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# Leon Festinger

## Lunch With Leon

Michael S. Gazzaniga

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How shall I outline my thoughts about a man whose mental life permeated every aspect of my own for more than 20 years? Leon Festinger and I took an instant liking to one another in a chance meeting back in the late 1960s. It would be difficult to imagine two more different people—we had different philosophies, different styles, and different aspirations. Our friendship developed around a mutual love for good ideas and for good food and drink. The rest took care of itself.

One of the hallmarks of a gifted mind is its steadfast belief that, in fact, not much of anything relates to anything else. How often we say, “Because of X, we seem to have new evidence to believe in Y.” Leon, with cold logic, could take even the best scientists and reduce them to blubbering mortals in a matter of seconds. His favorite joke related the story of the old Jewish couple who are lying in bed when the wife says, “Harry, close the window. It’s cold outside.” Harry gets up and closes the window, turns to his wife, and says, “So now it’s *warm* outside?” Every statement has multiple implications, and Leon reflexively noted them all.

I am told by his lifelong friends that in his youth, he was an aggressive, sometimes scathing critic. As the father of cognitive dissonance theory, he quickly became a legend in psychology, and conferences were commonly devoted to discussing his theories. At one meeting, a young scientist presented a paper that by and large supported Leon’s ideas. Leon arose from the audience, and in a blistering remark, shot down the entire set of experiments. The speaker was stunned, and responded, “But Dr. Festinger, this work completely supports your theories.” Leon replied, “The way those experiments were done, they support nothing.” He could not be flattered into one’s corner.

By the time we met, he was the doyen of social psychology, but changing fields and plunging forward into the study of visual perception. During this early period, when I was a lowly assistant professor at the University of California at Santa Barbara, and he was a famous Stanford professor, he called to invite me to a seminar at his home. A mutual friend of ours at Stanford assured me that the seminar would be interesting, adding, “Oh,

and Leon is really smart, Mike—you’d better prepare.” This was one of Leon’s quirks: As he became acquainted with people in foreign fields, he offered them his gracious hospitality, assuming they would have something to say. And so it was that I sat down in an easy chair in his living room, with Leon about 3 feet from me, smoking his ever-present Camel, his students clustered behind him. Drinks were served, and we were off to the races. Leon was not going to miss a single word of this neophyte’s remarks, and it turned out to be a glorious evening. There I was, with the smartest man in the world listening attentively to me talk about my experiments, and with deference at that.

I would say that over the next 20 years or so, we talked about our own research programs no more than 5% of the time when we were together. What is it about discovering a true intellect that causes conversations to wander? Leon viewed and considered everything from a perspective informed not only by years of experience, but also by enormous knowledge of almost every topic. Here is one of the first puzzles about Leon: He wasted prodigious amounts of time. He loved games and played them endlessly, and he was a chronic lingerer. He would linger at lunch, at dinner. Yet Leon had read everything, and worse, had remembered it all. None of his friends could figure out how he found the time to accumulate his vast, unusually detailed knowledge of the world. Not surprisingly, the people he talked with and listened to provided much of this detailed knowledge, and after listening carefully, Leon would always present a summary of the speaker’s errors.

In his later years, he would come to small meetings I organized on various issues in brain research. One particular meeting was held in Paris, and Leon could never pass up a trip to Paris, so he sat through an entire week of discussions on the biological basis of memory, a topic about which he knew virtually nothing. Participants at the meeting, of course, knew who he was and were intrigued as to why he was present. Leon smiled, sat down, and began to listen, smoking Camels. One of the speakers had the difficult task of presenting his paper after a Parisian lunch. The 10 or so scientists present at the meeting were only human, and when lecture time came, around 4:00, they were lulled into a seminar nap. The speaker was fired up nonetheless, which is always the case, and he started in on a mathematical analysis of learning.

