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A Forecaster's Story: Robert H. Johns

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ABSTRACT

The stages in the life of a severe storms forecaster, Robert H. Johns, are reconstructed from information in a series of interviews with him. The traditional interview format, question-and-answer mode, has been converted to a first-person narrative that leads to a more continuous train of thought.

The storyline begins by describing Johns' entrainment into meteorology as a youngster. By virtue of his contact and conversations with farmers in rural Indiana, he became interested in weather's impact on the farmers and their crop yields. Early stimulation also came from a challenging weather project in the 6th grade and reading George Stewart's novel *Storm*. From these experiences, Bob Johns decided to pursue a science career in service to society. This service took the form of work as a weather forecaster for the United States Weather Bureau (USWB)/National Weather Service (NWS).

The arduous path to severe storms forecaster is traced by highlighting his youthful experiences, his academic training, and the stepwise progression from student trainee to lead forecaster at the Severe Local Storms (SELS) unit of the USWB/NWS.

1. Prologue

As if it happened yesterday, I (the author) remember the question asked of me just prior to my entry into graduate school to study meteorology: "John, so you're going to be a weather forecaster." To which I responded, "Well, by next summer I should probably be able to forecast." The university catalog indicated that a U. S. Weather Bureau office was on campus, and I thought this would give me the chance to mix academic training with forecasting. After a year of grappling with the conceptual framework that underpins weather forecasting, I realized that this was not my strong point. I immediately developed an admiration for those fellow students who could make an accurate prediction by pragmatically combining course work with experience and intuition.

From a larger perspective, the weather forecasting community has been a great source of help to theoreticians/modelers. Although the alliance between these groups has been and remains uneasy, the healthy contentious interplay between them is at the heart of much progress in meteorology. One of the most celebrated members of this society of weather forecasters is C. K. M. Douglas. Douglas served as an RAF (Royal Air Force) pilot during World War I, and at war's end, he began his career as a weather forecaster (Sutcliffe 1982). His forecasting skill was extolled by Sverre Petterssen, leader of the *Dunstable* weather group (British Central Forecasting Office) during World War II (Petterssen 1974). His forecast for D-Day was a pivotal contribution to Eisenhower's decision to

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invade Normandy[1]. Douglas had an encyclopedic mind when it came to recalling weather events: “His memory was so precise that he could, almost blindfolded, pull out of the bulky map files any weather situations that he had in mind” (Petterssen 1974, p. 186).

In an effort to understand and appreciate those skills that concertedly act to produce outstanding forecasters like Douglas, I've chosen to interview a subset of the forecasting community, SELS (Severe Local Storms) lead forecasters at the National Weather Service’s (NWS) Storm Prediction Center (SPC). They are recognized as members of the forecasting elite, along with the senior hurricane specialists at the Tropical Prediction Center. At each of these centers there have been five such forecasters at a given time.

We begin with an interview of Robert Henry Johns, a lead forecaster at SELS from 1979 - 1994. Subsequently, he served as Science and Operations Officer at the Storm Prediction Center (SPC) until his retirement in 2001. In Table 1 we have summarized Johns’ career in the form of a résumé.

The typical question-and-answer format for the interview has been converted to a first-person narrative, a dialogue similar to that used by Lawrence Ritter in his interviews with early twentieth century major league baseball players (Ritter 1966). Following the interview are vignettes from forecasters who served alongside Johns and the paper ends with an epilogue.

2. Interview (Robert H. Johns’ narrative)

a. Corn, rain and farmers

I was born in Lebanon, Indiana, in 1942, north of Indianapolis, but grew up in the small town of Terhune, in the northeast corner of Boone County, about 40 miles north of the Indianapolis airport [See Fig. 1][2]. My father ran the general store there, a town of about 60 residents — very small, two streets, we had a house in town and the store was on the west side, so the west side of the store faced open fields to the west [Fig. 2].

So it was easy to watch storms. I got interested in the weather actually through the farmers who would come into the store, shopping, some loafing, and talking about their rainfall. This was mostly cash grain, corn and soybean country, with a little bit of wheat and oats; some people had cows and pigs and fields of hay and alfalfa.

The primary concern of the farmers was whether they were getting enough rain or not — that was a constant discussion. There was that fine line where everything was perfect — and it didn't seem to last very long, just always a little too dry or a little too wet. Since it's the Corn Belt, and corn needs lots of rain, they needed rain all through the growing season (through the summer). So the farmers wouldn't want the rain while they were trying to plant, and after planting, they wanted it to rain at least once per week. Again, in the fall, they didn't want it to rain when they were harvesting, just during the growing season.

Starting in about the sixth grade, I worked in my dad's store. The farmers would come in and talk about the weather, and I got interested in the rainfall patterns. Every farmer had at least one rain gauge, although the exposures may not have been too good. Generally, they would always remember how much rain they had each day and I could get detailed reports from them. I also had my own rain gauge outside the store near the horseshoe pits [in the Commons shown in Fig. 3 (a) and (b)]. I had a tomato can that I could set on the flat spot next to the pit and I used two bricks, one on each side of the can, to keep it from blowing over. I then got my measurements with a ruler. I started these measurements when I was about twelve years old.

I'd notice storm clouds on the horizon to the west, and could sometimes use that to make a forecast. I remember telling some of the farmers that they could expect rain in a few hours — and, of course, there is a good chance when you have cumulonimbi to the west. One farmer, in particular, liked to bet me whether it was going to rain or not. He'd say, “bet you a Coke, Bob,” and sometimes I'd be right. It was a game we played.

[1] A summary of issues surrounding the weather forecasts for D-Day is found in Douglas (1952).

[2] Bracketed information, i.e., […] has been inserted by the author.

Table 1: Résumé of Robert Henry Johns.

