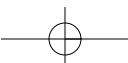
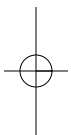
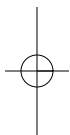


PART VI  
Earthquakes, Freedom of the Press,  
and Astrology



## CHAPTER 17

Booms and Earthquakes:  
Saving the East Coast a Scare

*Carl Sagan asks the author to decide whether and when to hold a press conference announcing an impending East Coast earthquake allegedly heralded by mysterious East Coast booms both in Nova Scotia and off the U.S. Coast. Rather than alarm the entire East Coast, an urgent investigation is undertaken, which unearths the fact that the Nova Scotia booms, which have alarmed Canada, are in fact due to Concordé shortcuts.*

*Efforts ensue to track down the source of the U.S. Coast booms, leading to a wild-goose chase looking for a new method by which sound might propagate.*

In a congressional office at 5:00 P.M. on February 27, 1978, word was passed to me that an FAS sponsor, Carl Sagan, had left a message to call; it was labeled “most urgent.” He advised me that Thomas Gold, an astronomer, and Dr. Gordon J. F. MacDonald, a former charter member of the president’s three-man Council on Environmental Quality, thought the mysterious East Coast booms then being headlined in the newspapers were precursors of an earthquake. Would I “handle” it?

Dr. Gold had a theory that methane might belch out of the earth during earth movements and then spontaneously ignite. Dr. MacDonald had heard of peculiar animal activities: bottom-dwelling fish being caught in large numbers in Canada, the Canadian lobster crop disappearing, and red snappers appearing on the surface. He began studying past earthquakes and felt that he had examples in which booms had been precursors to earthquakes. He also believed

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that the Chinese had reliably used booms as warning signals of earthquakes. Gold and MacDonald had prepared a press release and asked if FAS would convene the press.

The government, they said, was preparing a report that military aircraft were responsible, but it did not identify the aircraft, and it was emphasizing either unusual winds or unusual temperatures (neither of which, MacDonald felt, existed). The Naval Research Laboratory (NRL), he felt, would paper over its uncertainty about many events by saying that "supersonic-capable aircraft" were at issue—but since they were there during working hours generally, and had been for years, this was considered less than persuasive. There were rumors that the Naval Research Laboratory had its conclusions rewritten at the last minute to emphasize "ducting" of sounds due to weather, but what this meant was unclear. Otherwise, it was said, the report would have just left many events unexplained.

I decided to defer a press conference until I had looked into this further rather than upset 100 million people here and in Canada with hard-to-predict economic and social consequences.

Remembering that the Chinese were especially expert on earthquakes and had maintained an "earthquake register" for almost three thousand years, I stopped at the Liaison Office of the People's Republic of China and asked that the register be searched for earthquakes with booms as precursors. In due course, in a first in Chinese-American emergency cooperation, the Chinese sent a cable from Beijing with two examples of similar situations, involving bottom-dwelling fish and gas and lightning strikes—one of which seemed to anticipate an earthquake and one of which did not. Lynn Sykes of Columbia's Lamont-Doherty Laboratory explained that the traditional seismologists and the Chinese did not consider booms as precursors, but as the sound of unfelt foreshocks.

Gordon MacDonald had found a 1906 letter suggesting booms were associated with the San Francisco earthquake and he also had examples from Turkey and Charleston in 1883. But he did not have an historical case in which there were: (a) months of booms, (b) no

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seismic activity, and (c) a subsequent earthquake. This disturbed me, but earthquakes are, after all, rare events.

More serious to the MacDonald/Gold theory, the mysterious events seemed to be occurring mostly during daylight hours. Dr. William Donn, also at Lamont-Doherty, advised me that these patterns were unprecedented in his fifteen years of observing with very sensitive microphones; he speculated about Russian secret weapons and said weather could not be the cause.

The zoos I called for animal reactions to possible underground movements had no unusual information to report, nor did FAS members at Woods Hole.