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That was it for the neurobiologists. As you glanced around the room, looking for listeners, you could not help noticing Leon, smoke rising from his seat as he puffed. Three quarters of the way through the presentation, the speaker had filled three chalkboards with equations describing a learning phenomenon. Leon interrupted, "Excuse me, but in that last derivation, I think you are wrong. Everything should be divided by 2." The crowd awoke, and the speaker turned to Leon, looked at him, turned to the board and looked at his life's work, looked back at Leon, looked at the board, paused, and turned ashen. "You're right," he admitted. Leon smiled and said, "But your point is interesting."

This sort of thing went on all the time. My neurobiology friends were initially stunned by him, and then always asked if he would be attending our meetings. They could not get enough of him, either. His attentive, critical mind could not be turned off, even by topics he cared little about. He was captivated by the nature of the world overall, and why people behaved as they did. Such a deep desire to understand issues as grand as that, I suppose, compels you to listen to and evaluate information endlessly.

As our friendship began to flourish, I learned that Leon was leaving his august position at Stanford University to take a post at a place called the New School for Social Research. Having lived in New York City and its environs for some 26 years, I know something about that institution. Although it has many wise faculty, the school is known only to New Yorkers, and it has marginal prestige. Nonetheless, oblivious to issues of academic reputation, Leon decided to move east and set up shop. He immersed himself completely in the study of perception, formed the Inter-University Consortium in Perception, discovered there was a job opening at New York University (NYU), and suggested to them that they hire me.

At some point as I was deciding whether to accept the offer from NYU, Leon visited me in Santa Barbara. My family had just moved into a spectacular house, built of redwood, glass, and rock, in Mission Canyon. Beautiful homes have become a specialty of mine, and this one was the first. The original builder-craftsman had labored on this house for years. It was unfinished when we bought it, as the poor man had remarried, and he and his new wife could agree on nothing, especially how to finish the house. My wife and I seized the moment, bought the house, and added the finishing touches.

In walked Leon. We sat out on the redwood deck, underneath a cluster of towering oak trees. Drinks were poured, cigarettes were lit, and he started in on how New Yorkers regard their city as Paris, whereas other Americans see it as Hell. He regaled us with stories about this and that. Unable to contain my impatience, I said, "But Leon, what do you think of the *house*?" He looked around, noting all of the fine woodwork, the lofty ceilings, the stone fireplace, the magnificent kitchen, and said, "Well, if you wanted this sort of thing in Manhattan, it would cost millions of dollars." He prevailed as always, and so we sold the place, packed up, and moved to New York.

Once consumed with understanding an issue, Leon could not divert his attention from it, and somehow nothing else seemed important in comparison. It was not that he was unaware of his surroundings—after all, New York was his Paris—but none of that mattered when he pursued an idea. I have to believe that, because earlier in his career he had left New York for Iowa City to study with Kurt Lewin.

Lewin was a commanding figure in psychology and, to hear Leon tell it, one adept at generating new frameworks for studying psychological mechanisms. Leon had read Lewin as an undergraduate and was drawn to his ideas. The great philosopher R.G. Collingwood noted in his autobiography that as a very young man, he had stumbled upon the work of Kant. Though he could not quite say why, Collingwood sensed that Kant's work was important. So it was for the undergraduate Leon, studying the concept of levels of aspiration. He was fascinated by the idea that events could be better remembered if interrupted in their execution. Lewin's research, prior to Leon's arrival in Iowa, had laid the groundwork for the ultimate rejection of the classic laws of associationism.

By the time Leon moved to Iowa, though, Lewin's interests had begun to shift toward social psychology. During their years of collaboration, Leon also came to focus on social psychology, even though neither of them had ever received formal training in that area. This pattern would repeat throughout Leon's life. You want to learn something? Go learn it. The bright, creative mind does not need training programs. Announcing that he was now a social psychologist, Lewin took a position at MIT and started the Center for Group Dynamics, which Leon joined. After 3 years of experiments in Iowa City, Lewin now rejected the idea of associationism, concluding that it was severely limited. He became interested in the behavior of small groups. Most important, his new group at MIT had developed ways to study complex human decision making in the laboratory. Lewin, Festinger, and many other psychologists migrated east, out of the dust bowl of empiricism, to prove the influence of group dynamics on private mental states.