Birthplace:	
1942	Born in Lebanon, Indiana
Education:	
1948 – 1960	Grade Schools, Boone County, IN Terhune Grade School (Grades 1 – 5) Marion Township School (Grades 6 – 8) High School, Hamilton County, IN Sheridan High School (Grades 9 – 12)
1960 – 1962	Purdue University
1963 – 1965	University of Oklahoma, B.S. (Meteorology)
Professional/Military Experience:	
1962 – 1964 (Summers)	Student Trainee (Meteorology)
1962-1963	United States Weather Bureau (USWB) Offices, Indianapolis, IN
1964	USWB Offices, Chicago, IL
1965-1966	Meteorologist, USWB, Ft. Wayne, IN
1966 – 1970	Officer, U.S. Coast and Geodetic Survey (USCGS)
1970	Retired from USCGS
1970	Meteorologist, USWB, Kansas City, MO
1971 – 2001 1971 – 1974 1974 – 1977 1977 – 1979 1979 – 1994 1994 – 2001	Meteorologist, USWB/NWS National Severe Storms Forecast Center (NSSFC), Kansas City, MO Storm Prediction Center (SPC), Kansas City, MO, and Norman, OK Meteorological Analyst Assistant Forecaster Aviation Forecaster Lead Forecaster Science and Operations Officer
2001	Retired

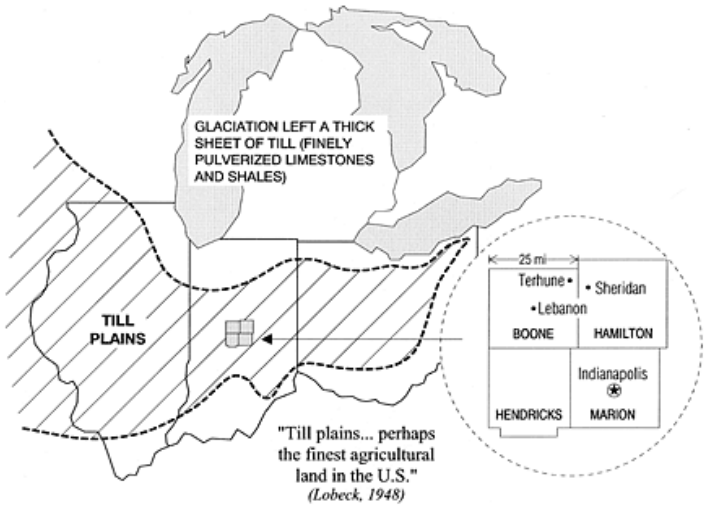


Figure 1: Delineation of the Till Plains: patterned after information in Lobeck (1948) that includes cities and counties in central Indiana that are referenced in the interview.

Figure 2: Aerial view of Terhune, IN, looking west. Monon Railroad (Indianapolis to Chicago Line) cuts across the section roads (ca. 1970). The grain elevator can be seen beyond the railroad tracks. Photo courtesy of R. Johns.

(a)

(b)

Figure 3: Views of Terhune from atop the grain elevator. The two views have the Chevrolet pickup truck as a common element. (a) The family store, owned by the International Order of Odd Fellows (IOOF) Lodge. (b) View of the Shell service station and the Commons, "used by all the townspeople for enjoyment — it was Indiana, hence the basketball court. Also note the horseshoe pit to the left of the court." (R. Johns, personal communication, 1997). Photo courtesy of R. Johns.

Figure 4: Robert Johns, at the extreme right of the second row, poses with his sixth-grade teacher, Mrs. Durr, and others in the class. Photo courtesy of R. Johns.

b. The sixth-grade science project and Storm

I had a natural interest in these rainfall patterns, but I was also inspired by my sixth grade teacher, Mrs. Durr [See Fig. 4]. Although I was not concentrating very well on learning in school by the time I was in the sixth grade, Mrs. Durr had a nice way of getting me to buckle down. We all had to choose a science project, and I decided to keep records of the weather. In addition to the rainfall records, we had a big Mail Pouch thermometer on the side of the store and I could read it morning and evening, put the data in my journal. It was an alcohol thermometer, 3 or 4 feet long. When the store was closed years later, I pulled that old thermometer off the side of the building and I still have it [See Fig. 5].

Figure 5: The Mail Pouch alcohol thermometer that Robert Johns used to make his temperature measurements. The thermometer housing measures 99 by 20 cm (39 by 8 in). Photo courtesy of R. Johns.

And then I would keep track of the clouds in my journal. It is a little hazy in Indiana, so I used these filtered glasses (lenses), something cheap I could buy at the drug store, to try to get a better view of the clouds. I didn't really know too much about what was going on, but I could recognize the changes in the clouds as the storms would approach. The project was to last 3 or 4 weeks, but mine just kept on going. I kept these weather records up to the time I went away to college [See Fig. 6].

