"Okay . . ."

Of course she meant well, but despite her words, Evans was experiencing an unpleasant, sinking feeling. The police were threatening to issue a warrant for his arrest. The firm was complaining about his absences. Now this effort to force him into silence—by putting him on television.

He said, "Why did you want me here so early?"

"We need you to sit in the hot seat again, as part of our test for jury selection."

"I'm sorry, I can't—"

"Yes. You have to. Same thing as before. Want some coffee?"

"Sure."

"You look tired. Let's get you to hair and makeup."

Half an hour later he was back in the deposition room, at the end of the long table. There was again a crew of eager young scientific types looking down at him.

"Today," Jennifer said, "we would like to consider issues of global warming and land use. Are you familiar with this?"

"Only slightly," Evans said.

Jennifer nodded to one of the researchers at the far end. "Raimundo? Will you give him the background?"

The researcher had a heavy accent, but Evans could follow him. "It is well known," he said, "that changes in land use will cause changes in average ground temperature. Cities are hotter than the surrounding countryside—what is called the 'urban heat island' effect. Croplands are warmer than forested lands, and so on."

"Uh-huh," Evans said. Nodding. He hadn't heard about these land use concepts, but it certainly stood to reason.

Raimundo continued, "A high percentage of weather stations that were out in the countryside forty years ago are now surrounded by concrete and skyscrapers and asphalt and so on. Which makes them register warmer."



"I understand," Evans said. He glanced away, through the glass wall. He saw film crews moving around the warehouse, shooting various things. He hoped the crews wouldn't come in. He didn't want to sound stupid in front of them.

"These facts," Raimundo said, "are well known within the field. So researchers take the raw temperature data from stations near cities and reduce them by some amount to compensate for the urban heat island effect."

Evans said, "And how is this reduction calculated?"

"Different ways, depending on who does it. But most algorithms are based on population size. The larger the population, the greater the reduction."

Evans shrugged. "That sounds like the right way to do it."

"Unfortunately," he said, "it probably isn't. Do you know about Vienna? It was studied by Bohm a few years back. Vienna has had no increase in population since 1950, but it has more than doubled its energy use and increased living space substantially. The urban heat island effect has increased, but the calculated reduction is unchanged, because it only looks at population change."*

"So the heating from cities is being underestimated?" Evans said.

"It's worse than that," Jennifer said. "It used to be assumed that urban heating was unimportant because the urban heat island effect was only a fraction of total warming.

* R. Bohm, "Urban bias in temperature time series—a case study for the city of Vienna, Austria," *Climatic Change* 38, (1998): 113–1128. Ian G. McKendry, "Applied Climatology," *Progress in Physical Geography* 27, 4 (2003): 597–606. "Population-based adjustments for the UHI in the USA may be underestimating the urban effect."

The planet warmed about .3 degrees Celsius in the last thirty years. Cities are typically assumed to have heated by around .1 degree Celsius."

"Yes? So?"

"So those assumptions are wrong. The Chinese report that Shanghai warmed 1 degree Celsius in the last twenty years alone.* That's more than the total global warming of the planet in the last hundred years. And Shanghai is not unique. Houston increased .8 degrees Celsius in the last twelve years.† Cities in South Korea are heating rapidly.‡ Manchester, England, is now 8 degrees warmer than the surrounding countryside.§ Even small towns are much hotter than the surrounding areas."

Jennifer reached for her charts. "Anyway," she said, "the point is that the graphs you see are not raw data. They have already been adjusted with fudge factors to compensate for urban heating. But probably not enough."

At that moment, the door opened and one of the four video crews came in, their camera light shining. Without hesitation, Jennifer reached for some charts, and brought them up. She whispered, "B-roll is silent, so we need to be active and provide visuals."

She turned toward the camera and said, "Let me show you some examples of weather station data. Here, for instance, is

* L. Chen, et al., 2003, "Characteristics of the heat island effect in Shanghai and its possible mechanism," *Advances in Atmospheric Sciences* 20: 991–1001.