Complicating the situation was the alleged existence, according to MacDonald, of mysterious lights over the East Coast. Gold felt they might be methane detonating. MacDonald felt the probability of a major earthquake was on the order of 1 percent a year ordinarily (four in the last four hundred years) but that, in the next few months alone, it might be 5 percent. I urged further delay, to which he and Gold agreed, with MacDonald's provision that the press conference definitely be held on March 14—ten days off.

Because of an unusual snowstorm on March 6, MacDonald failed to join me at a meeting at his office in the Virginia countryside, but I was able to question his assistant, and she informed me that much of Dr. MacDonald's information on sonic-boom data and animals had come from a Ms. Hattie Perry of Nova Scotia. *D* The assistant handed over these hitherto undisclosed Perry reports.

Ms. Perry had logged instances of both mysterious booms and mysterious rumbles in forty detailed pages. Recognizing that this was the Rosetta Stone, I abandoned meeting with Gordon and raced home to study it. Remembering that Concorde had begun flying about three weeks before and recalling from my experience opposing the supersonic airplanes in 1971 that they caused booms, I stopped calling the directors of East Coast zoos and began calling Concorde pilots.

It turned out that Hattie Perry was indeed getting boomed by

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*Hattie Perry of Barrington, Nova Scotia, who provided the Rosetta Stone that permitted the diagnosis that Concorde was producing the booms in Canada*

Concorde—not every day, but sometimes, probably on days that were hot in London and Paris. The Concorde was forbidden to fly over land at supersonic speeds, but a shortcut over Nova Scotia could save it a few minutes. And these few minutes could be important to the Concorde on days that were hot. This was because, on such days, with the fuel expanded due to the temperature, the fuel tanks could barely contain enough fuel to get the Concorde to its

destination with the required fuel reserve.

And what of the mysterious rumbles in which her house would vibrate but nothing loud would be heard? These, I realized, were “secondary booms” that were reflected off two main refracting layers in the stratosphere, at approximately thirty and sixty miles. Calculations showed that the Concorde flights originating from JFK or Dulles airport and flying 125 miles south of Nova Scotia were creating secondary booms that impacted her house with very-low-frequency sounds that caused her wall or door to rattle.<sup>[324]</sup>

This completely explained Hattie Perry’s data except for that data concerning animal behavior of which Gordon had spoken. But on calling her on March 5, I discovered that she had other explanations for the animal data. It was, she said, “not all that unusual,” and she “didn’t put much stock in it.” They were worried, she said, because they had heard that Mitre Corporation (where MacDonald worked) believed that an earthquake might be in the wind. Gordon had been on Canadian radio!

I thereupon advised the Canadian embassy (remembering that concerned high-level Canadian officials had been calling MacDonald while I was in his office) that in Nova Scotia it was Concorde, not to

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worry. And I made an appointment with the president's science adviser, Frank Press, to advise him of it.

I called J. D. Brown, a deputy superintendent at the Naval Research Laboratory, and explained what I had done. He made a generous comment: "You have my heartfelt thanks. This clearly falls in with what we wish we had done."

## But What of the American Booms?

So we had solved completely both the main booms and the secondary booms being felt in Nova Scotia. The entire earthquake scare there had been resolved. But this still left American booms. We could correlate some vague rumbles on Long Island with Concorde; they were secondary booms from the period in the flight path before the plane went subsonic.

But there were still unexplained American booms. I thought I saw correlations between these unaccounted-for booms and the takeoffs from London of the Concorde. But the correlations would have required the booms to travel faster than the ground speed of sound. Could this happen?

As a nonphysicist, who had just learned about the "super" (secondary) booms reflecting off upper stratospheric levels, I thought, perhaps, anything could happen. Perhaps there were "hyper" booms as well. Nobody had any clear idea about this speculation until I called Richard Garwin. Without even putting down the phone, he thought for a minute and said, "Yes, there is a way."

He later released a paper explaining how shock waves, fired a hundred miles up into the thermosphere by the Concorde, could—because of their strength and the supertemperatures of that altitude—maintain their coherence and bend downward again while keeping roughly to the speed at which they were propagated upward.