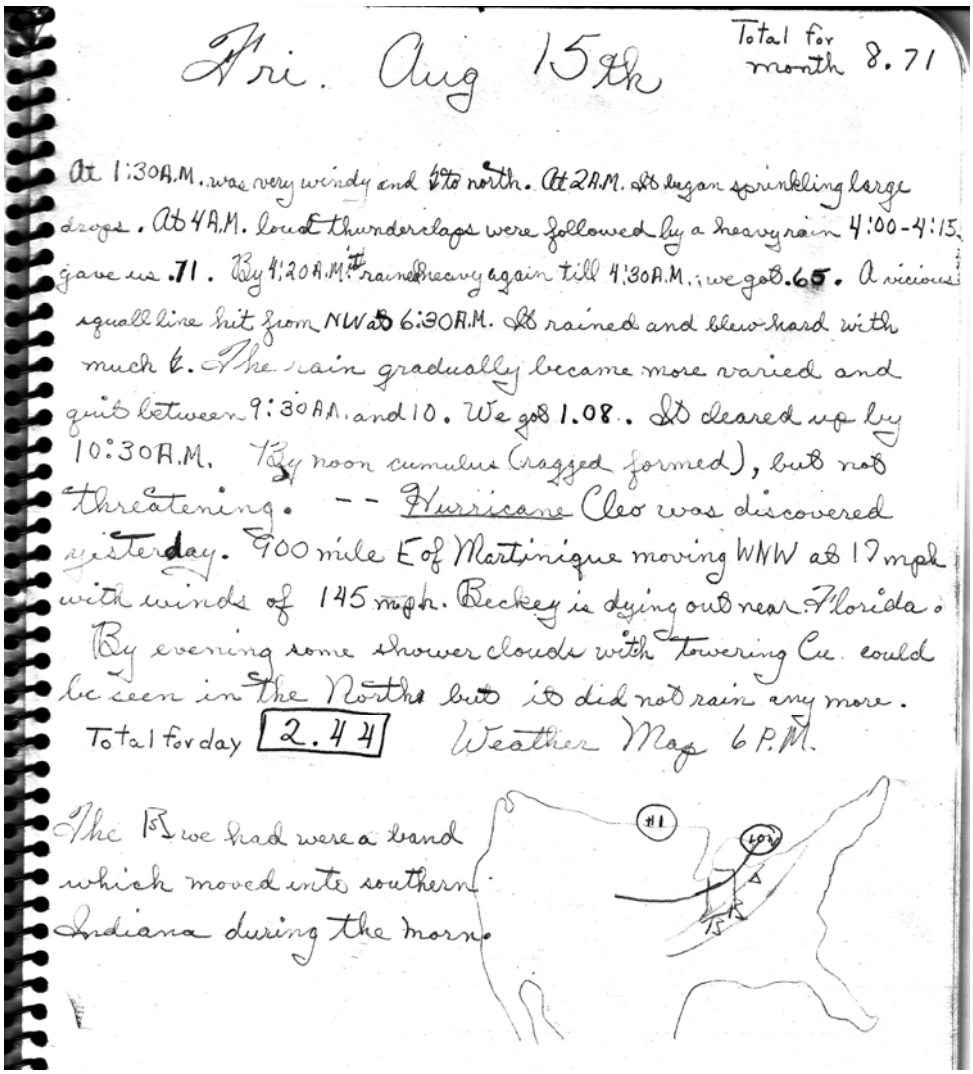


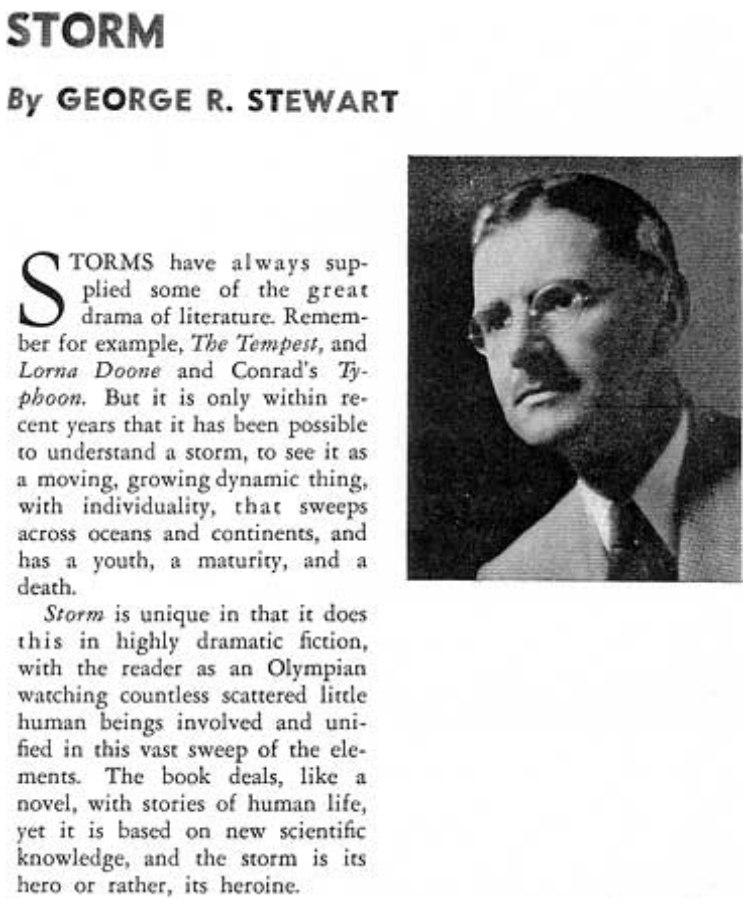
Figure 6: A page from Bob Johns' journal (from 1958).

So I started to talk to these farmers and would collect all the data and plot it on a map. I made my own maps, and it wasn't too much of a challenge because everything is flat there and they have section-line roads. I would draw the lines of constant rainfall. I think the thing I was fascinated with was the narrow bands of rainfall that would develop as the storms would pass. I was looking more at the climatology of it. I didn't really have anybody to talk to about it, and the library at school was pretty sparse — it consisted of 3 foot shelves that extended from the floor to the ceiling. I did find one book at the Sheridan Public Library that quite impressed me. It was a novel called *Storm* [Stewart, 1941; See Fig. 7].

It told about a junior meteorologist who was tracking a storm over the Pacific Ocean that was bearing down on the West Coast. I really liked all the details about how the storm was affecting various groups of people. This junior forecaster also gave all the storms a name. It was thrilling to read about weather.

c. The Indianapolis News and TV weather

I delivered the *Indianapolis News*, an evening paper, to people in town and to some farmhouses within a half-mile or so of Terhune. There was a weather chart in the paper, and I'd take the information off that chart and record it in spiral bound notebooks. I'd draw these maps of the United States in the notebook, and then transfer all the weather information from the newspaper to these maps. I could keep track of the movement of the weather systems that way.



STORM

By GEORGE R. STEWART

STORMS have always supplied some of the great drama of literature. Remember for example, *The Tempest*, and *Lorna Doone* and Conrad's *Typhoon*. But it is only within recent years that it has been possible to understand a storm, to see it as a moving, growing dynamic thing, with individuality, that sweeps across oceans and continents, and has a youth, a maturity, and a death.