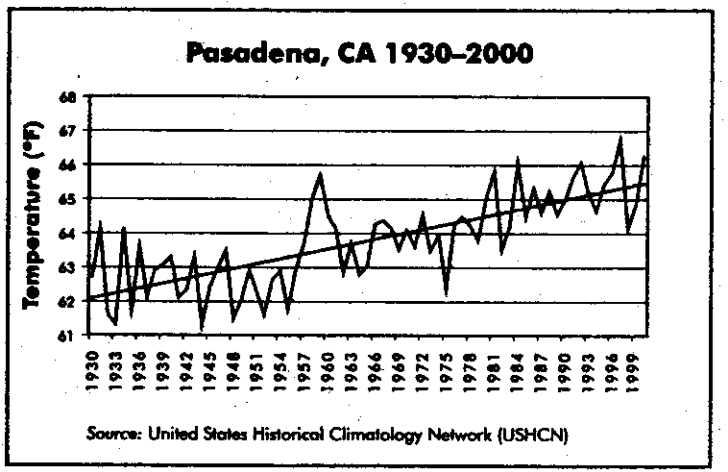
† D. R. Streutker, "Satellite-measured growth of the urban heat island of Houston, Texas," *Remote Sensing of Environment* 85 (2003): 282–289. "Between 1987 and 1999, the mean nighttime surface temperature heat island of Houston increased 0.82 ± 0.10 °C."

‡ Y. Choi, H.-S. Jung, K.-Y. Nam, and W.-T. Kwon, "Adjusting urban bias in the regional mean surface temperature series of South Korea, 1968–99," *International Journal of Climatology* 23 (2003): 577–91.

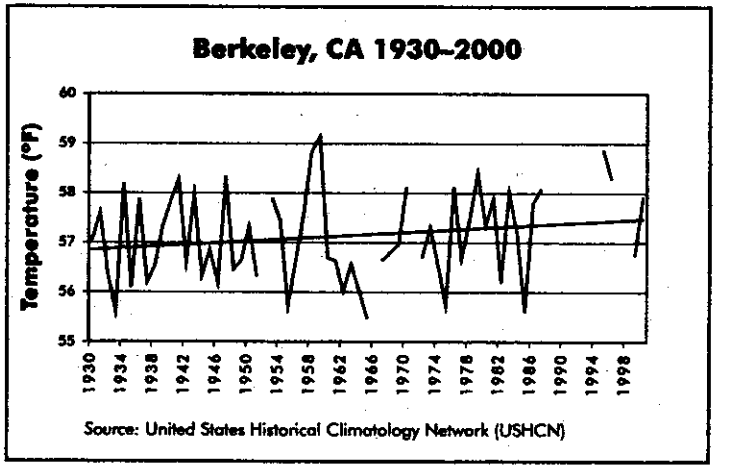
§ http://news.bbc.co.uk/1/hi/in_depth/sci_tech/2002/leicester_2002/2253636.stm. The BBC gives no scientific reference for the eight-degree claim.



a record of the average temperature for Pasadena since 1930."*




"As you see," Jennifer said, "a dramatic rise in temperature. And here is Berkeley since 1930."

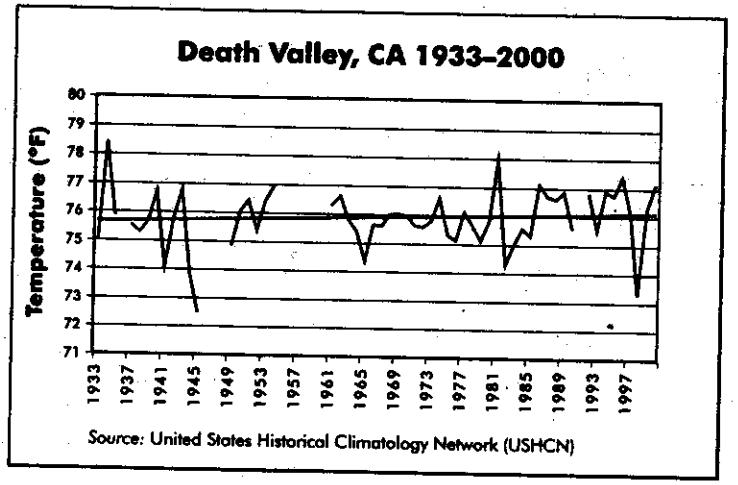



"A surprisingly incomplete record. But we are using raw data, so you can see missing years. And you see a clear warming trend. Indisputable, wouldn't you agree?"

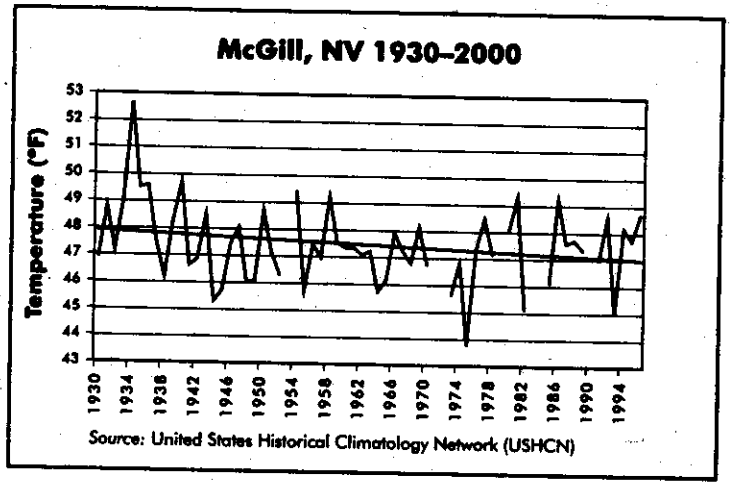
* LA population is 14,531,000; Berkeley is 6,250,000; New York is 19,345,000.