It is interesting to note that years later, after Leon was studying visual perception at the New School, he was invited back to MIT by Hans Lukas Teuber, the charismatic director of MIT's new brain and cognitive science department. Teuber's agenda was to hire Leon as a social psychologist, as he was under great pressure to have representation in that area. He did not care what Leon actually studied, and Leon's new interests in visual perception were perfectly fine with him. Leon turned down the attractive job offer. Though no longer at the forefront of social psychology, he felt the field deserved only the finest attention.

## THE THEORY OF COGNITIVE DISSONANCE

Leon's most famous work started with a small grant from the Ford Foundation to study and integrate work in mass media and interpersonal communication. He and his colleagues took on the

project, and, to hear him tell it, the seminal observation came from considering a 1934 report about an Indian earthquake. The fact that puzzled them was that after the earthquake, the vast majority of the rumors that were circulated predicted that an even worse earthquake was coming. After such a horrendous event, why would people want to provoke further anxiety? After Leon and his colleagues thought about it, they finally concluded that it was a coping mechanism that the Indian people had developed to deal with their present anxiety. In other words, because the earthquake had filled the population with grief, they had formulated an even greater future tragedy, in comparison with which the present state of things did not look so bad. It was out of this basic observation that the theory of cognitive dissonance was born. It would take 7 years of hard work to nail down all of the parameters of the phenomenon, but nail them down he did.

Early in his career, Leon carried out an experiment with two close friends, Stanley Schachter and Lew Riecken, in Lake City, Minnesota, where a group of people had come to believe the prophecy of one Marian Keech. Months before the crucial day, the following headline and news report had appeared in the *Lake City Herald*:

Prophecy from Planet Clarion Call to City: Flee that Flood.  
It'll Swamp us On Dec. 21, Outer Space Tells Subordinate.

Lake City will be destroyed by a flood from Great Lake just before dawn, Dec. 21, according to a suburban housewife. Mrs. Marian Keech, of 847 West School Street, says the prophecy is not her own. It is the purport of many messages she has received by automatic writing, she says . . . . The messages, according to Mrs. Keech, are sent to her by superior beings from a planet called "Clarion." These beings have been visiting the earth, she says, in what we call flying saucers. During their visits, she says they have observed fault lines in the earth's crust that foretold the deluge. Mrs. Keech reports she was told the flood will spread to form an inland sea stretching from the Arctic Circle to the Gulf of Mexico. At the same time, she says a cataclysm will submerge the West Coast from Seattle, Wa., to Chile in South America. (quoted in Festinger, Riecken, & Schachter, 1964, p. 30)

Now, your ordinary scientist might have stayed as far away from this as possible. I mean, really, this is *National Enquirer* stuff, and potentially hazardous to one's career. Well, not Leon. He and a team went to Lake City forthwith, where Keech received another message on December 20. An extraterrestrial visitor was to appear at her house around midnight to escort her and her followers to a parked flying saucer and take them away from the flood, presumably to outer space.

Leon's prediction, assuming that the momentous event did not occur, was that the followers would attempt to reduce their dissonant state at having their beliefs disconfirmed by attempting to convince other people of those beliefs. There is now a vast set of experimental data to support that view, but at the time it was brand new. In Lake City that evening, as the clock

struck 12 and no alien visitor arrived to take them to the spaceship, an awkward period began among the believers waiting in Keech's living room. But a few hours later, she received another message:

For this day it is established that there is but one God of Earth and He is in our midst, and from his hand thou hast written these words. And mighty is the word of God—and by his word have ye been saved—for from the mouth of death have ye been delivered and at no time has there been such a force loosed upon the Earth. Not since the beginning of time upon this Earth has there been such a force of Good and light as now floods this room and that which has been loosed within this room now floods the entire Earth. As thy God has spoken through the two who sit within these walls has he manifested that which he has given thee to do. (quoted in Festinger et al., 1964, p. 169)

Suddenly, the crowd was in better shape, and Keech reached for the phone to call the press. She had never done this before, but now she felt that she must, and soon all the members of the group had called various branches of the news media. For days, this sort of justification went on, and Leon's prediction was confirmed in a spellbinding way.