Storm is unique in that it does this in highly dramatic fiction, with the reader as an Olympian watching countless scattered little human beings involved and unified in this vast sweep of the elements. The book deals, like a novel, with stories of human life, yet it is based on new scientific knowledge, and the storm is its hero or rather, its heroine.

Figure 7: A picture of George Stewart, author of *Storm*, with an excerpt from the article by Henry Canby in *Book-of-the-Month Club* (Canby 1941).

There was also another thing that helped. At that time, the 1950s, television was in its infancy. There was a weather show on one of the Indianapolis TV stations, at 6 and 10 p. m. It lasted about 10 minutes, and the weatherman's name was Bill Crawford. He was a dentist who got his weather training in the Air Force. He had an easel next to his chart, and he'd explain weather in simple terms that the layman could understand — situations like a warm front with freezing rain — and he'd flip the pages of that easel and draw with his marker. I wrote a letter to him telling him of my interest in weather. He answered me, but it was like a doctor writing — I could hardly read it. I learned a lot from him, some of the basics of weather.

d. Hurricane Audrey

Later in my life, my mom told me that Dad was really worried about my future. You see, I was so wrapped up in weather, and my dad, coming from a business background, didn't think these things should be a high priority. I guess I gave them reason for concern. In addition to running outside the store to watch the weather, it wasn't unusual for me to get up in the middle of the night to watch a storm. I'm sure I'd make noise (a door creaking or whatever), and Mom and Dad would hear me. I especially remember getting up throughout one night in June, 1957, when the remnants of Hurricane Audrey came through Indiana. It had hit the coast of Louisiana and killed a lot of people. There was a stalled front over central Indiana and in combination with the tropical air there was a tremendous amount of rain that fell that night (7 or 8 inches). I can remember getting up to find my rain gauge overflowing, and getting so mad because I had missed measuring some of that rainfall.

e. College bound

I liked school and did pretty well. I especially liked geography, anything to do with science, and I liked math, at least at that period of my life. I shared the valedictorian spot with two others in my graduating class [1960] at Sheridan High School. Sheridan was in the next county and they had a population of about 2000. There were about 70 students in our graduating class.

Well, one thing as we were growing up [3 children], my father, rightly or wrongly, automatically assumed we'd be going to college. My dad was from a rather poor economic background and he had to scrape just to go to high school. He instilled in us to save money to go to college — mowing lawns, paper routes, etc. — which was pretty good money in those days.

Well, I had a limited amount of money when I graduated from high school, so I decided to go to Purdue [in nearby Lafayette, Indiana]. My plan was to transfer to a college that had a meteorology department after two years. So, in fall 1960, I entered Purdue University and took the standard preparatory courses for science majors.

In early 1961 I learned that the U. S. Weather Bureau had a Student Trainee program where students could work for the Weather Bureau during the summer when they were on the college break. In March of 1961 I sent a letter to the Weather Bureau in Washington, D. C. asking if I could get a "summer job" with them while I was in college. Although the response to my letter was too late to work for the Weather Bureau during the summer of 1961, I received a "career-conditional appointment" as a "Student Trainee" for the WBAS (Weather Bureau Aviation Station) Indianapolis in late August 1961. I was then able to work as a Student Trainee for the Indianapolis Weather Bureau Office during the summers of 1962 and 1963 while I stayed at my parents' home.

Near the end of my sophomore year at Purdue, I wrote to several colleges: Florida State University, University of Wisconsin, and University of Oklahoma. I never heard from Florida State or Wisconsin, but I received a letter from Walter Saucier at Oklahoma. He said, "Come on down, I'll show you around." [Saucier is pictured in Fig. 8.]

So, in the late summer of 1962, I headed down to Oklahoma. My mom and sister brought me down. I had not traveled much outside the Great Lakes region, only to Colorado to see my brother receive his master's degree from the University of Colorado. So this trip was exciting for me. I noticed all the different grasses, for example, Bermuda grass, and I'd never seen mistletoe. I was fascinated by everything — climatic differences and plants among them.[3]

I met Walter Saucier and he brought me over to the old field house where they had these long tables and class cards for registration. He personally got me started. That was neat! There were dozens of Air Force students, but only several of us civilians — Gordon Hammons and Tice Wagner were two of the civilians. Gordon eventually ended up in the Scientific Services Division of the NWS Southern Region, and Tice joined the NWS and later became the Meteorologist in Charge (MIC) of the Jackson, MS, Weather Service Forecast Office (WSFO).

Figure 8: Walter Saucier, professor and chairman of the meteorology department at the University of Oklahoma during the 1960s. (ca.1970). Photo courtesy of W. Saucier.

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[3] Wladimir Köppen (1846-1940), the noted climatologist, had a remarkably similar experience in 1858 when he traveled through the whole expanse of Russia with his parents. It was an epiphany that turned him to science [Wegener-Köppen (1955) and Lewis (1996a)].

I took synoptic lab, 5 credits I think, from Saucier. I just loved synoptics. We had to make forecasts one or more times per week, and it was part of the course grade. I remember that Charleston, South Carolina, was one of the stations where we made forecasts. On one occasion, they had light winds, and temperature and dew point values were relatively low. But I noticed that the winds, with the pressure gradient and all, would turn to the southeast and the air would be coming off the ocean — so I jacked the temperature up and it was right. I felt it was the first time I was really putting things together.

I graduated in summer of 1965, but a significant event occurred just before graduation. On Palm Sunday [April 11], a tornado outbreak occurred that affected Indiana and nearby states near the Great Lakes. Over 200 people were killed. The southern most violent tornado, F4 intensity and 47 miles long, affected the area close to my hometown. On Monday, I could not get through on the telephone, but read an article in the Oklahoma City evening newspaper [*Oklahoma City Times*] that listed the dead and I knew some of them. That was really awful. I finally got through to a relative and found out my family was all right — although my parents and sister had close calls. From that point on, I wanted to get to know more about these tornadoes — something we needed to know more about.

