

**I Only Wanted to Be a Weather Forecaster:
A Cloud and Weather-Centric, “C” and “D” Student’s
Improbable Journey through Science¹**

By Art Rangno¹

¹ Bachelor of Arts Degree, Meteorology, 1969, San José State College, San Jose, California; Retiree, Research Scientist IV, Cloud and Aerosol Research Group, Atmos. Sci. Dept., University of Washington, 1976-1985 and 1987-2006. Co-recipient with Prof. Peter V. Hobbs of a monetary award for research in weather modification adjudicated by the United Nations' World Meteorological Organization.

Dedications

My life would not have happened the way it did without a mom who encouraged me so much as a little kid. I got interested in the odd subject of clouds and weather when I was just six years old. She took me to a nautical instruments store, Pan American Navigation, in North Hollywood, CA, and bought me books on weather, a rain gauge, and even an aneroid barometer from my parents' meager salaries. Mom also had a strong sense of what was right and wrong. If the car wasn't fixed right, *she* was the one that took it back and got it fixed right. Thanks, Mom, for all you did, and who you were! You really helped make me into who I turned out to be. (My dad was only interested in my baseball achievements...)

I had two elementary school teachers, Mr. Borders in the 4th grade, and Mr. de la Gega in the 5th, at Bertrand Elementary School in Reseda that also had interests in weather who were critical in sustaining my interest.

I also want to mention the Cub Scouts and their Merit Badge series because my troop had one with excerpts from the 1941 George Ripley Stewart book, "Storm", one that ends a drought in California. That helped cement my weather interest, too.

Selected quotes from a career steeped in controversy and "disparate impact:"

The source for each of these quotes follows.

1. *"I think you should give up the idea of becoming a meteorologist and write about weather instead."*
2. *"You seem to have a genius for finding surprising and perhaps unwelcome discoveries."*
3. *"Art, your name kept coming up as I spoke with many qualified scientists around the country. I hope you can shed light on this subject (cloud seeding) for me. I have gained great respect for you based off what many of your peers have to say about you."*
4. *"I may say that your (journal) comments had a tremendous impact on the cloud seeding activities in Israel."*
5. *"The reviewers are still unconvinced by these controversial claims."*
6. *"(Your discovery) ...was an embarrassment to the airborne research community."*
7. *"I think you're arrogant for thinking that you know more about the clouds of Israel than those who study them in their backyard."*
8. *"Who do you think you are, the Messiah, come to expose the liars? Did Hobbs send you?" followed by, "Leave my office, do your own thing, and don't come back."*
9. *"We don't hate you, Art, but we don't love you either."*
10. *"There is a widespread perception of a personal vendetta out there."*
11. *"I think they (your peers) see you as a kind of gadfly."*
(Merriam-Webster gadfly definition: **"a cattle-biting fly,"** or an **"irritating harassing person"**).

12. *"You WILL die of most malignant and fast-growing tumor. In 11 month (sic) sharp. Just wait, you fucking rascal²."*
13. *"I hate to tell you Art but you are thought of on the Wx (weather) street as a whacko sceptic (sic). I was told that by several scientists that we both know personally. So, you are not called upon to be a reviewer because they expect a biased review. In fact, many journals ask who you don't want to review the paper and guess who is first on the list?"*
14. *"You've become (along with Peter Hobbs) the most criticized author (in print) in the history of the American Meteorological Society".*
15. *"This certificate of Honorary Resident Skeptic (within the Bureau of Reclamation's seeding division) is hereby conferred upon Arthur Rangno who has shown himself to be worthy of being a respected member of the Loyal Order of Resident Skeptics (of cloud seeding claims) ."*
16. *"(Your experiment) is the way to prove cloud seeding."*
17. *"As one of the supporting letters said, 'Peter Hobbs and Arthur Rangno's research on weather modification set some much-needed higher standards in the science of weather modification that persist today. Their research in cloud physics and cloud dynamics were the pioneering works that many of us adopted in our research work in attempting to assess impacts of cloud seeding on precipitation reaching the ground.'"*
18. *"I really admired your careful analysis of the evidence."*
19. *"Do you have any more (journal) blockbusters coming? Those guys have gotta be stopped."*
20. *"Peter (Hobbs) stole that paper."*
21. In Hawaii: *"You're Art Rangno?!!"*

Oh, well, you can't please everybody.