"I would," Evans said, thinking that it wasn't much of a trend—less than a degree.

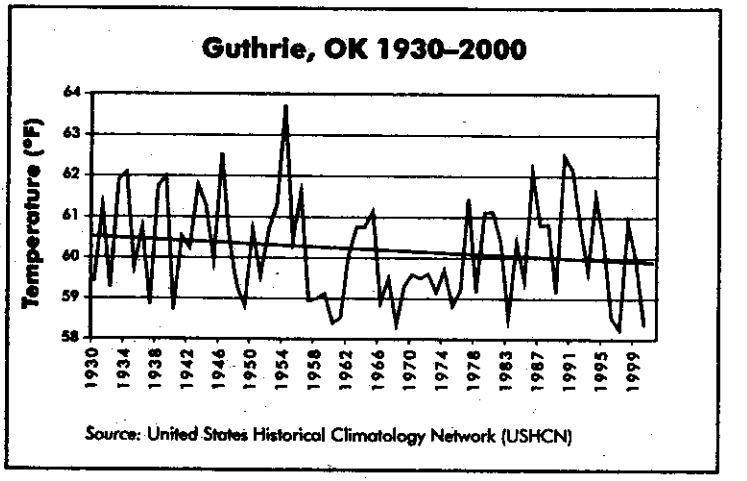
"Now, here is Death Valley, one of the hottest, driest places on Earth. No urbanization has occurred here. Again, missing years."



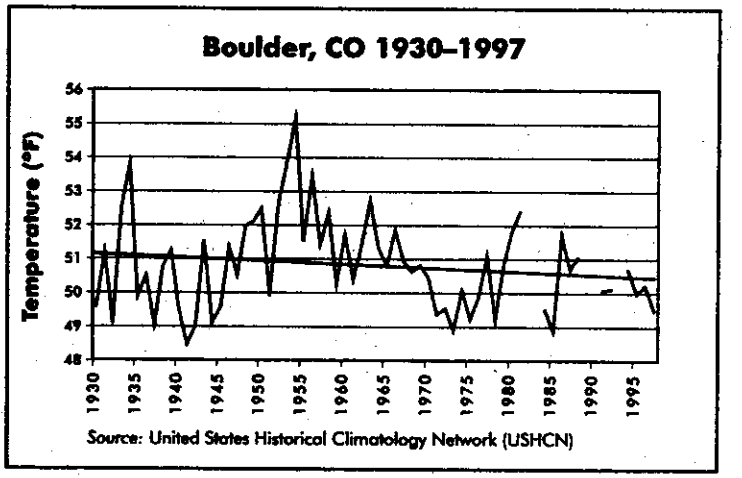

Evans said nothing. It must be an anomaly, he thought. Jennifer put up more graphs:



