public opinion about belts underwent what the pollster Gary Lawrence has called "one of the most phenomenal shifts in attitudes ever measured." Americans, it turned out, did not have a cultural aversion to seat belts. They just needed some encouragement. "It's not a big Freudian thing whether you buckle up or not," says B. J. Campbell, a former safety researcher at the University of North Carolina, who was one of the veterans of the seat-belt movement. "It's just a habit, and either you're in the habit of doing it or you're not."

Today, belt-wearing rates in the United States are just over seventy per cent, and every year they inch up a little more. But if the seat-belt campaign had begun in the nineteen-seventies, instead of the nineteen-eighties, the use rate in this country would be higher right now, and in the intervening years an awful lot of

car accidents might have turned out differently, including one at the intersection of Egg Harbor Road and Fleming Pike.

## VI. CRASH TEST

William Haddon died in 1985, of kidney disease, at the age of fifty-eight. From the time he left government until his death, he headed an influential research group called the Insurance Institute for Highway Safety.

Joan Claybrook left the N.H.T.S.A. in 1980 and went on to run Ralph Nader's advocacy group Public Citizen, where she has been a powerful voice on auto safety ever since. In an interview this spring, Claybrook listed the things that she would do if she were back as the country's traffic-safety czar. "I'd issue a rollover standard, and have a thirty-miles-per-hour test for air bags," she said. "Upgrade the seating structure. Integrate the head restraint better. Upgrade the tire-safety standard. Provide much more consumer information. And also do more crash testing, whether it's rollover or offset crash testing and rear-crash testing." The most effective way to reduce automobile fatalities, she went on, would be to focus on rollovers—lowering the center of gravity in S.U.V.s, strengthening doors and roofs. In the course of outlining her agenda, Claybrook did not once mention the words "seat belt."

Ralph Nader, for his part, spends a great deal of time speaking at college campuses about political activism. He remains a distinctive figure, tall and slightly stooped, with a bundle of papers under his arm. His interests have widened in recent years, but he is still passionate about his first crusade. "Haddon was all business—never made a joke, didn't tolerate fools easily," Nader said not long ago, when he was asked about the early days. He has a deep, rumbling press-conference voice, and speaks in sentence fragments, punctuated with long pauses. "Very dedicated. He influenced us all." The auto-safety campaign, he went on, "was a spectacular success of the federal-government mission. When the regulations were allowed, they worked. And it worked because it deals with technology rather than human behavior." Nader had just been speaking in Detroit, at Wayne State University, and was on the plane back to Washington, D.C. He was folded into

his seat, his knees butting up against the tray table in front of him, and from time to time he looked enviously over at the people stretching their legs in the exit row. Did he have any regrets? Yes, he said. He wished that back in 1966 he had succeeded in keeping the criminal-penalties provision in the auto-safety bill that Congress passed that summer. "That would have gone right to the executive suite," he said.

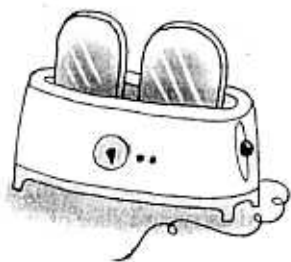
There were things, he admitted, that had puzzled him over the years. He couldn't believe the strides that had been made against drunk driving. "You've got to hand it to MADD. It took me by surprise. The drunk-driving culture is deeply embedded. I thought it was too ingrained." And then there was what had happened with seat belts. "Use rates are up sharply," he said. "They're a lot higher than I thought they would be. I thought it would be very hard to hit fifty per cent. The most unlikely people now buckle up." He shook his head, marveling. He had always been a belt user, and recommends belts to others, but who knew they would catch on?

Other safety activists, who had seen what had happened to driver behavior in Europe and Australia in the seventies, weren't so surprised, of course. But Nader was never the kind of activist who had great faith in the people whose lives he was trying to protect. He and the other Haddonites were sworn to a theory that said that the way to prevent typhoid is to chlorinate the water, even though there are clearly instances where chlorine will not do the trick. This is the blindness of ideology. It is what happens when public policy is conducted by those who cannot conceive that human beings will do willingly what is in their own interest. What was the truly poignant thing about Robert Day, after all? Not just that he was a click away from saving his only life but that his son, sitting right next to him, *was* wearing his seat belt. In the Days' Jeep Wagoneer, a fight that experts assumed was futile was already half won.