One good thing about being a Student Trainee was that the Weather Bureau assumed you would be their employee once you graduated from college. When I completed my BS degree at the University of Oklahoma in 1965, I was assigned to work as a meteorologist at the Weather Bureau Office in Fort Wayne, IN, and began working there during the summer of 1965.

f. Military service

Because of the Vietnam War, I was about to be drafted by the U.S. Army in late 1965. Given that I had to enter the U. S. military, I decided to try to join the U. S. Coast and Geodetic Survey (USCGS) since that met my military requirements. I was able to do that in March 1966. I served aboard the research vessel *Oceanographer* and got involved in several research projects in the Pacific Ocean, and the Barbados Oceanographic and Meteorological Experiment (BOMEX) in the Atlantic Ocean. I also served as a meteorologist at the National Meteorological Center (NMC) in Suitland, MD. I retired from the USCGS in late 1969 and resumed my job as a meteorologist for the National Weather Service, this time at the Kansas City [MO] Forecast Office.

g. Learning about severe storms

I was pleased that the Kansas City Forecast Office was located in the same building as the National Severe Storms Forecast Center (NSSFC) SELS unit. In fact, it was in the same large room! I really wanted to learn more about severe local storms and hoped that some day I could get a job in the SELS unit. When I was on shift and had some free time, I would get a U.S. regional map with surface data plotted on it and analyze it. On those days when the lead forecaster was not busy with severe weather, I would go over to the SELS unit and ask him what was correct and incorrect about my surface analysis. Lead forecaster Hilmer Crumrine was really helpful in looking at what I had analyzed and letting me know what he thought. Several others were also. As it turned out, I was able to get a job as a meteorological assistant in the SELS unit in May 1971. Although my new job did not involve forecasting, some of it did involve analysis. And given my prior help from SELS lead forecasters, I already had the sufficient experience to analyze surface maps with the details needed for severe weather forecasting.

By April 1974, I was promoted to an assistant forecaster position in the SELS unit. The primary job was to issue severe weather outlooks for the entire United States, except for Alaska and Hawaii. Although I had been learning about analysis and forecasting issues from several of the experienced SELS forecasters, my primary mentor was Larry Wilson. In the 1960s Larry became a forecaster in the Air Force Military Weather Warning Center [MWWC] and Col. Robert C. Miller was his mentor. The Warning Center was located in Kansas City at the time and was in the same building as SELS. When the Warning Center was moved to Offutt AFB (NE) in late 1969, Larry decided to get a job as an assistant forecaster at SELS. So, Larry was a SELS forecaster when I got a job with SELS in 1971. He became a lead forecaster in 1975.

Larry had an important influence in improving the way the SELS severe weather outlook forecasts were prepared. He had learned from Col. Miller how to make detailed “composite” charts that were used to make outlook forecasts [See Lewis et al. (2006) for a discussion of Colonel Miller’s approach to severe weather forecasting,

including his development of the composite chart.] I and the other assistant forecasters in SELS learned how to make and use these composite charts from Larry.

Larry also seemed to have a "natural" ability to be a good severe weather forecaster and mentor. He was very helpful in showing me how to interpret various forms of weather data analysis and to understand how various severe weather events would develop and evolve. He also told me about past severe weather events that he remembered and mentioned specific issues about them that were important to know. Even though I was learning a lot about how Larry Wilson and other experienced SELS forecasters handled various types of severe weather events, I felt I had more to learn before I could become a severe weather forecaster. I was nervous about the risk of making some "very bad forecasts." However, one day I heard Vern Nebergall, an experienced aviation weather forecaster at NSSFC, mention that a forecaster had to issue a forecast at a certain time for it to be useful, and because we could not know everything needed to make a perfect forecast, we should expect a few of our forecasts to not work out well. Over the years, I kept remembering what Vern said to me about what a forecaster should expect when making a forecast.

h. Introduction to research

In the mid 1970s the Techniques Development Unit with several research meteorologists was established at the NSSFC. Since I had many questions about the forecast problems that I was encountering, I appreciated being able to discuss forecast issues with these researchers.

On July 11, 1976, a severe weather event occurred in the northeastern U. S. which I felt I had not forecasted correctly. I had issued a "slight risk" outlook forecast in the area expecting there would be a limited amount of marginal severe weather reports. However, there were more severe weather reports than expected and two tornadoes in western Pennsylvania killed and injured people. This significant event occurred in an area where the flow aloft was

Figure 9: This photograph of Bob Johns (analyzing the weather map), Jack Hales (SELS lead forecaster standing at the rear), and SELS assistant forecaster Steve Corfidi, was taken by Iris Schneider, staff photographer of the *Los Angeles Times* in April 1984. Photo courtesy of S. Corfidi.

northwesterly, and I wondered how common it was for severe weather events to occur where the flow aloft was northwesterly. I also wondered where they occurred most often. I remember discussing this issue with Chuck Doswell, and he encouraged me to work on an applied research project concerning the climatology of northwest flow severe weather. He also showed me the methods I should use to do the research. I worked on this project for several years before publishing formal papers (Johns 1982, 1984). This type of applied research helped me improve my forecasts for severe weather events.

i. Research continued

Given additional types of forecast problems that I and other SELS forecasters experienced over the years, I continued to work on applied research projects to discover new information and help improve our forecasts. In the process of gathering data while working on the northwesterly flow project in the late 1970s and early 1980s, I noted that quite a number of the northwesterly flow cases appeared to consist of relatively long paths of progressive straight-line wind damage. After publishing the two northwesterly flow severe weather papers mentioned before, I decided to begin a new applied research study with coworker William Hirt concerning long-path, convective, straight-line windstorms during the summer season. Such events were often difficult to forecast during the summer since many of them were associated with what appeared to be weak synoptic patterns. As we gathered data for this study, I wondered what one should call these events. They seemed to fit most closely with Fujita and Wakimoto's (1981) criteria for a "family of downburst clusters."

