THE POPE OF PHYSICS
To immigrants, then and now
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THE POPE OF PHYSICS
July 16, 1945. Dawn broke reluctantly, the early rays of the day barely grazing the tops of nearby peaks. It was almost as if the sun sensed that its brightness would be outshone. A group of scientists, huddled together against the morning chill, set aside their worries about bad weather and concentrated on the seismic event that was about to occur.

The countdown began at 5:09:45 a.m. If all went according to plan, exactly twenty minutes later they would throw a switch triggering the detonation of the world’s first atom bomb. The tension at the site was palpable as they waited. An earthen mound above a concrete slab roof, all supported by massive oak beams, fortified the structure they were staying in. Located ten thousand yards south of the hundred-foot-high tower holding the bomb, the shelter was thought to be safe no matter how large the explosion at Ground Zero might be. The small group who manned the Trinity Project, as it was named, included George Kistiakowsky, the head of explosives, Kenneth Bainbridge, the man who had selected and built up the site, and of course J. Robert Oppenheimer.

General Leslie Groves, feeling that he and Oppenheimer should not be together in case of disaster, had gotten into his jeep a little earlier and driven five miles south to Base Camp, leaving his military
deputy in charge at the bunker. Most of the physicists who had worked on Trinity were at Campania Hill, some twenty miles northwest of Ground Zero. A few, including Enrico Fermi and Emilio Segrè, were ten miles closer, at Base Camp. Shallow trenches had been dug there to protect them, but would those trenches be enough? Everybody thought yes, but how big was the blast going to be? Might it even be a complete failure?

A few days earlier the senior physicists had started a betting pool about the blast’s magnitude; a one-dollar entrance fee built up the pot. Kistiakowsky’s wager had been one thousand tons of TNT equivalent, a low estimate, as he would discover when he climbed on top of the bunker after the blast, only to be knocked over by the shock wave that reached him a few seconds later. Hans Bethe, head of the theory division, had said eight thousand, while a worried Oppenheimer had settled for a modest three hundred.

The switch was thrown at 5:29:45. Many recorded their impressions of what happened next, an event subsequently described as brighter than a thousand suns. From base camp, Isidor Rabi’s memory was that “Suddenly there was an enormous flash of light, the brightest light I have ever seen or that I think anyone has ever seen. It blasted, it pounced: it bored its way right through you. It was a vision that was seen with more than the eye.” The flash was so overwhelmingly intense that irrational instants of fear were common. “For a moment I thought the explosion might set fire to the atmosphere and thus finish the earth, even though I knew this was not possible,” Segrè recalled.

Seconds later, as the mushroom cloud began rising in the sky, those watching it were left trying to grasp the meaning of what they were witnessing. Oppenheimer remembered the lines from the Bhagavad Gita’s scriptures coming to him: “I am become Death, the destroyer of worlds.” Bainbridge expressed himself in much more prosaic language: “Now we are all sons-of-bitches.”

Fermi was arguably the physicist most responsible for the world-changing event that had just occurred in the New Mexico desert. There is no documentation of what he was thinking at the time. But there is a record of what Fermi was doing. If you didn’t know him, it would seem bizarre, but everybody knew he always acted with purpose. A few
seconds after the blast, Fermi stood up and began tearing a large sheet of paper into small pieces and then dropping them from his upraised hand. Forty seconds later, as the front of the shock wave hit, the mid-air pieces were blown a short distance away. Pacing off the distance to where they landed, some eight feet, he consulted a little chart he had prepared beforehand. Shortly afterward, Fermi told those around him that he estimated the blast’s force as roughly equivalent to ten kilotons of TNT.

A few hours later, Fermi climbed into a special lead-lined tank and headed toward Ground Zero to scoop up material for a more careful assessment of what had transpired. The detailed measurements took about a week. It was concluded that the blast’s magnitude, corresponding to twenty kilotons of TNT, was close to the estimate he had made within a minute of the explosion. None of the physicists was surprised.

The dropping of the paper pieces soon became yet another vintage Fermi story, adding to the lore of how he could, with the simplest of means, estimate the magnitude of any physical phenomenon. And, as usual, he had been right. His colleagues in Rome used to joke that Fermi was infallible, like the Pope. He had acquired the nickname “the Pope of Physics” early on. It was an appellation that persisted, deservedly, throughout Fermi’s lifetime.
PART 1

ITALY, BEGINNINGS
Enrico Fermi’s ancestral roots can be traced to the valley of Italy’s greatest river, the Po, whose origins lie in the western Alps. It flows from west to east, neatly bisecting Northern Italy, and finally empties into the Adriatic Sea. As it travels its four-hundred-mile course, it grows steadily in volume, fed by rivers coursing down from the Alps and from ones born in the central Apennine mountain chain.