1. Professor Joanne Malkus, January 1963 at UCLA's Department of Meteorology. Her sage advice came after I told her about my grades in calculus and physics in junior college. Joanne had just been named Los Angeles Times "Woman of the Year." I had hoped that I could get into their meteorology program due to extreme interest in weather rather than grades.
2. Dr. S. C. Mossop, cloud physicist, co-discoverer of the Hallett-Mossop riming-splintering ice particle mechanism, Commonwealth Scientific and Industrial Research Organization, Sydney, Australia, February 10, 1986, personal communication to me in Israel.
3. Billy Tiller, a west Texas farmer in emails, September 5, and September 14, 2002, respectively. His farm was in a county that was considering cloud seeding to alleviate drought. He wrote that he had gotten responses to his cloud seeding question from 130 out of 160 universities he had contacted. He did not

² Perhaps when you comment publicly on an issue and receive a death threat it's a measure that you are perceived to have great impact?

mention how many times my name came up, only “often.” He asked me to write an editorial about cloud seeding in his local paper, the Lubbock Avalanche Herald.

4. Professor Yair Goldreich, Professor (Emeritus), Department of Geography and Environment, Bar-Ilan University, Ramat-Gan, Israel; author of “*The Climate of Israel*,” in a June 11, 2018, email. Goldreich was referring to the Rangno and Hobbs (1995, *J. Appl. Meteor.*) article reanalyzing the first two Israeli cloud seeding experiments and the many journal-published “Comments” and the “Replies” to those comments by me and Prof. Hobbs that came afterward in 1997.

5. Dr. Bernard A. Silverman, Editor, of the *J. Appl. Meteor.*, in his 1982 letter informing Professor Peter Hobbs that our revised paper had been rejected by reviewers for a 2nd time. The manuscript, Rangno and Hobbs, concluded that the Douglas B-23 aircraft used by Peter Hobbs’ group had produced ice while flying in droplet clouds at -10°C. A third version was accepted in 1982 and the effect confirmed by independent researchers eight years later after a considerable period of denial that an aircraft could create ice at this relatively high in-cloud temperature.

6. Professor John Hallett, Desert Research Institute, University of Nevada, Reno, co-discoverer of the Hallett-Mossop riming-splintering ice particle process with S. C. Mossop, stated at the January 2008 New Orleans Peter Hobbs Symposium Day concerning the Rangno and Hobbs finding that an aircraft can produce ice in clouds at temperatures as high as -10°C. This finding cast a shadow of doubt on all prior airborne studies when a cloud was sampled more than once, particularly by a prop aircraft.

7. Professor Peter V. Hobbs, Director, Cloud and Aerosol Research Group, Atmospheric Sciences Department, University of Washington, in a verbal appraisal in his office before I boarded a plane going to Israel for my self-funded cloud investigation of the reported super “ripe for cloud seeding” clouds. I came to believe that the clouds, as described by Hebrew University of Jerusalem (HUJ) cloud seeding experimenters were mythical after plotting soundings when it was raining at the launch site.

8. Professor Avraham “Abe” Gaglin, leader of the benchmark Israeli cloud seeding experiments, in his HUJ satellite office, January 15, 1986. Professor Gaglin asked me what I had discovered about the clouds of Israel after the first week of storms during my visit. What I told him contradicted *everything* he had published about them. His response was understandable. And, no, Hobbs did **NOT** send me!

9. Professor Lewis O. Grant, Department of Atmospheric Sciences, Colorado State University (CSU), and leader of the benchmark Climax, CO, cloud seeding experiments, June 1984, at the Park City weather modification conference. I had asked for an investigation of the reporting of the Climax experiments in October 1983 by CSU, National Academy of Sciences, and the American Meteorological Society. Then, at Park City in 1984, I was in “the kitchen.”

10. Dr. L. Randall Koenig, 1995, Editor, *J. Appl. Meteor.*, in a telecon during the process of publishing “Comments” by Paul Mielke, Jr. and K. Ruben Gabriel on a 1993 *J. Appl. Meteor.* article by me and Hobbs pointing out for the 3rd time more faults and barriers to cloud seeding effectiveness and improper conduct of the Climax, CO, cloud seeding experiments, e.g., the experimenters had not drawn random decisions when they said they would.

