

REFERENCE FRAME

How Not to Create Tigers

N. David Mermin



O ew'ge Nacht! Wann wirst du schwinden? Wann wird das Licht mein Auge finden?

—TAMINO, *Die Zauberflöte*

Long-time readers of *PHYSICS TODAY* may recall a series of conversations with my opinionated friend and colleague Professor Mozart, reported in Reference Frame columns early in this decade (*PHYSICS TODAY*, August 1990, page 9; November 1990, page 9; June 1991, page 9; April 1992, page 9; and November 1992, page 9.) In answer to inquiries about his long silence, I can now reveal that Mozart mysteriously disappeared at the height of the Gingrich revolution in late 1995, demoralized by the growing obsession with “strategic research.” I have just learned and am happy to report that he is alive and well, the proprietor of a small tobacco plantation in central Connecticut.

I had transcribed one of my last conversations with Bill Mozart in early 1995, but before I could negotiate his permission to report it in these pages, he vanished without a trace. As soon as I rediscovered his whereabouts, I sent him a brief note of inquiry, enclosing the text reproduced below, and was delighted to get it back decorated with the familiar scrawl I had despaired of ever seeing again: “PT-OK-WAM.” I am publishing our four-year-old conversation today both for the insight it sheds on the state of mind that led so productive a physicist to drop out of the profession at so early an age, and also because Professor Mozart’s views on the state of our discipline in the mid 1990’s remain relevant to the difficult situation in which we find ourselves today, at the brink of the new millennium.

A little background: Several years before the conversation reported below, Professor Mozart had become deeply involved in satisfying the congressional demand for international assistance in the construction of the Superconducting Super Collider. In seeking contributions from abroad he had given free range to his prodigious imagination, and for several years after the cancellation of that visionary undertaking, he was fully occupied with the

unwinding of his far-flung operations. His normally sunny disposition was clouded by his ongoing dismay at the failure of the great dream.

To aid younger readers in understanding what follows, I should also explain that well into the mid 1990’s there were people—even a few in the State Department—who remembered that Russia, Ukraine, Belarus, Georgia, and many other countries once constituted a single nation that claimed to be “building” something called “communism.” The disintegration of this effort was still on Mozart’s mind, as my record of our last meeting reveals:



For the first time in years, I could sense cigar smoke as I entered the building, and by the time the elevator let me out on the fifth floor the scent of fine Havanas was unmistakable. His office door was ajar, so I went right in and there he was, clearly visible across the room through the haze, struggling to wrap an Oriental carpet in enormous sheets of brown paper. “W. A.,” I cried out, “where on earth have you been?”

“Everywhere on Earth,” he sighed. I’ve returned cigars to Cuba, carpets to Kazakhstan, peanuts to Senegal. Sicilian carts for hauling magnets in the tunnel, crates and crates of Chinese seminar tea. They wanted international support? I got them international support! Not enough . . . not enough . . .” he trailed off, emitting a fresh jet of smoke. “So,” he resumed, perking up a bit, “I’ve taken it all back. Everything. Overlooked this carpet,” he muttered, tying one more knot with a great flourish, “but now it’s all accounted for. Every jot and tittle.”

“The cigars?” I ventured, timidly. “Private side order,” he shot back. “Everything is now returned. And we can start asking ourselves what next.”

“In the import-export business?” I ventured.

“In the pursuit of an understanding of nature,” he corrected me, more in sorrow than anger, “in the post-SSC era.”

“You seem to have taken the cancellation rather hard,” I observed, “for somebody who once called the study of elementary particles the archeology of physics.”

“And so it is,” he noted. “But archeology is a noble pursuit. The only comfort in the whole business is that the discoveries will still be there, waiting to be made, when we finally manage to summon up the will to make the attempt. No danger of earthquakes pulverizing everything or tidal waves washing it all away. So sub specie aeternitatis little has been lost if we have to wait for the 22nd or 23rd century to learn whether the Higgs is really there or merely a figment of an overactive 20th-century imagination. The main problem is going to be keeping the flame of learning alive over that long gap, so that when mankind finds itself again ready to resume the quest, there will still be a few who know what it’s all about and can rekindle the fire in others.”

“So you plan to retire to your study and write books?”

“Certainly books will have to be written, but books alone will not be enough. Were professional baseball to undergo a similar collapse, there would have to be a complete codification of the underlying principles for there to be a hope of reviving the game in a later century. But that would not suffice. In isolated villages and towns, we would need small bands of volunteers quietly working hard to maintain their skills with ball, bat, and glove, passing a working knowledge of their craft on to a younger generation who in turn would struggle to refine their capabilities and transmit them to yet the next generation, waiting, hoping, until the time came to resume the game at the highest level.

“In physics we don’t even know the complete rules of the game, and probably never will. And the rules that we do know are so strange that were we merely to write them down and close the shop for a few generations, nobody would be able to make any sense of them when the time came to open the book. If we don’t stay in training, in a

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generation or two nobody will be able to make any sense of it. Which means that the universities are now more important than they have ever been before."