From this background came one of the greatest scientists of psychological research. In a masterful summary of Leon's career, Henri Zukier (1989) wrote that his work "transcends the traditional bounds of the discipline" (p. xi), ranging across topics including the voting behavior of Catholics and Jews, the meaning of minute eye movements, the decisions of maze-running rats, and the proselytizing behavior of cultists. Zukier went on to say that Leon's contributions

have permeated the general cultural and scientific sphere—far more than any other line of research in experimental social psychology. The work has been influential in literary theory of fiction; in ethnological studies of modern industry and of percussive noise in ritual; in demographic studies of fertility, marketing research, and philosophical works on justificationism and free will; in histories of ancient Rome, of the American involvement in Vietnam, of Madison's trade negotiations with France in 1811, and of China's cultural revolution; in studies of Karl Marx's social theories, discussions of Supreme Court decisions, economic theories of income redistribution, and the editorial columns of major newspapers. (p. xii)

Discussing the theory of cognitive dissonance, Zukier referred to it as "conceptually and experimentally . . . social psychology's most notable achievement" (p. xxi). All of this came from a man who loved to play backgammon for hours on end. Leon was a conversationalist, unlike many academics who talk a great deal but never listen to you, and that reinforced his game behavior. Like all the truly great intellects I have known, he both listened to and elicited testimony from the speaker, becoming turned off only when lectured to.

## THE 1980S: FINAL EXPLORATIONS

In the early 1980s, I held a meeting on the problem of memory, on the island of Morea. It was an exquisite place, and I had discovered that with various package deals, a meeting in the South Seas cost less than one in Omaha. I have found such arrangements to be effective in getting first-class people to participate in a conference, usually after making only one phone call. Indeed, this meeting proved no different, although I subsequently paid dearly for the effort from various foundation chiefs who believed the exotic setting created the perception that the participants were not serious.

At any rate, one of the dozen participants was none other than Sir Francis Crick, a man of enormous intellect who had recently decided to become a brain scientist. More significantly, his wife had always wanted to go to Morea. Crick was one of those people who raise the mean IQ of the room when they enter it, yet even after years of effort, he found understanding the brain more daunting than any problem in molecular biology. I learned at this meeting that he could be bombastic. This surprised me, because he also could be quite a good conversationalist, and it certainly did not sit well with Leon. As the meeting wore on, the tension increased. Crick kept interrupting the speakers, who were talking about various biological measures of memory phenomena, with the single, persistent, annoying remark, "But come on, move on. What you are doing is solvable in principle." In fact, the complete understanding of the mind is solvable in principle, but scientists will be busy for many hundreds of years accomplishing it.

Eventually, Leon had had enough, and he dressed Crick down. He then wondered aloud why the other biologists present had put up with this behavior so long. I muttered something about how the granting system made everyone scared of critiquing in public, but that private remarks were as vicious as ever. To Leon, Crick's approach was anathema. When Leon embarked on a new intellectual discipline, which he did habitually, he first studied the details of the field and sought expert consultants to answer and inform him about the nature of his new topic. I participated in two of his last adventures, one to the Negev and one to the south of France, and I have never enjoyed myself more in my academic life.

Leon's first break from formal experimental science came with his exploration of archaeological and paleontological evidence concerning the nature of early humans. It turns out that, in his spare time, he had been reading literature from this field over much of his career. He now focused on the data and the nature of the claims about early humans. His psychologist friends cheered him on, much as one would cheer on a comrade on a reconnaissance mission. He was entering a vastly complex field of human inquiry, and he regularly reported on his efforts to our group in terms we could understand, in our own language. Leon was our Rosetta stone.