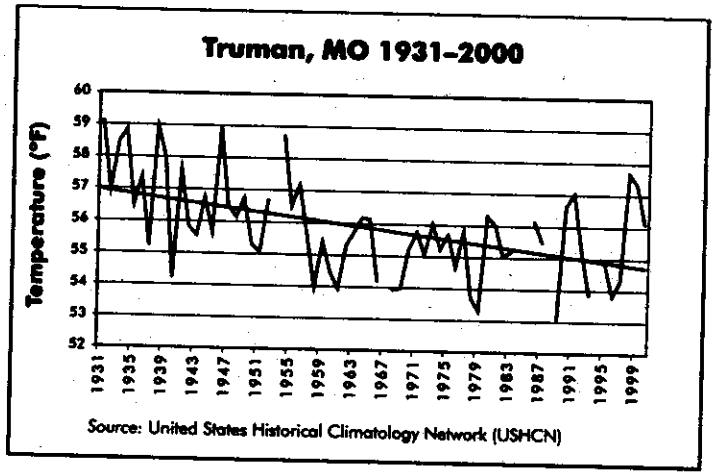


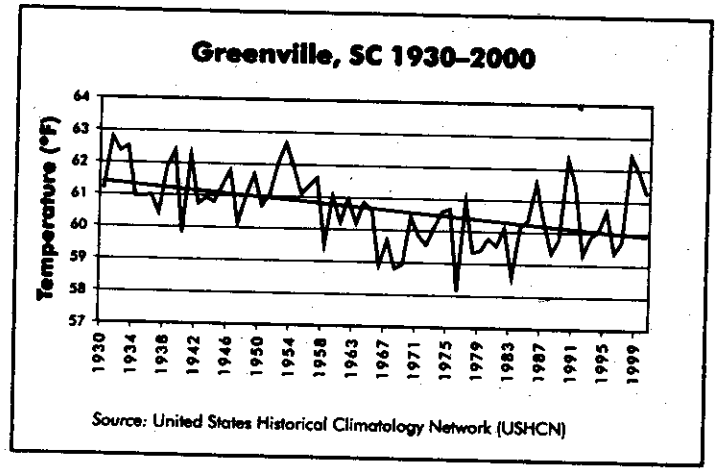



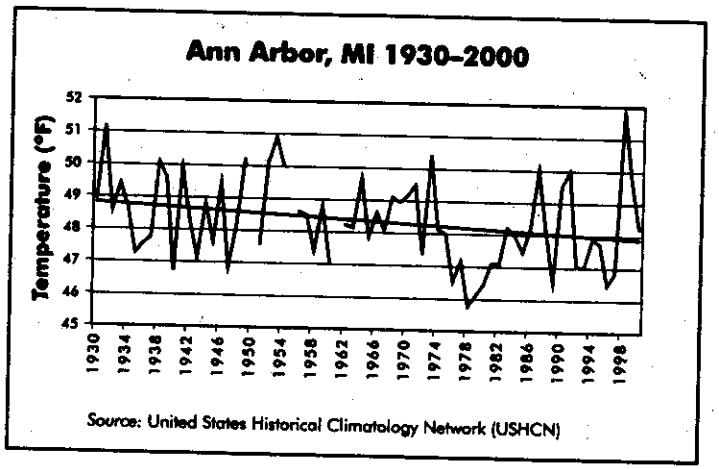

"These are stations from the Nevada desert and the Oklahoma plains," she said. "They show temperatures that are flat, or declining. And not only rural areas. Here is Boulder, Colorado. It's only of interest because NCAR is located there—the National Center for Atmospheric Research, where so much global warming research is done."




"Here are some more small cities. Truman, Missouri, where the buck stops . . ."



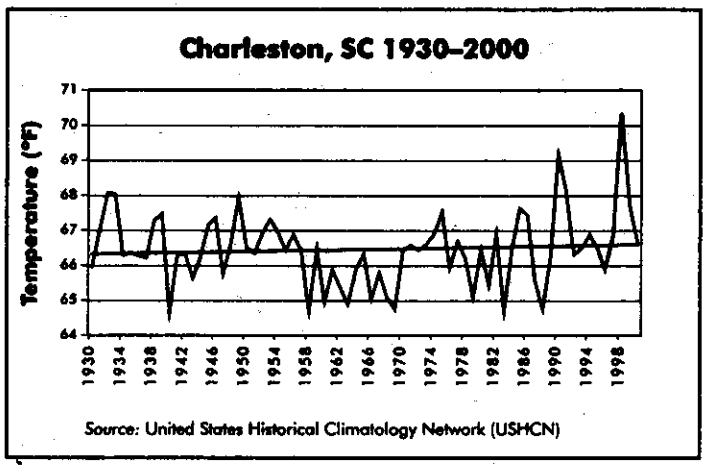



Evans said, "You have to admit, it's not very dramatic."

"I'm not sure what you consider dramatic. Truman has gotten colder by 2.5 degrees, Greenville by 1.5 degrees, Ann Arbor by one degree since 1930. If the globe is warming, these places have been left out."

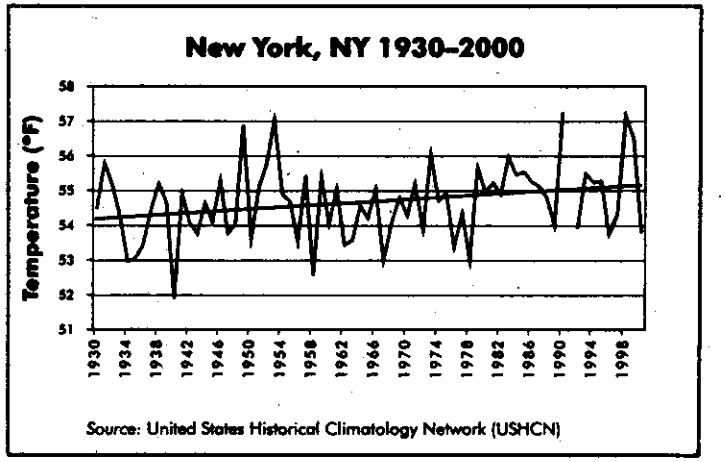
"Let's look at some bigger places," Evans said, "like Charleston."