One day this spring, a team of engineers at Ford conducted a crash test on a 2003 Mercury. This was at Ford's test facility in Dearborn, a long, rectangular white steel structure, bisected by a five-hundred-and-fifty-foot runway. Ford crashes as many as two cars a day there, ramming them with spe-

cially designed sleds or dragging them down the runway with a cable into a twenty-foot cube of concrete. Along the side of the track were the twisted hulks of previous experiments: a Ford Focus wagon up on blocks; a mangled BMW S.U.V. that had been crashed, out of competitive curiosity, the previous week; a Ford Explorer that looked as though it had been thrown into a blender. In a room at the back, there were fifty or sixty crash-test dummies, propped up on tables and chairs, in a dozen or more configurations—some in Converse sneakers, some in patent-leather shoes, some without feet and legs at all, each one covered with multiple electronic sensors, all designed to measure the kinds of injuries possible in a crash.

The severity of any accident is measured not by the speed of the car at the moment of impact but by what is known as the delta V—the difference between how fast a car is going at the moment of impact and how fast it is moving after the accident. Capoferri's delta V was about twenty-five miles per hour, seven miles per hour higher than the accident average. The delta V of the Mercury test, though, was to be thirty-five miles per hour, which is the equivalent of hitting an identical parked car at seventy miles per hour. The occupants were two adult-size dummies in orange shorts. Their faces were covered in wet paint, red above the upper jaw and blue below it, to mark where their faces hit on the air bag. The back seat carried a full cargo of computers and video cameras. A series of yellow lights began flashing. An engineer stood to the side, holding an abort button. Then a bank of stage lights came on, directly above the point of impact. Sixteen video cameras began rolling. A voice came over a loudspeaker, counting down: five, four, three . . . There was a blur as the Mercury swept by—then *bang*, as the car hit the barrier and the dual front air bags exploded. A plastic light bracket skittered across the floor, and



the long warehouse was suddenly still.

It was a moment of extraordinary violence, yet it was also strangely compelling. This was performance art, an abstract and ritualized rendering of reality, given in a concrete-and-steel gallery. The front end of the Mercury was perfectly compressed; the car was thirty inches shorter than it had been a moment before. The windshield was untouched. The "A" pillars and roofline were intact. The passenger cabin was whole. In the dead center of the deflated air bags, right where they were supposed to be, were perfect blue-and-red paint imprints of the dummies' faces.

But it was only a performance, and that was the hard thing to remember. In the real world, people rarely have perfectly square frontal collisions, sitting ramrod straight and ideally positioned; people rarely have accidents that so perfectly showcase the minor talents of the air bag. A crash test is beautiful. In the sequence we have all seen over and over in automobile commercials, the dummy rises magically to meet the swelling cushion, always in slow motion, the bang replaced by Mozart, and on those theatrical terms the dowdy fabric strips of the seat belt cannot compete with the billowing folds of the air bag. This is the image that seduced William Haddon when the men from Eaton, Yale showed him the People Saver so many years ago, and the image that warped auto safety for twenty long years. But real accidents are seldom like this. They are ugly and complicated, shaped by the messy geometries of the everyday world and by the infinite variety of human frailty. A man looks away from the road at the wrong time. He does not see what he ought to see. Another man does not have time to react. The two cars collide, but at a slight angle. There is a two-hundred-and-seventy-degree spin. There is skidding and banging. A belt presses deep into one man's chest—and that saves his life. The other man's unrestrained body smashes against the car door—and that kills him.

"They left pretty early, about eight, nine in the morning," Susan Day, Robert Day's widow, recalls. "I was at home when the hospital called. I went to see my son first. He was pretty much O.K., had a lot of bruising. Then they came in and said, 'Your husband didn't make it.'" ♦