I remember that a bit into the enterprise, Leon and I met with Stephen J. Gould on a rainy day in New York at Cornell Medical

School. Leon wanted to try out on Gould some ideas he had been formulating, and as a voyeur during most of this project, I was intrigued to see them interact. Why was Gould even responsive? Leon was a novice in the field, even though he was world famous as a psychologist. Gould arrived in my dingy office, soaked but smiling. He had the raw curiosity, the insatiable desire to understand the natural world, that drives all academic endeavors. Leon was cordial, and in seconds the conversation was flowing. The topic of sociobiology soon emerged. They both had great reservations about this approach, but at the same time, they were deeply committed to the evolutionary perspective and curious as to the extent to which basic human features are genetically based.

Leon wanted to know about origins, specifically when and for what reasons scientists call an earlier species human. The evidence available from 3 to 4 million years ago is not great, and it severely limits what one can say with any degree of confidence. Still, some important things could be said, providing basic direction to Leon's research on early humans. There is good evidence that early humans emerged about 4 million years ago. A key to this determination is that this beast walked fully erect, thereby freeing the hands for other duties. This is an incredibly strong claim, made possible only by beautiful reconstructions of skeletons found in Africa.

It is often claimed that the shift to bipedalism was the most significant event in human evolution, yet several scientists have pointed out that bipedalism in and of itself was a dangerous adaptation. Every four-legged creature in the jungle could outrun a bipedal creature, making early humans easy prey. If that had been the only change that occurred, the species would not have survived. Another drawback was that a truly bipedal creature would not survive injury to one leg. Not so with a quadruped: Three limbs allow survival. An explanation is needed for the success of the switch to bipedalism.

Leon reasoned as follows. Even though early humans had only a quarter of the cranial capacity of their modern descendants, they must have been inventive. Some emergent intelligence allowed them to become inventive in the use of their hands, and to use these appendages as multipurpose devices that helped them survive. This brings us to the crux of his argument: Because of their use of their hands, humans began to control their own evolution, manipulating their environment instead of the other way around. One of the most significant things these early humans did with their hands was to make tools. They spent much of their time making them, and they became very proficient at it. People who dispute the importance of this innovation point out that other animals also made tools. This fact has been known for years, ever since Kohler's chimps solved problems in captivity. Leon insisted on an important distinction, however: There is a fundamental difference between primitive use of tools and major use of tools. In fact, even ants use tools. What so fascinated Leon was the quantum leap in both the quantity and the quality of tools the early humans used. No species had ever used tools like

this before, and that development ensured the survival of the species.

Leon wanted to investigate primitive toolmaking firsthand, so off we went on a weeklong trip to southern France. There, close to Antibes, we visited Jacques Tixier, paleontologist extraordinaire and lithic technologist. That is, he has mastered the art of early toolmaking. Tixier instructed Leon, who had never held a hammer in his life, on how the vast variety of early tools were probably made. The evolution of the complexity in these tools and their aesthetic growth provided a microcosm of the inventive human. The quality and variety of tool use remained fairly constant for a million or so years, followed by an explosion of complexity that correlates with a major change in cranial vault size. As the brain supported more intelligent behavior—which is to say, became more inventive—the complexity of the tools improved . . . perhaps.

One fact is clear from the evolutionary record: The emergence of tool use triggered humans' dependence on technology, even though tool quality changed little in the early days of humanity. For instance, if climatic changes caused a group of individuals to become migrant, giving up their agricultural plots, their increased hunting activity would cause them to develop additional tool-use behaviors, upon which they would become dependent in time. Human inventive capacity thereby determined which biological changes would prove important for the species. It is a clever twist on the question of determinism. Analysis of early humans' stone use revealed another truth to Leon: There were good tool makers, and there were lousy tool makers. In order for the species as a whole to survive, only a few individuals needed to be inventive enough to develop new technologies, and they could teach the others. After all, how many Thomas Edisons are there?