The Po Valley, defined by its river, is agriculturally fertile and culturally vibrant. It is also Italy’s economic center, thanks to large industries, but enriched by a wealth of small businesses that have adapted an older tradition of craftsmanship to the demands of the new commerce. Turin, the automotive home of Fiat, is located directly on the river. As it winds further, Milan, a center of style and fashion, is a little north, and Bologna, known for its culinary treats, a little south, of its course. Venice, an architectural wonder, is not far from the delta where the Po empties into the sea. These are the region’s dominant cities, but there are a number of midsized ones with their own history and institutions.

In most cases this diversity comes from their ancient founding during the Roman Empire and sometimes even earlier, followed by an
evolution during the Renaissance into independent city-states. What we currently call Italy, a country that came together only in 1870, was until shortly before then little more than a hodgepodge of smaller fiefdoms wavering opportunistically to and fro in their allegiances to larger European powers.

Piacenza, the ancestral home of the Fermis, lies in the midst of the Po Valley. It has a particularly impressive thirteenth-century city hall, but the town is largely neglected as a tourist attraction because it lies almost directly in the middle of a triangle formed by the better-known Parma, Cremona, and Pavia. Founded by the Romans in 218 B.C.E., the settlement was given the name Placentia, from the Latin * placere*, “to please.” Through the following centuries, it did indeed please, and in doing so underwent the same cyclical sacking and rebuilding that its neighbors suffered.

In 1545 the Duchy of Parma and Piacenza was established. Except for a brief interlude during Napoleon’s short-lived conquest of Northern Italy, it controlled the region surrounding those two cities until the formation of modern Italy. Shortly before that, the Fermis, a local family, made the transition away from tilling the soil. The man who would become Enrico’s grandfather, Stefano Fermi, entered the employment of the state and rose to be administrative head of a small municipality adjacent to Piacenza.

Enrico Fermi’s grandfather married Giulia Bergonzi, a woman thirteen years his junior, and began a large family; their second son, Alberto, would one day become Enrico’s father. The fluid national identities that characterized the Italian peninsula in the first years after Alberto’s birth in 1857 were such that he entered the world as a subject of the Duke of Parma and Piacenza, became a resident of the free territory of Emilia two years later and a citizen of the Kingdom of Sardinia a year after that, and finally, at age four, became an Italian. All this without ever leaving the vicinity of Piacenza.

In the 1840s, Alberto’s father, Stefano, had settled with his wife in Caorso, a small municipality that lay eight miles east of Piacenza. Their life was a simple one, centering on family, work, and church. He and his wife, Giulia, almost certainly went occasionally to Piacenza, but they probably did not venture as far as Cremona, for though it was only
eight miles west of Caorso, going there required crossing the Po and entering a different country.

Those borders vanished in 1861 with the emergence of the Kingdom of Italy. Stefano and Giulia hoped there would be opportunities for advancement in this new country, still woefully underdeveloped by comparison to those of Northern Europe. The Industrial Revolution had for all practical purposes bypassed the peninsula, and most of Italy’s workers either labored on the land as they had for centuries or engaged in minor commerce. Nor was transportation very different from what it had been since Roman times, for there was little more than fifteen hundred miles of rail lines in the whole country, almost all of it north of the Po.

Education was viewed as providing a first step to bettering oneself. More than three quarters of Italy’s population was still functionally illiterate. Many could read a little but, like Enrico’s grandmother Giulia, had not learned to write, much less how to deal with arithmetic problems beyond a simple shopping list.

The newly formed Italian government instituted a set of reforms designed to change this state of affairs. An innovative law called for universal enrollment in elementary school starting at age six. Attendance in the first four years was compulsory, though in practice the rule was often broken. The poor considered it a luxury to have their offspring removed from the workforce. The rich educated theirs at home.

Stefano and Giulia, despite their modest circumstances, insisted on having their children attend school, and Alberto, who seemed to be the most scholastically gifted of them, advanced beyond an elementary education. But given the Fermi family’s financial situation, attending university was never considered. When he reached the age of sixteen, Alberto’s schooling was finished and it was time for him to seek employment.