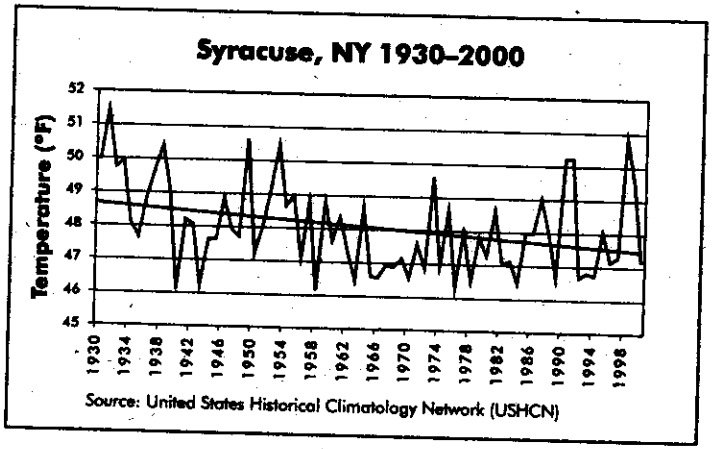
"I have Charleston." She thumbed through her graphs.

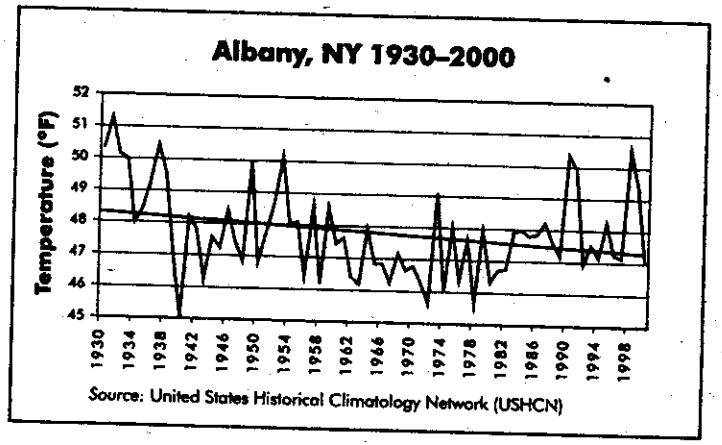


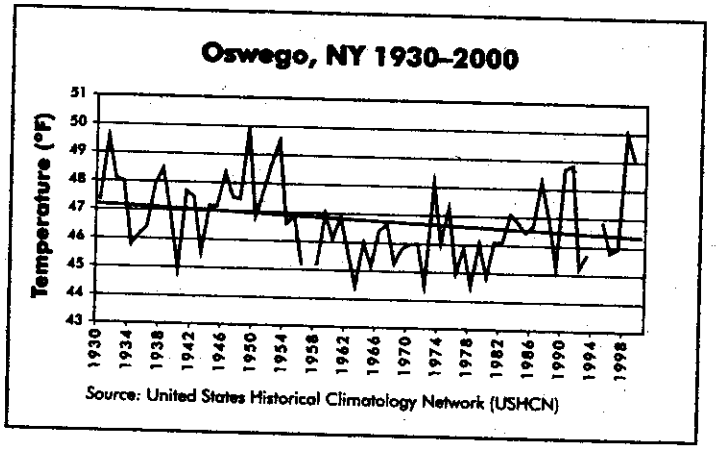

Evans said, "So, a bigger city gets warmer. What about New York?"

"I have several records from New York, city and state."








"As you see," Jennifer said, "New York City is warmer, but many other parts of the state, from Oswego to Albany, have become colder since 1930."

Evans was acutely aware of the cameras on him. He nodded in what he hoped was a judicious, thoughtful manner and said, "And where does this data come from?"

"From the Historical Climatology Network data set," she said. "It's a government data set, maintained at Oak Ridge National Laboratories."

"Well, it's quite interesting. But, I'd like to see the data from Europe and Asia. This is, after all, a global phenomenon."