11. Dr. William A. “Al” Cooper, Atmospheric Scientist, and cloud seeding specialist, National Center for Atmospheric Research, 1992, after I asked him on how he thought I was seen by the weather modification community.

12. Foretold by a Texas resident named “Mark Portnoy,” in an email, September 4, 2002, the evening before my editorial on cloud seeding appeared in the Lubbock Avalanche Journal newspaper. What he predicted happened 11 months later in August 2003 except for the death part. The editorial had been requested by a Texas farmer, Billy Tiller who questioned cloud seeding for his county.

13. Professor William R. Cotton, Emeritus, Department of Atmospheric Sciences, Colorado State University, October 30th, 2024, in an email following his attendance at an American Meteorological Society conference. Prof. Cotton and those he spoke to apparently do not understand the purpose of peer-review of journal manuscripts. Manuscripts must pass muster with the most knowledgeable in the field.

14. K. Wilson, Technical Editor, Amer. Meteor. Soc., 1996, in a telecon prior to publication in 1997 of a record number of pages of comments/criticisms of my 1995 paper with Prof. Hobbs reanalyzing the first two Israeli randomized cloud seeding experiments.

15. Dr. Archie M. Kahan, Chief, Division of Atmospheric Water Resources Management of the Bureau of Reclamation, spring 1974, in an award “ceremony” hosted by Mr. Bill Douglas, Project Monitor for the Colorado River Basin Pilot Project. I had questioned in correspondence to the BuRec their ludicrous claims about the effect of left over silver iodide on a following randomly selected control day. In that correspondence, I stated that the BuRec needed a “resident skeptic,” and got the job! Haha.

16. Dr. Vincent Schaefer, Professor Emeritus, Albany University, NY, and discoverer of the modern method of cloud seeding, in a hand-written note to Peter Hobbs, October 1981. His letter followed the *Science* magazine published seeding experiment (Hobbs et al. 1981) that yours truly had suggested to Prof. Hobbs and Prof. Radke, which was to use our vertically pointed Ka-band radar as a seeding target after I saw virga go over it and realized it could be a seeding plume! (However, Peter Hobbs did not credit me with that idea in the article. I was the flight director in those experiments but was not asked to analyze the results.)

17. An excerpt from the World Meteorological Organization (WMO) certificate awarded to Prof. Hobbs and me in 2005. A monetary prize of \$20,000 was also awarded to us. However, that was the least of those sums awarded to prize winners and was, thus, somewhat of a consolation prize despite all the work that Hobbs’ group and I had done. The prize money was funded by the United Arab Emirates and the awards adjudicated by the WMO.

18. Professor Roddy Rogers, Professor of Atmospheric Science, McGill University, Toronto, Canada, June 22, 1979, regarding the publication of, “A Reanalysis of the Wolf Creek Pass Cloud Seeding Experiment,” in the *J. Appl. Meteor.* Rogers was a co-author of the book, “A Short Course in Cloud Microphysics.”

19. Prof. Richard Reed, Professor of Atmospheric Sciences, University of Washington, and former President of the American Meteorological Society, in a stairwell encounter at the University of Washington after my “Reanalysis of the Wolf Creek Pass Experiment” appeared as the lead article in the May 1979 issue of the *J. Appl. Meteor.*

20. Prof. Larry Radke, of Peter Hobbs’ Group, 1978, when the “Reanalysis of the Skagit Project” was published in the *J. Appl. Meteor.* as “Hobbs and Rangno 1978.” It had been submitted AFTER the “Reanalysis of the Wolf Creek Pass Experiment” manuscript had been, but was published first. I had

done what lead authors do on that paper; initiated the study, analyzed the data, wrote up the results. Hence, Larry Radke's comment about the author sequence. This was not an uncommon occurrence in Prof. Hobbs group.

21. A couple in a MacDonalds restaurant near Diamond Head, Hawaii, erupted with that comment after I gave my name (for some reason) before asking them a question about the local bus schedule. Tom Wilson, our software engineer, and I were looking to see if anyone knew the local bus schedule after walking down the highway from Diamond Head toward our hotel for a couple of miles. The couple was apparently referring to my weather forecasting days on Seattle's KUOW-FM during NPR's Weekend Edition. But I had not forecasted on that program since the fall of 1992! The University of Washington's Cloud and Aerosol Group had a layover in Honolulu on our way to Kwajalein Atoll in the Marshall Islands as part of the KWAJEX scientific field study of tropical Cumulus clouds. What an incredible, unexpected moment that was!