By then Rome was the capital of Italy. The city and its surrounding region had been an independent state under papal rule until 1870, when the Kingdom of Italy had annexed the territory. Pope Pius IX had declared the occupation violent, unjust, and invalid. Retreating into the Vatican, he refused to recognize the existence, much less the legitimacy, of the new Italy.
Alberto Fermi, thirteen at the time, must have followed the story with keen interest. His parents, especially his mother, were devout Catholics, but he was already having the doubts that would later turn him into an agnostic, if not an atheist.

Alberto knew that he would have to leave Caorso if he was to advance in the world. Working for a company that built and managed rail lines seemed to be a particularly interesting choice in the early 1870s. At the time of his birth Italy had more than two dozen independent railway companies, each operating separate lines. Many of the lines had been founded with foreign capital, making them dependent on events outside Italy’s control. Each attempted to maximize its profits with no concern for helping to forge a national identity.

By the age of twenty-four, Alberto was employed in the service of the company that managed the northern Italian railroads, one of the four that had emerged from consolidation. Through various reorganizations, the railroads continued to employ him until his retirement. In 1905 he became a civil servant for the Italian railroads, nationalized and combined into a single company, the Ferrovie dello Stato.

During all the years of employment, Alberto’s willingness to work harder than anybody else, combined with his organizational ability, perseverance, and native intelligence, had led to his steady rise in the ranks. These personality traits would be very much imprinted on his only surviving son, Enrico.

Like his father, Alberto did not marry until he was forty-one. Ida de Gattis was fourteen years his junior. The daughter of an army officer, she was born in Bari, a city in Puglia, commonly known as the heel of Italy. Ida had been orphaned at a young age and raised by relatives in Milan. Like Alberto, she strongly advocated self-sufficiency and self-reliance. She began teaching after a three-year course for elementary school teachers, her ambitious trajectory a relative rarity at a time when women were still discouraged from entering a profession.

Ida and Alberto were both intelligent and upwardly mobile. They were not cultured in the traditional sense of appreciating art, music, and literature, though Alberto, a rather taciturn man, was known to occasionally break into song in the privacy of his home when shaving or bathing. His choice was almost always a Verdi aria, probably because
the composer was born in Busseto, a small town only a few miles from Piacenza.

When Ida and Alberto married, they settled in Rome on Via Gaeta, a street that lay a short distance from the central railroad station. Their apartment was in one of the newer buildings that had sprung up during the thirty years since Italian unification, a period during which the city’s population had roughly doubled to some four hundred thousand. Their neighbors were much like the Fermis, upwardly mobile middle-class people, the husbands typically employees of the government or of a quasigovernmental agency.

The Fermis lived on Via Gaeta for ten years, then moved to a nearby apartment in 1908. Slightly more spacious, but still far from luxurious, it had no central heating and its bathroom, as was not unusual at that time, was equipped with only a sink and a toilet. Baths were taken in two zinc tubs, a smaller one for children and a larger one on casters for the parents. By then Ida and Alberto had three children. Maria was born in 1899, Giulio in 1900, and Enrico on the twenty-ninth of September, 1901.

The closeness in age of the children and Ida’s desire to continue teaching resulted in Enrico’s being placed in a farm family. The tradition of having wet nurses for infants was centuries old in Italy, usually only adopted by the upper classes. A young woman who had recently given birth would be brought in from the countryside to nurse and care for the baby, living with the family at least until the child was weaned.

Toward the end of the nineteenth century, the reverse was becoming common for middle-class couples living in big cities: their children were sent to the countryside. With three children in less than three years, the Fermis made such arrangements for Enrico, the youngest. At the time farms still existed close to Rome; it was not too hard to find a suitable family willing—for a fee, of course—to take on a little boy for a few years.

A child psychologist, ruminating on where such a beginning would lead, might conclude that in adulthood the person would be either very self-reliant and controlled or overly needy and dependent. Enrico was obviously an example of the former.

One can speculate that the farm family provided a loving
environment and a place where he could observe, explore, and enjoy nature. The security that Fermi exuded, as well as his love of the outdoors, might be related to those farm years. Yet the pain of separation from his family of birth must have affected his development, too, and is probably related to why Fermi kept emotions to himself and never complained. This is how he learned to cope.

And those coping skills served him well in later life.