I briefed Frank Press on Friday, March 10, and then, at his request, briefed the secretary of transportation on Monday, March

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*Richard Garwin— who provided a theory (here providing the author with an FAS Public Service Award in 1995 in the U.S. Capitol)*

12. I had little paper triangles and maps of the entire system of worldwide Concorde flights (e.g., including flights to Dakar). With these I showed Frank why various strange phenomena might be related to certain Concorde flights.

He, an experienced scientist, correctly separated out the firm conclusions (Nova Scotia, secondary booms, and so on) from the more speculative and told

*Science* magazine that the latter were “an interesting speculation that deserves further study.”<sup>325</sup> But since the Naval Research scientists there for the briefing did not really understand the still-mysterious booms on the East Coast—which had started the flap—they could only agree to reopen the investigation, which they did.

Over the weekend, between the briefings of Science Adviser Frank Press and the secretary of transportation, I began worrying about the Concorde more generally. It had just been put into service, and I now realized, from Dick’s reasoning, that it was throwing large amounts of energy upward into a very thin atmosphere. Was it doing any harm? After all, there had recently been some weird weather.

I began calling experts. I reached Hans Arnold Panofsky, the elder brother of Wolfgang K. H. (Pefe) Panofsky, who was an expert on atmospheric sciences. He cautioned me that the weather was formed at much lower altitudes and not normally influenced by the altitudes we were discussing.

In any case, I spent a weekend as “defender of planet earth,” trying to see if anybody knew anything relevant. The Naval Research Laboratory reconvened its experts, and Dick went out to explain his theory with me in tow. He began deriving formulas on the black-



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board while saying, over his shoulder, “Do you fellows know this one?” Evidently, he was deriving relevant formulas without knowing whether the experts in the field knew them or not! I was flabbergasted.

At one point, it seemed that the jig was up. One scientist said, “You have an exponent ‘2’ on ‘e’ where there should be no exponent.” Dick said, “Well, wait a minute,” and went on deriving formulas while he thought about this in the back of his mind. And then he said, “Well, both formulas are right.” How on earth both formulas could be right was then, and is now, beyond me. But Dick survived the scrutiny of the experts. They *knew* he was wrong but could not prove it.

Dick was, of course, infinitely experienced in all this. And he warned me, early on, that physicists could “always come up with a theory if there were data.” But if there were not enough data, the theory would not be accepted. And really, in the end, I did not have enough data to support even a minor theory.<sup>[326]</sup>

Some months later, FAS received a call from a meteorologist, Richard Wood, from the U.S. Weather Service’s Tucson office. He said he thought he knew what had happened off the East Coast—could I get him the weather maps for the days in question?

Wood had learned, in 1975, that mysterious booms in Tucson had been caused by supersonic flights, far beyond the normal range, because of the presence of an unusually swift jet stream blowing in the direction of the supersonic flights. The jet stream, with 250-kilometer winds, could push the supersonic booms along.

Wood confirmed that, on the days in question on the East Coast, the meandering west-east jet stream had been in such an unusual snakelike configuration that it was blowing due north around Charleston. It had blown the supersonic booms of offshore aircraft right onto the shore. Thus supersonic aircraft that had caused no audible booms for years were causing them on those unusual days.

In the end, the NRL computers proved right about the mysterious booms, but because the computers did not explain the phenom-

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enon in a way that humans could understand, the unusual weather conditions involved had not been persuasive to critics.

Gordon MacDonald was still not entirely convinced. In a report he concluded that only 413 of the 594 boom events could be associated with known supersonic aircraft and that many of the remaining 181 events had a natural origin.<sup>327</sup> But I felt I had saved him and Gold from great embarrassment by discovering, in a few days of looking around, that it was Concorde in Nova Scotia and not the possibility of a Canadian earthquake, as Gordon was suggesting.

In the end, I did more than Carl Sagan had asked; I made the right decision on the press conference, and not just as an educated guess but by resolving much of the uncertainty that was breeding a crisis atmosphere. My main emotion, on remembering all this, is a feeling of having narrowly escaped complicity in sounding an unnecessary and provocative alarm for which FAS would have taken the fall, plus my satisfaction in the simple calculations that confirmed it was Concorde that was harassing Hattie Perry.<sup>[328]</sup>