It was a ludicrous claim. But I had become convinced in that those successes were mirages.

This newspaper article made it all the way to the National Science Foundation, who then queried the CSU cloud seeding scientists, "What's going on?" Within two years, the CSU scientists themselves were starting to retract their claims of success at Climax, CO, behind the scenes.

But that was not to be the end of the story.

I eventually did reanalyze all their work on my own time over the 20 years that followed that newspaper article, as I had said I would. I sacrificed savings and a personal life in doing so. My activist background at San Jose State College told me I had to do something.

My experiences in Durango with the Colorado River Basin Pilot Project, where I saw false claims in a journal article describing cloud seeding successes, led to a lifetime of investigating such claims. Prior to the CRBPP, peer-reviewed journal articles to me were like the contents of the Bible to devotees; true and infallible. I never got over the journal corruption I saw in Durango, though I did nothing about it at the time.

I began to think, too, that nothing might be true about a cloud seeding success reported in a journal article, never mind that it was peer-reviewed one. As you will read in "my story," it was a fruitful perception.

I challenged the work of scientists deemed the best in the world in cloud seeding and exposed their journal errors and falsehoods in my own peer-reviewed journal publications reanalyzing their works. This would not have happened without the support of the director of the airborne research group I worked in at the University of Washington, Professor Peter V. Hobbs who organizational and editorial skills greatly improved the drafts of findings that I brought to him.

But Professor Hobbs, too, had passed favorable judgement on the experiments I was to overturn before I arrived in his group in 1976 which may have led to some problems between us.

I refer to the journal problems I encountered as "The Dark Side of Science³" and "The Lab Chief Syndrome," the latter label referring to some of the inappropriate authorship acts that Professor Hobbs did concerning my work (and those of others).

This story will include some brief personal stuff, some sophomoric tongue-in-cheek humor, as is my want.

The order is more or less chronological and contains appendices: Appendix I, concerning technical aspects of this story with links to relevant publications. Appendix II consists of growing up weather and cloud manic "benchmarks" Appendix III, some summer, mostly baseball anecdotes, like how in a 1960 game at Long Beach, Blair Stadium in front of 500 fans and scouts against the hated L. A. Dodger Rookies, I got two key hits, including one in the 10th inning that sent in the winning run and my team, having no one good enough on it for the Dodger Rookies, beat them that night. I still revel in that night! Yeah, the "Glory Days", so important in one's life that Bruce Springsteen himself even sang about them!

☺

³ The name of a American Association for the Advancement of Science conference on fraud in 1989.

Yeah, I played baseball almost my whole life, even becoming a batting practice pitcher for a major league (?) team, the Seattle Mariners in the early 1980s. Some guys whiffed on my deliveries like, Gaylord Perry and Al Cowens⁴.

Every so often I link to what I think is appropriate music for the topic, like me in the cloud seeding China shop where everything is fragile, "[Nothing but Trouble](#)" by The Lazys. "Enjoy." (For some further insight, I never get tired of this song!)

My Grades Are What Makes this Journey So Improbable

My "D" grades at Reseda High School were emblematic of all the ones that populated so much of my academic life from middle school through my several years at Los Angeles Pierce Junior College, 1959-1966.

Last Name		First Name		Middle Name		Grade		Home Room		
RANGNO		ARTHUR		LOUIS		B11		A.35		
Reseda High School					Date		11-15-57		Advisee or Home Room Teacher	
Los Angeles City High School District					Quarter Ending					

SUBJECTS	SUBJECT GRADE LEVEL	SEMESTER PERIOD CREDITS	QUARTER MARKS					TEACHERS' SIGNATURES
			MARKS IN SUBJECTS	WORK HABITS	COOPERATION	TIMES ABSENT	TIMES TARDY	
GEOMETRY	2		D-	S	E	5	-	John
AMER. LIT	1	5	C	S	E	6	0	John
CHEMISTRY	1		D	U	S	5	0	Malessi
SPANISH	4	5	D	W	S	3	-	Wm B. Kuwana
U.S. HISTORY	1	5	B	S	E	5	0	John
FOOTBALL (J.V.)		5	A	E	E	5	0	H. M. John L. J.
HOMEROOM								