We flew back from Brussels on Capital Airlines, and we had a buzz on in more ways than one; the Scotch was good, and the trip had been sublime. We played backgammon for 7 hours in the foul air of the smoking section, concocting schemes along with our drinks. I recall planning a trip to Israel to walk the Levant. After we landed at Kennedy airport, we poured into a cab in an epic state of weariness and headed homeward, interrupted only by a stop at Leon's favorite pickle store in Soho. All of this and much more is detailed in his magnificent book, *The Human Legacy* (Festinger, 1983). The Sloan Foundation favored the enterprise and provided some funds for our future meetings and wanderings. The fruit of this effort was the articulation of the basic parameters of the human inventive mind. Leon tracked it through the appearance of war, religion, slavery, and complex societies. In the final chapter of his book, he wondered how adaptive we humans can be, especially given the unparalleled social problems we have created.

Since he wrote his book, there has been an explosion of interest in evolutionary psychology, led by the anthropologist John Tooby and his psychologist wife, Leda Cosmides. These very talented scientists argue that many of our current cognitive

skills reflect specific adaptations that occurred at least as far back as the Stone Age. Thus, if we are to understand the modern mind, we need to start with the adaptations humans had to make in that time period. Knowing both parties, I think it more than unfortunate that they never met. Although the ideas presented by Leon and those of Tooby and Cosmides need not be at odds, my guess is that Leon would not have bought into their model.

For him, the key to human success, whether for the individual or for the species, was inventiveness—finding ad hoc solutions to new problems, which goes on all the time, and has gone on for millions of years. Tooby and Cosmides would respond that inventiveness is fine, but they would tell you which adaptations allow for that inventiveness. Leon would have gotten out another Camel and pursued the issue in painful detail, pointing out all the way why this or that cannot be known. Leon would have delighted in that kind of vigorous exchange with them, given their interests and huge investment in a particular view. Many scientists today do not want to discuss their views openly and freely, and they do not care to hammer out the common ground of agreement. Most simply stake out positions and stick with them through thick and thin.

One might think that this deeply quantitative scientist would have felt his canvas had been extended enough after this foray into archaeology and paleontology, but Leon did not. Before his death, he became fascinated with yet another issue. He wanted to study how an idea is either absorbed or not absorbed into a culture. Furthermore, he wanted to know the reasons for the idea's acceptance or rejection. Leon decided that a good laboratory to study these questions was to be found in medieval history. He was curious as to why technology was so quickly absorbed in the Latin West, but not in the Byzantine or Islamic empires.

Back in his days as an experimental psychologist, he used to warn his students not to fall into the "trap of premature precision." Get going on the idea, he said, understand its full potential, and try to think of all the ways an experiment would or would not work. With his new project in hand, we organized a meeting in Seville and brought together a new group of medieval historians. Leon had come to know Robert Sommerville, the highly talented religious scholar at Columbia University. Sommerville took a shine to Leon and guided him through yet another academic maze of talent and ideas. After much consultation, Islamists, Russian authorities on Byzantium, Catholic clerics, psychologists, and my tape recorder arrived in Seville, all under Leon's direction.

This mix of personalities had all the ingredients of disaster, but it worked because Leon had read all of the principals' works. More important, he remembered precise details about medieval history. The historians were stunned. They knew the exercise was genuine, and they told their stories with zest. Leon's vast knowledge and understanding of personalities helped as well. At one point, I was telling him about a fascinating lunch I had had with one of the Russian scholars, now living in the United States

on a green card. Leon educated me about the differences between the two cultures, culminating with the declaration, "In the Soviet Union, a bureaucracy exists for a purpose: to prevent you from doing anything. In America, it also exists, but I have never understood why, since eventually you can always do what you set out to do." I then asked Leon why this Russian scholar and his wife always ate at the hotel, given that Seville was full of wonderful restaurants that outstripped the hotel by a mile. Leon smiled and observed that the man was still a victim of his experiences in the Soviet Union. He knew the full hotel bill was being paid by the conference directly, but Leon supposed he simply could not believe the submitted restaurant bills would ever get paid. At any rate, born out of this meeting were the beginnings of Leon's last manuscript.

I speculated at length about what triggered Leon's interest in this project. He was deeply committed to the evolutionary perspective and to universal psychological mechanisms, but he was also fascinated with the dynamics of both small and large groups. Culture is a strong and powerful force on humankind, and seeds planted early in a culture can strengthen a social group for centuries. Yet the next culture over is free of this or that shackle. How does this happen? Leon felt that understanding this sort of phenomenon held greater potential relevance to humankind's current problems than, for example, understanding the diet of Kalahari tribesmen.