"You mean . . . ?"

"Yes, to keep learning alive. As the monasteries preserved literacy during the Dark Ages, so must the universities bend to the task of keeping learning alive during the dark night of strategic research that now sweeps irresistibly over us." He was wracked by so violent a sob that I felt obliged to try to put a cheerful spin on the vision he seemed to find so grim.

"So that when the fruits of strategic research have brought prosperity and abundance to all, we can resume the real quest?" I cheerily injected.

"No," he sighed, "so that when the sterility of attempting surgically to extract golden eggs from flocks of anesthetized geese becomes evident even to the most avaricious, we can still have a hope of averting the impending disaster . . ."

"By resuming the search for the Higgs?"

"By restoring the climate in which free-range geese can lay their golden eggs unmolested in the tall grass."

I tried to dislodge him from his avian metaphor. "You are waiting for the day when the nation is again prosperous enough to indulge in the luxury of curiosity-driven research?"

A shudder of revulsion swept over him. "A phrase that calls to mind little boys and girls playing doctor—probably as close to research as the thinker who coined it ever got. No, I am awaiting the day when people remember the fact that discovery does not work by deciding what you want and then discovering it. Until that happens, we are trapped in an epoch of stifling creationism."

"What do you mean, creationism? Nobody is suggesting that the physical world requires no explanation beyond a declaration that God made it that way. At least nobody in Congress is. At least not yet. Are they?" A wave of alarm swept over me.

With this remark, I seemed to have finally reached his great reserves of pedagogical energy. He smiled at my foolishness. "The problem with creationism is not just that it appeals to God to obviate the need for thought. If that were all, it would be easily disposed of. But today, though creationism has suffered a crushing defeat in the former Soviet Union, it is now running rampant in the United States."

"You've lost me, W. A. How was the collapse of atheistic communism a crushing defeat for creationism?"

His good humor thoroughly restored, Professor Mozart gave me a tolerant smile. "Religion offers just one avenue for creationism to do its mischief. Communism was creationism in the economic sphere." Noting my blank expression, he elaborated. "Creationists assume that the passage from the actual or conjectured starting point to the actual or desired final stage has been or can be achieved by direct and purposeful construction of the latter



I am going to give you 15.5 billion in 6.1 money for basic research—but you must spend it before midnight.

from the former."

The light dawned on me. "You mean religious creationists maintain that we got from the void to an Earth teeming with life through the purposeful intervention of God?"

He smiled and moved as if to pat me on the head, ending up offering me a cigar instead.

"And," I went on breathlessly, declining the offer with a shake of my head, "economic creationists maintain that we go from an inequitable distribution of wealth to a just society by the purposeful action of government?"

His smile seemed to light up the room.

"And the proponents of strategic research are creationists because . . ." I ran out of steam and sheepishly grinned back at him.

Professor Mozart rose to his feet. Waving his cigar like a conductor with a baton, he declared, "Proponents of strategic research hold the creationist belief that science works by deciding where we want to get and then going there. They would prescribe for science what Stalin prescribed for agriculture.

It will have a similar success."

"What's wrong with going where you want to get to?" I foolishly inquired.

"What's wrong with it?" Mozart thundered, "what's wrong with it? Nothing," he hissed, suddenly pianissimo, "if where you want to get is to the mountains for a hike or the delicatessen for a sandwich. But it doesn't make very much sense to insist on where you want to end up when you're dealing with a process that always manages to get you somewhere wonderful, provided only you don't specify in advance the particular nature of the next miracle."

"How can you get anywhere interesting if you renounce any advanced planning?" I asked.

"Are tigers interesting?" he snarled at me.

I jumped back a good two feet. "Yes," I said, having always liked zoos.

"So you maintain that the first thing that crawled out of the primeval slime sat down and drafted a proposal to the National Institutes of Health for a grant to help it become a tiger?"

"Of course not," I replied. "Natural selection led in the course of time to an amazing variety of more and more complex forms, the particular character of the complexity of each variation being governed entirely by chance. Planning had nothing to do with it."

"Right," he pronounced. "No immortal hand or eye could frame a strategic plan for that fearful symmetry. The only requirement was for the surroundings to be both challenging and hospitable enough for wonderful things to develop. One of them happened to be a tiger. Another, an oak tree. Yet another, you. All wonderful, to be sure, but all unplanned and all intrinsically unplannable."

And fixing his eyes on me as if I were a specimen of a possibly interesting species of butterfly, he completed the last knot in the last loop of cord, hoisted the fully wrapped carpet over his shoulder, and headed for the door. "They'll be glad to get this beauty back in Kazakhstan," he sang out.

"What will you do when you've shipped it off?" I called after him.

"Think," the answer drifted down the hall. "Sit back and think."

"What about?" I shouted.

"If I knew that," he proclaimed, as he disappeared into the freight elevator, "there'd be little point in doing it!" And as he slowly descended to the loading dock his parting benediction for science drifted up the shaft:

Tyger! Tyger! burning bright
In the forests of the night . . . ■