One day when I was off shift and working on this research project, Joe Galway happened to come by where I was working outside the SELS operation area. Joe was one of the "first" SELS lead forecasters and he had retired in 1984 (Lewis 1996b). He did not come into the SELS area very often, but here he was now and he asked me what I was working on. I told him that Bill and I were examining long path convective straight-line windstorms which often crossed over several states and caused widespread damage.

Since his retirement, Joe had been working on a historical project about John Finley's tornado research and experimental forecasts which occurred a century earlier in the 1880s [Finley 1888]. Given his findings and learning about our project, Joe mentioned that he had become aware of a person by the name of Dr. Gustavus Hinrichs who, at the time, was the director of the Iowa Weather Service and had had a feud with Finley concerning what constituted a tornado event. In a publication Finley had written statistics about tornadoes in Iowa and he included large-scale, straight-line, convective wind events as tornadoes. Because these statistics were not correct, Hinrichs (1888) published an article that mentioned that straight-line wind events should be called "derechos" as an analog to the term "tornado." ["Derecho" is a Spanish word meaning "straight."]

I was surprised that Bill and I were not aware of the term "derecho" from our literature review. However, in reviewing what had been written about convective straight-line winds, all of the useful information that we had found was limited to the period after 1940. Bill and I were pleased to hear about Hinrichs' terminology proposal and decided to use the term "derecho" to describe the events we were studying. Our paper concerning "derechos" was published in 1987, almost 100 years after Hinrichs first published an article proposing the use of this term.

After 1987, I continued to work on applied research projects with other forecasters and researchers based on severe weather forecasting issues. One thing I and other SELS forecasters noticed from forecasting all across the contiguous United States and during the entire year was that the most common recipes of parameters associated with severe weather tended to vary from season to season and between regions. Also, we noticed that local land topography and the locations and water temperatures of oceans and lakes appeared to affect the time of day, the seasons, and the locations within the region where severe weather could occur. Most of the applied research projects that I and others worked on were based on what we observed while forecasting. [Johns has authored or co-authored 38 research papers (13 in the refereed journals). Click here for a complete list.]

j. SELS lead forecaster

In 1979 I was promoted to a SELS lead forecaster position [See Fig. 9]. I felt that the many things I learned from Larry about forecasting severe weather events helped me to become a SELS lead forecaster.

One of the things I realized when I began issuing forecasts was that it was important to remember those cases where the forecasts worked well and those where they did not. For a case where the forecast did not work well, it seemed important to examine the case in detail to see if one could find out what caused the problem. Sometimes you could find an analysis error or a misinterpretation of parameter values and learn to do things better next time. However, most of the time there were issues involved that were more complex. One problem was that the operational data available for forecasters often would not be dense enough so that one could see small areas where the parameters were strong enough for severe weather development. Another problem was that in the 1970s and 1980s there was a lack of understanding about many physical processes associated with severe local storm development and evolution.

One case that occurred on July 15, 1988 was associated with both of these problems and resulted in one of my incorrect forecasts. An F3 intensity tornado had caused much damage and many injuries in Council Bluffs, Iowa, and I had issued a severe thunderstorm watch instead of a tornado watch for this area. This case involved an MVC (mesoscale vorticity center), which, in later years, was called a mesoscale convective vortex (MCV). The development of MCV's from thunderstorm convective systems had been recognized by NSSFC satellite meteorologist Edward (Ned) Johnston a decade before, and because we worked with Ned, we began to call an MCV a "Neddy Eddy." However, before 1988 I (and probably most other forecasters) did not know that on rare occasions an MCV could be a key factor in the development of tornadoes because of its enhancement of environmental wind shear. It was the result of the July 15, 1988 case that caught my attention as well as other SELS forecasters. SELS lead forecaster Jack Hales presented an AMS Severe Local Storms preprint paper about this case (Hales 1990). And another SELS forecaster, Mike July, presented a paper about an unusual case that occurred on May 5, 1989 (July 1990). In this case, thunderstorms that developed in southeastern Colorado on May 4th evolved so that they played a part in the development of a violent tornado outbreak in the Carolinas during the next day! And it was the development of an MCV during this evolution that played a part in enhancing the wind shear in the Carolinas where the violent tornadoes developed.

Despite remembering those severe weather cases that caused forecast problems, I also remember many of the events where the forecasts worked well. Although there were usually only a few widespread major tornado outbreaks each decade, they were typically easy to forecast for several reasons. The numerical model forecasts would usually show the associated patterns and parameter values several days ahead of time, and as the tornado outbreak day arrived, the patterns and parameter values necessary for such development would be easy to observe. Three of these major tornado outbreak events for which I remember issuing tornado watches include those that occurred on April 2, 1982, June 2, 1990 and April 26, 1991. The April 2, 1982 event occurred in the central and southern Plains and was the first major tornado outbreak for which I issued tornado watches. It was also the first event where the text, "This is a particularly dangerous situation with the possibility of very damaging tornadoes," was placed on a tornado watch. The April 26, 1991 event was also a case affecting the central and southern Plains with the most deadly tornado affecting Andover, KS, a suburb of Wichita. During both of these April cases, I was working on day shift and I issued the initial watches for afternoon development before the thunderstorms had formed.

On June 2, 1990, the lower Ohio Valley was struck by a major tornado outbreak. I worked the evening shift and issued a large tornado watch area that included almost all of Indiana and portions of Ohio and Kentucky. Most of the violent tornadoes passed through southern Indiana, but one weak-intensity (F1) tornado hit my sister's home in Terhune. Fortunately, my sister and brother-in-law had gone over to a basement in the town church before the tornado hit. This was the fourth tornado that had come close to them over the years with the first one being the violent F4 tornado on April 11, 1965 [Palm Sunday tornadoes].