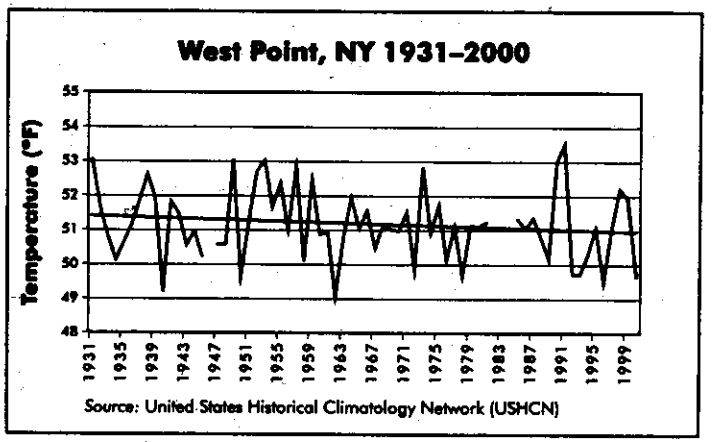
"Certainly," Jennifer said. She, too, was playing to the cameras. "But before we do that, I'd like your reaction to the data so far. As you can see, many places in the United States do not seem to have become warmer since 1930."

"I'm sure you cherry-picked your data," Evans said.

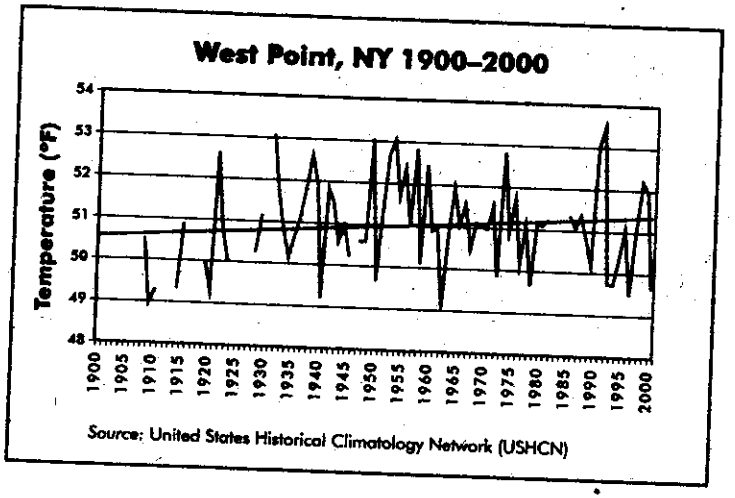
"To some degree. As we can be sure the defense will do."

"But the results do not surprise me," Evans said. "Weather varies locally. It always has and always will." A thought occurred to him. "By the way, why are all these graphs since 1930? Temperature records go much further back than that."

"Your point is well taken," Jennifer said. "It definitely makes a difference how far back you go. For example, here is West Point, New York, from 1931 to 2000. Trending down."



"And here is West Point from 1900 to 2000. This time the trend is up, not down."




"Ah-ha," Evans said. "So you *were* massaging the data. You picked the interval of years that made you look good!"

"Absolutely," Jennifer said, nodding. "But the trick only works because temperatures in many parts of the US were warmer in the 1930s than they are today."

"It's still a trick."

"Yes, it is. The defense will not miss the opportunity to show the jury numerous examples of this trick from environmental fund-raising literature. Selecting specific years that appear to show things are getting worse."

Evans registered her insult to environmental groups. "In that case," he said, "let's not permit any tricks at all. Use the full and complete temperature record. How far back does it go?"

"At West Point, back to 1826."

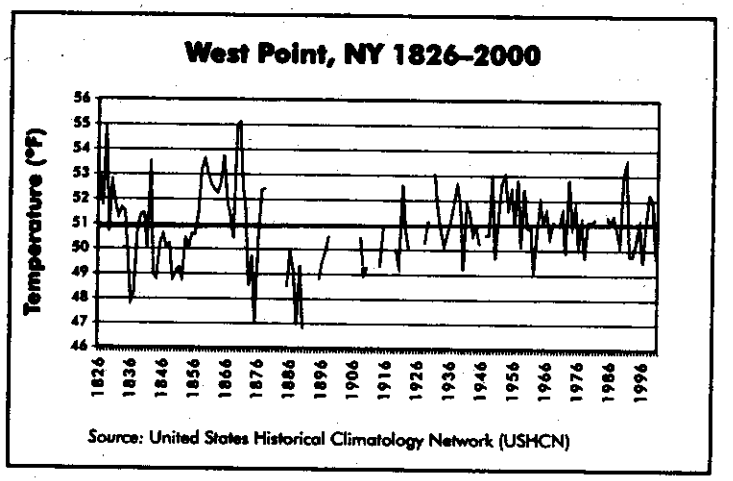
"Okay. Then suppose you use that?" Evans felt confident proposing this, because it was well known that a worldwide warming trend had begun at about 1850. Every place in the world had gotten warmer since then, and the graph from West Point would reflect that.



Jennifer seemed to know it too, because she suddenly appeared very hesitant, turning away, thumbing through her stack of graphs, frowning as if she couldn't find it.

"You don't have that particular graph, do you?" he said.