Let us return, then, to Leon's fascination with why the Latin West had, by the Middle Ages, completely surpassed the Byzantine and Islamic world in technological innovations. Why was the West so receptive to new ideas, so desirous of them, and why were the other cultures not? Why, in the Islamic and Byzantine worlds, was there such a reverence for the past? Indeed, to this day, the West and the Islamic worlds diverge in their willingness to accept new ideas. Leon had determined that the divergence had occurred in the Middle Ages, so he reasoned that he would have to learn medieval history. Going into the project, because of his penchant for original sources, he confided to me that he was bothered that he would have to read translations.

The first chore was to characterize the three cultures, to set the framework for understanding the great change in human history that occurred in only one of them. There was no question about the attitudes being different. In an unpublished manuscript, Leon cited the following quote by Francis Bacon, English monk and scholastic philosopher, from the 17th century:

Machines may be made by which the largest ships, with only one man steering them, will be moved faster than if they were filled with rowers; wagons may be built which will move with incredible speed and without the aid of beasts; flying machines can be constructed in which a man . . . may beat the air with wings like a bird . . . machines will make it possible to go to the bottom of seas and rivers.

Of course, Leon pointed out that these prescient attitudes did not arise overnight, and he found evidence for them starting much

earlier, in the 9th century. But none of this kind of thinking was going on in the worlds of Islam or Byzantium.

The background for this curiosity, as characterized by Leon, was as follows: Byzantium, which was the New Rome as far as Constantine was concerned, was really Greek to the core. Greek was spoken in the streets and taught in the schools, and a major part of the curriculum consisted of teaching the philosophy and science of Aristotle and Plato. Constantine never tampered with the local traditions, and by the sixth century, Greek became the official language of the government as well. Greek was still the language of learning, and Leon noted that the two great Greek scientists, Ptolemy and Galen, were both second-century-A.D. Alexandrian scholars. In short, advanced human thinking was alive and well in Byzantium. It was firmly believed there that The Philosopher, as Aristotle was called, had solved all problems; there was and would be nothing new to learn.

The Islamic world of the time exhibited a variation on the same theme. By the time of Muhammad's death in the seventh century, an alliance of Arab armies had captured most of the southern Mediterranean, and the empire spread from Spain in the west to Damascus in the east. The dominant view was that Muhammad was the last messenger of the One God Allah and that the Koran was the last word on revealed truth. Simple, clean, and neat—and from that an incredible empire emerged. Of course, it later splintered, but the overall region remained largely Islamic, with the dominant belief remaining that all had been said by Muhammad.

Despite this reverence for the past, the Byzantine and Islamic worlds were furiously busy advancing science. The Islamic world translated all the Greek works of Aristotle, Plato, Euclid, Galen, Archimedes, Ptolemy, and other writers into Arabic. Leon found a wonderful quote (cited in his unpublished manuscript) from an 11th-century upper-class Persian writing to his son about the differences between the exact and inexact sciences:

You must realize, my son, that you may only enjoy the fruits of pure science in the next world. If you wish to reap mundane benefits from science, you must mix a practice with it that is not free of lies. . . . Similarly with medicine; as long as there is no legerdemain and quackery and indiscriminate prescription of drugs, the physician is unable to earn a livelihood.

The high respect for Greek thought and science is reflected, for example, in the fact that it was Arab scientists who used the astronomical reasoning of Ptolemy and accepted his ideas in practice when calculating the movements of the stars. The Arabic scientists also laid the foundations for modern number theory. None of this was known in the Latin West at the time; most of the works of Aristotle were not even translated into Latin until the 12th and 13th centuries. Still, the puzzle: It was the Latin West that flourished in the 13th and 14th centuries.