Besides major tornado outbreaks, there are many other types of severe weather events that can be deadly and very destructive. And many of these events are more difficult to forecast than the major tornado outbreaks. Some of the parameter values may be marginal at best while others are very high, and some of the patterns may be unusual or not very clear. Also, as I

mentioned concerning the July 15, 1988 case, the scale of the parameters may be too small to be seen clearly in the operational data network. And they may occur in a climatologically unusual area, season, or time of day. Because of the forecasting challenge of these types of events, I have really felt pleased when forecasts for these events work out very well.

k. Forecaster training

After I had been a severe weather forecaster for several years, I thought it would be helpful to provide new SELS forecasters with some initial training for forecasting severe local storms. And I thought it would be good to do this in the form of a workshop with exercises that involved what are currently called "displaced real-time cases". So, in the early 1980s I volunteered to develop a weeklong training workshop that we could provide for new forecasters when they arrived at SELS. I gave the first weeklong workshop for new SELS forecasters in 1982. Shortly after this, Dan Smith, chief of the NWS Southern Region Science Services Division, discovered what I was doing and asked me to do some workshop training at NWS offices in the Southern Region. I gave my first one-day training workshop for Southern Region forecasters at the Memphis, TN office in January of 1983. As time progressed, I gave quite a few one-day training workshops at many NWS offices east of the Rocky Mountains. For each geographical area where I gave a workshop, I provided displaced real-time cases that had occurred within that area. Besides providing workshops for the NWS offices, I also provided training workshops for many forecasters outside of the NWS, including those from the media. I really enjoyed severe weather training and I continued to be involved with it until I retired in 2001.

l. Retirement

Now that I am retired, I have found other things associated with severe weather that are very interesting for me. Currently, I am working with several other meteorologists on a project concerning the 1925 Tri-State Tornado. One part of this project is to determine just how continuous the damage track was for this event. I really enjoy being involved with this historical project and being able to interact with people who are old enough to remember what they experienced and who are able to show me where damage occurred.

m. Looking back

I've often thought back to those farmers in my dad's store — it was their intense interest that got things going. And then, Ina Durr — I was able to visit her before she died and let her know that she had a big influence on my life.

3. Retrospective Vignettes

In order to complement information in the interview, vignettes from three forecasters who worked with Bob Johns have been obtained. These forecasters are among the elite in meteorology, having served or currently serving as lead forecasters at SELS/SPC. In Larry Wilson's case, he served as both a lead forecaster at SELS and its equivalent in the U. S. Air Force, the Military Weather Warning Center (MWWC). Itemized statements from each forecaster follow:

a. Steve Corfidi, SPC

1. First and foremost, Bob was an excellent analyst. For example, his surface charts were works of art, not only scientifically accurate but also easy to understand. He seemed to garner extra bits of information regarding subtle meteorological features that were often overlooked by less dedicated forecasters.

2. Bob always brought a no-nonsense approach to the task at hand. He never wasted time. I cannot ever recall seeing him sit idly on the forecast desk, even during quiet weather; he was always at work on a study, preparing for a workshop presentation or reading weather-related papers. On busy days, he expressed no tolerance for anything other than 100% effort of the forecast team. His glare let you know that he was not pleased with a lack-luster effort. Overhead speakers that ordinarily fed "easy listening" music to the operations area were routinely silenced using a special stick he devised to reach volume adjustment buttons on the ceiling speakers. On the other hand, Bob was always quick to recognize work well done. He also went out of his way to make "marginal team members" (such as student trainees, etc.) serious contributors by assigning them useful tasks.

3. Bob had a good sense of history and was quick to compare characteristics of current forecasters with those from the past whom he considered his mentors. In this way he fostered a feeling of belonging and a SELS *raison d'etre* for the more junior members of the unit.

b. Richard Thompson[4], SPC

Steve Corfidi's descriptions of Bob match my personal experiences, though I only worked with him for about two years. He was a little hard on me coming in due to my rather unbridled criticisms of some SELS forecasts in the early 90s [when Richard worked as a forecaster at the Houston, TX, weather station], but I think we both learned from that experience. It turns out that Bob was correct in pointing out that I had a bit to learn about forecasting (which the infamous Lahoma, OK, event of 17 August 1994 illustrated quite nicely). [On that occasion, Richard was an assistant forecaster in SELS and he was responsible for issuing the outlook for storms on that day. Storms traveled from his predicted thunderstorm area into the "no storms area". In that no-storm area, a thunderstorm produced a wind of 113 mph that was recorded at the University of Oklahoma mesonetwork station in Lahoma, OK].

Bob was very intense about his forecast responsibilities, to the point that some forecasters were a bit nervous working with him. His "glare," as noted by Steve Corfidi, certainly reminded you of his expectations while you were on shift. Also, Bob had a rather abrupt way of halting non-meteorological discussions and switching the focus to the current weather. With Bob in Kansas City, it was all weather all of the time. Thinking back on Bob's story, I'm curious about his early desires to observe the weather first hand. He didn't seem too keen on mine and Roger's [Roger Edwards] "storm chasing" in our early years with SELS. It seems we tried to convince Bob that chasing wasn't solely about the adrenaline rush, but that we were able to test and refine conceptual models that we used in daily forecasting. I think he agreed that you could learn about forecasting severe storms by observing them directly, though he always worried that chasing took focus away from the job at SELS.

c. Larry Wilson, formerly at SELS and MWWC

After five productive years working alongside Colonel Robert C. Miller in the MWWC in Kansas City, I became an assistant meteorologist at NSSFC in 1969. I had learned to forecast severe weather patterns by utilizing the Miller methodology that was detailed in Miller's publication TR-200 [Technical Report 200, Miller (1967)]. I was able to share my knowledge about how to successfully use the Miller Composite Chart with the young and eager SELS assistants who came into the unit by 1974, most notably Bob Johns and Steve Weiss.