EXPLANATION OF MARKS		Your signature indicates that you have reviewed this progress report.  Signature of Parent or Guardian
Subjects	Work Habits and Cooperation	
A Superior	E Excellent	
B Better than average	S Satisfactory	
C Average	U Unsatisfactory	
D Barely passing		
Fail Failure		

Thus, the message I want to give in my story is that you must keep trying to reach your goal even if you fail at first, as I did. From a fellow scientist, astronomer, Fusa Miyake, Nagoya University, the 2012 graduate student discoverer of immense solar storms that now bear her name, "[Miyake Events](#)." Oh, in passing, a Miyake solar storm would end civilization as we know it. Fusa Miyake wrote this:

⁴ Al Cowens had a horrible year in 1983 when I pitched BP. Hit only 0.210. But in 1984, after I was let go by Del Crandall on the first day of the season, Cowens rebounded, hitting over 0.300. In a 1984 Seattle Times sports column about his rebound, he recounted how in 1983, "I couldn't even hit batting practice." Yeah, that was me. He broke his bat on one my deliveries, too. (I felt SO BAD!)

"I was bad at physics and math when I was a high school student, but I persevered so I could study astronomy. Even if there is something you do not do particularly well, it is important to keep trying your best and to pursue your interests."

That's it. You can stop reading here. The rest is "blah, blah, blah" on a sometimes difficult and disillusioning journey in science; with some cry-babbling here and there. And who wants to hear about disillusionment with science?

Oh, and thanks, Fusa. I'm now afraid of the sun.

After reading the disparate quotes at the start of this piece, you'll realize that my under-credentialed status (no advanced degree) and roiling the field I entered was a problem for many of my faculty and Ph. D. peers. Their problem and mine was perfectly described by Douglas Adams in his late 1970s NPR sci-fi radio comedy, *"A Hitchhiker's Guide to the Galaxy"*. Adams's narrator:

"It startled him (a graduate student) even more when just after he was awarded the Galactic Institute's Prize for Extreme Cleverness, he got lynched by a rampaging mob of respectable physicists who had finally realized that the one thing they really couldn't stand was a smart-ass."

The result of being a "smart-ass" was that my peers have not cited my work when it should have been, a demonstration of the "human side" of science which we like to pretend doesn't exist.

But I wasn't a "smart-ass!"

I just did what reviewers of manuscripts should have done in the first place. And, really, what I did was pick low hanging fruit that most anyone with a modicum of skepticism and my weather and cloud experience could have done.

So how did I get into this mess as someone who just wanted to forecast weather?

It all started with the Colorado River Basin Pilot Project (CRBPP), 1970-1975, conducted in SW Colorado. It is still the nation's most expensive, best planned randomized cloud seeding experiment. Dave Schultz, Professor of Atmospheric Sciences at the University of Manchester, and I have recently (2025) [published an account](#) of that experiment to correct many of the misleading and erroneous accounts still out there. Yep, after all these years... Oh, well. Better late than never.

And none of what I did was directed by my illustrious boss, Prof. Peter V. Hobbs. Our teamwork came together *after* I brought findings and drafts to him from home when I thought they were ready concerning cloud seeding reanalyses. It was the same regarding grant work. I presented Peter with drafts and findings when I thought they were ready for his expert perusal. All the conclusions I came up with concerning cloud seeding and the problem of how high ice particle concentrations in slightly supercooled clouds developed in them countered all the prevailing scientific consensus at the time. I think that's what makes this story have a bit more interest. And Peter Hobbs supported all those controversial findings! Thank you, Peter Hobbs.

No manuscripts by his staff and faculty were allowed to be sent to journals without Hobbs' perusal (this caused problems).

A pictograph of this journey: And it could be a candid one...

The Economist

CURRENT AFFAIRS • INTERNATIONAL • BUSINESS

Too many empty calories?

FREE Offer Inside!

- Sample 3 issues of The Economist
- Our Gift to You — *The Pocket World in Figures*
- Free Access to Web Edition
- Save 51% off the cover price