"No, no. Believe me, I have it. Yes. Here." And then she pulled it out:




Evans took one look and saw that she had sandbagged him.

"As you predicted, this graph is quite telling," she said. "For the last one hundred seventy-four years, there has been no change in the average temperature at West Point. It was 51 degrees Fahrenheit in 1826, and it is 51 degrees in 2000."

"But that's just one record," Evans said, recovering quickly. "One of many. One of hundreds. Thousands."

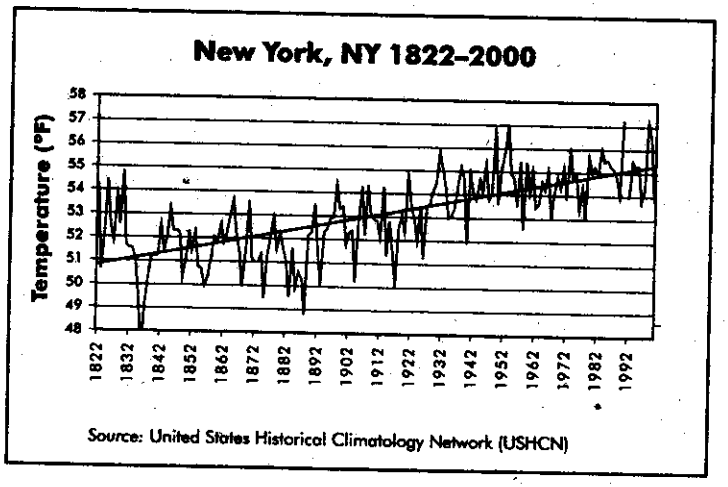
"You're saying that other records will show other trends?"

"I'm sure they will. Especially using the *full* record from 1826."

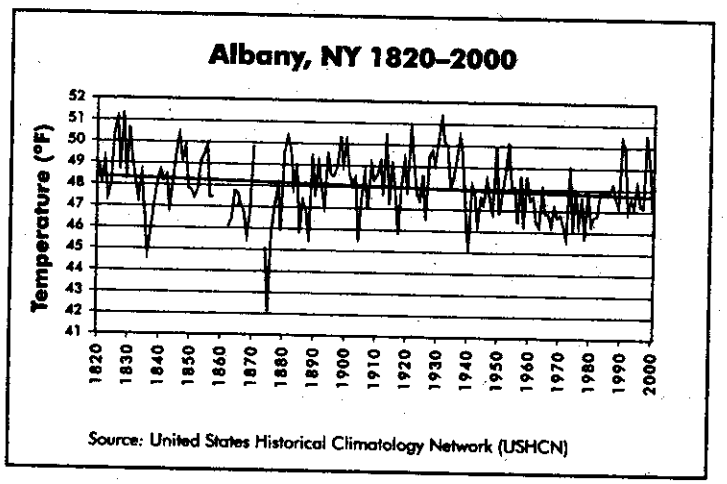
"And you are correct," she said. "Different records do show different trends."

Evans sat back, satisfied with himself. Hands crossed over his chest.

"New York City, a rise of 5 degrees Fahrenheit in a hundred seventy-eight years," she said.




"Albany, a decline of half a degree in a hundred eighty years."




Evans shrugged. "Local variations, as I said before."

"But I wonder," Jennifer said, "how these local variations



fit into a theory of *global* warming. As I understand it, global warming is caused by an increase in so-called greenhouse gases, such as carbon dioxide, that trap heat in the Earth's atmosphere and prevent it from escaping into space. Is that your understanding?"

"Yes," Evans said, grateful he did not have to summon a definition on his own.

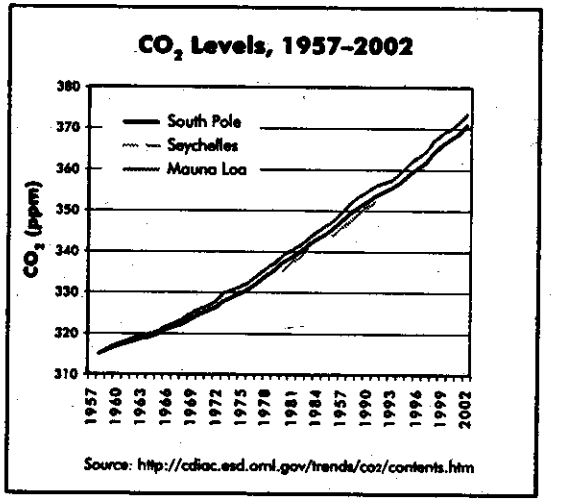
"So, according to the theory," Jennifer said, "the atmosphere itself gets warmer, just as it would inside a greenhouse?"