At about this time, the scientists of the Latin West were busy with crop rotation, soil fertilization, new ways of harnessing

horses, mechanical clocks, and so on. The one advance that intrigued Leon more than any other was the transformation in the Latin West from animal power to mechanical power. Mills had been introduced in Rome much earlier, and over the centuries, they had proliferated only in the Latin West. The mills were tremendously valuable for grinding grain, and gradually, laws were passed so that only land barons could own mills. The private use of mills was strictly forbidden, as they represented major power and money.

Leon, in his unpublished manuscripts, went into minute detail on all of these issues. He strewed his writings with dozens of caveats, the exceptions he had found to his own hypotheses. He then dispensed with each in one way or another, because he wanted to communicate the larger view of what happened. Many people are stymied by all of the exceptions to their hypotheses, and such people rarely advance knowledge. Some look for the pregnant exception that might turn a whole idea on its ear, but it is important to minimize what turn out to be irrelevant exceptions. Of course, if you judge relevance incorrectly, the mistake can be very costly.

No one knew this more than Leon, and that is why much of his work on these issues never saw the light of day, because he had not applied his full analysis to it before he died. Still, his notes and early drafts of his chapters, and our glorious lunches, made clear to me his ideas about the Latin West and the other two cultures. As he put it, "Of one thing we can be sure—there is not an easy, single factor. It was not merely economics, it was not merely religion, it was not merely climate and environment or any other single thing. On the other hand, many such factors had impact and they all interacted."

### FINAL DAYS

In the fall of 1989, I received an e-mail from Leon. He wanted to know the possible significance of a fluctuating temperature that had plagued him for a month or so. I wrote him back and told him it might suggest he had some kind of cancer. He immediately went for an examination, and the news was not good. He had a tumor in his lung. His doctors wanted to operate. Leon went home and thought about it, but we all knew what his decision would be. In a man his age, the morbidity and mortality rate for aggressive lung surgery was about 40%. It would be a horrendous experience, and he saw no point in going through it with those kinds of odds.

I called my good friend, Ira Black, who was experienced with cancer both as a physician and as a patient. He was one of the neurobiologists who had discovered Leon through our small meetings, and Leon had had a great impact on him. Ira went down to Leon's apartment in Greenwich Village one evening in a valiant effort to convince him to go through with the surgery.

Leon calmly explained his arguments about the statistical probability that there were other sources of the cancer than the ones detected and that he most likely was doomed anyway. Ira countered with the view that you cannot fight the demons you do not know about; all you can fight is the identified disease. They both had a lot to drink, and Ira went home knowing he had not moved Leon from his decision.

Leon called me at Dartmouth late the following January and said we should have lunch. He added, "Make it soon." I flew down almost immediately, and we met in the Village. He chatted a bit about his downward course and the various nuisances of the medications he was on. We reminisced a bit and talked a bit about medieval history. Two martinis later, I walked him home. At his front door, after an awkward moment, I hugged him and said, "I guess I'll see you later." He gave me a look that said I had made a logical error in thinking, and said, "You probably won't." I replied, "Well, you know what I mean. I'll be in touch on e-mail." He gave that big Cheshire Cat smile of his and said, "You bet." He walked into his apartment building, and I walked up 12th Street for maybe 10 feet before I grabbed an iron fence and wept.

The next week, I was in La Jolla, staying at La Valencia. It was early Saturday morning and the phone rang. It was his wife, Trudy, with the news that Leon had died. She added, "He left you an e-mail message." How is it that the death of family or friends, even though you know it is coming, is so upsetting? I left the research meeting early and flew home to log on to my computer. There it was. No, there were two messages. The first message read, "Dear Mike, good friend, good-bye. Leon." Written minutes later, another message: "Dear Mike, I have been having trouble with e-mail all day long. There is something screwy with the networks, so in case the last message didn't get to you, good-bye, good friend. Leon."

About a month later, I had lunch with his lifelong best friend, Stanley Schachter. We were exchanging our favorite Leon stories when Schachter suddenly interjected, "You know, I played backgammon with him the afternoon before he died, and you know what? The son of a bitch took \$2.25 off me, and he wanted to be paid." We both laughed so hard that we knew we were on the road to recovery.

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