"Yes."

"And these greenhouse gases affect the entire planet."

"Yes."

"And we know that carbon dioxide—the gas we all worry about—has increased the same amount everywhere in the world . . ." She pulled out another graph:*




* South Pole, Mauna Loa: C. D. Keeling, T. P. Whorf, and the Carbon Dioxide Research Group, Scripps Institute of Oceanography (SIO), University of California, La Jolla, CA 92093, U.S.A.; Seychelles: Thomas J. Conway, Pieter Tans, Lee S. Waterman, National Oceanic and Atmospheric Administration, Climate Monitoring and Diagnostics Laboratory, 325 Broadway, Boulder CO 80303. See http://cdiac.esd.ornl.gov/trends/co2/contents.htm.

"Yes . . ."

"And its effect is presumably the same everywhere in the world. That's why it's called *global* warming."

"Yes . . ."

"But New York and Albany are only a hundred forty miles apart. You can drive between them in three hours. Their carbon dioxide levels are identical. Yet one got a lot warmer and the other got slightly colder. Is that evidence for *global* warming?"

"Weather is local," Evans said. "Some places are warmer or colder than others. And always will be."

"But we are talking about climate, not weather. Climate is weather over a long time period."

"Yes . . ."

"So I would agree with you if both locations got warmer, albeit by different amounts. But here, one got warmer and one got colder. And as we saw, West Point—which is midway between them—remained unchanged."

Evans said, "I think the theory of global warming predicts that some places will get colder."

"Really? Why is that?"

"I'm not sure, but I read it somewhere."

"The Earth's entire atmosphere warms, and as a result some places get colder?"

"I believe so."

"As you think about it now, does that claim make sense to you?"

"No," Evans said, "but you know, climate is a complex system."

"Which means what, to you?"

"It means it's, uh, complicated. It doesn't always behave the way you think it will."

"That's certainly true," Jennifer said. "But going back to New York and Albany. The fact that these two locations are so close, yet their temperature records are so different,



could lead a jury to wonder whether we're really measuring something other than a *global* effect. You would agree that in the last hundred eighty-five years, New York has grown to a city of eight million, whereas Albany has grown much less?"

"Yes," Evans said.

"And we know that the urban heat island effect makes cities hotter than the surrounding countryside."

"Yes . . ."

"And this urban heat effect is a local effect, unrelated to global warming?"

"Yes . . ."

"So, tell me: how do you know that the dramatic increase in temperature in New York is caused by global warming, and not just from an excess of concrete and skyscrapers?"

"Well." Evans hesitated. "I don't know the answer to that. But I assume it is known."

"Because if cities like New York become larger and hotter than they were before, they will raise the average global temperature, will they not?"

"I assume they will."

"In which case, as cities expand all around the world, we might see an increase in average ground temperature simply because of urbanization. Without any global atmospheric effect at all."

"I am sure the scientists have thought of that already," Evans said. "I'm sure they can answer that."

"Yes, they can. Their answer is that they have subtracted a factor from the raw data to compensate for the urban heat effect."

"Well, there you are."

"Excuse me? Mr. Evans, you're a lawyer. Surely you are aware of the extraordinary efforts that are made in a lawsuit to be certain the evidence is untainted."

"Yes, but—"

"You don't want anybody to be able to change it."

"Yes . . ."

"But in this case, the evidence is the raw temperature data. And it is tainted by the very scientists who claim global warming is a worldwide crisis."

"Tainted? It's adjusted *downward.*"

"But the question the defense will ask is, have they adjusted downward *enough?*"

"I don't know," Evans said, "this is getting very specialized and nitpicky."

"Hardly. It's a core issue. Urbanization versus greenhouse gases as the cause of the increased average surface temperature. And the defense will have a good argument on their side," Jennifer said. "As I said before, several recent studies suggest the reduction for urban bias has, in fact, been too small.* At least one study suggests that half of the observed temperature change comes from land use alone. If that's true, then global warming in the past century is less than three tenths of a degree. Not exactly a crisis."

Evans said nothing. He tried to look intelligent for the cameras.

"Of course," Jennifer continued, "that study can be debated, too. But the point remains: as soon as anybody adjusts the data, they open themselves to the claim that their adjustment was incorrect. That's better ground for the defense. And the larger point the defense will make is that we have allowed the data to be adjusted by the very people who have the most to gain from that adjustment."

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* For a summary, see Ian G. McKendry, 2003, "Applied climatology," *Progress in Physical Geography* 27, 4:597–606. "Recent studies suggest that attempts to remove the 'urban bias' from long-term climate records (and hence identify the magnitude of the enhanced greenhouse effect) may be overly simplistic."