It was apparent that Bob Johns had a knack for drawing detailed surface and upper-air charts that depicted current and forecasted weather patterns. He also had a unique ability to compare severe weather reports with certain critical parameters. He had lots of questions about using the composite charts and how to display certain color schemes that Miller had developed. We often discussed the daily threat of severe weather during the middle 1970s based on such analyses.

Both Bob Johns and I had a dedicated interest in learning how to make better forecasts for the daily convective outlook and later in the issuances of severe weather watches. But it was Bob Johns who had a passion for delving into case studies and eventually for writing landmark papers about the northwest flow situations and also the derecho phenomenon, both of which had challenged severe weather forecasters for many years.

By 1982, it was a combination of forecasters like Bob Johns, Jack Hales and myself who dared to use terms like "high risk" and "particularly dangerous situation" in outlooks and watches after a failed attempt in the late 1970s, when other meteorologists had teamed up to alert the public to a "big next day" only to see "no severe" reports the next day. Bob Johns was one of seven SELS meteorologists awarded a Silver Medal by the Department of Commerce for the nearly perfect forecast of severe thunderstorms on April 2, 1982.

From 1979 through 1994, both Bob Johns and I shared duties as lead forecasters in SELS and we experienced the agony and the ecstasy of seeing daily forecasts come to fruition. After mentoring Bob Johns in the middle 1970s, it was satisfying for me to see him share his knowledge of severe storms forecasting with the younger meteorologists coming into the SELS unit, just as I had done with him.

[4] Mr. Thompson had access to Mr. Corfidi's commentary and thus he makes several references to the earlier vignette.

4. Epilogue

The fire was lit during that weather project in Mrs. Durr's 6th grade class. Further, Bob Johns' meticulous records of rainfall and temperature in the spiral-bound notebooks from the 1950s certainly attest to a high probability of success in a field such as meteorology. Beyond the numbers, however, there was another important ingredient in his approach to weather. He genuinely cared about weather's effect on the individual — in his youth, his concern centered on the farmers and their crops. His favorite novel, *Storm*, reinforced his desire to link people and businesses with the devastating effects of weather.

On his path to becoming a severe storms forecaster, there were several key stops along the way. Notable were: (1) Professor Saucier's accommodation of the reserved country boy who gained confidence from academic experiences — especially the application of basic principles of meteorology to forecasting, and (2) mentorship under the watchful eyes of Larry Wilson and Chuck Doswell.

It also becomes clear that Johns had a perfectionist quality or characteristic. It was evident in his meteorological charts as described by Corfidi and Wilson, and further by his extensive postmortem review of severe storm events. And as noted by Joe Galway, one of the original SELS lead forecasters, the perfectionist trait can become a liability in the business of severe storm forecasting [Lewis (1996b)]. We must credit Vern Nebergall, the aviation forecaster at NSSFC, who offered Johns sage advice that allowed him to accept the inevitable imperfection that comes with a severe storms forecast.

Few understand the process that leads to advancement and skill in these most demanding jobs of operational severe storm forecasting. By examination of the careers of forecasters like C. K. M. Douglas and Robert Johns, one is left with the impression that forecasting excellence only comes with Herculean effort in the presence of mentorship that is complemented and reinforced by battle borne experience.

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I am indebted to Robert Bundgaard for sharing his knowledge of the D-Day Invasion with me and for translation of that portion of Petterssen's book pertaining to C. K. M. Douglas. I have also benefited from discussions with mountaineer Bob Savarino, especially those discussions related to the influence of George Stewart's book on the Sierra outdoorsman. Joan O'Bannon is acknowledged for graphics support and Domagoj Podnar and Vicki Hall have assisted with formatting the article and the electronic submission process.

Finally, I would like to credit *EJSSM* editor Roger Edwards for his advice on structuring this paper.

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REVIEWER COMMENTS

[Authors' responses in *blue italics.*]

REVIEWER A (Jeffry S. Evans):

Initial Review:

Recommendation: Accept for publication pending minor revisions. Please send the revised manuscript back for a brief second review.

General Overview: The manuscript is unique in its approach, but still acceptable in its current format. The merits of the work are informative and worthy of publication, though a few points need to be addressed before it is suited for publication. I felt the paper was interesting but could be improved with only a little reworking and some additional discussion. Though the manuscript may be true to Bob's actual dialogue, there are some grammatical errors and minor rewording which needs to be done to better convey the overall message.

[Minor comments omitted…]

Substantive Comments:

MILITARY SERVICE

Could you expand on "military requirements"? I was left wondering exactly what was required of Bob after beginning work at the USWB. I assume this was because of the draft?

Military requirements have been elaborated upon by Mr. Johns.

INTRODUCTION TO RESEARCH

I was surprised that this section did not expand on his "ground-breaking" work on derechos. In fact, Bob is credited in defining what is now called a derecho, and set the stage for expanding the science regarding these events. I feel it is important to add some discussion here about this work. Perhaps a few follow-up questions allowing Bob to elaborate more on this issue are needed. Maybe even let Bob expand on what he feels are his greatest contributions to severe weather forecasting/research.

"Introduction to Research" section revised to accommodate concerns about "derecho."

SELS LEAD FORECASTER

The topics within this section and the two prior seem to overlap considerably. For instance the tie-in with Larry Wilson's influences in Bob's selection as a lead seems to flow directly from the end of the section, "Learning about Severe Storms." Also, the second paragraph in this section seems a natural lead-in to the Introduction to Research section. I would recommend rewording/restructuring to make the paper flow better through these sections. As it reads now, it is quite choppy and seems to jump back and forth too much.

Addition of the section "Research Continued" gives a more complete picture of Mr. Johns' range of experiences as a SELS forecaster.

Second Review:

Recommendation: The manuscript is improved and ready for submission, pending a few minor issues.

[Minor comments omitted…]

REVIEWER B (William Read):

Initial Review:

Recommendation: The paper is acceptable with minor revisions and no further review is requested unless major changes are made in accordance with other reviews (at the discretion of the Editor).

General Comments: I found this article to be a unique method of biography. Although I know Bob Johns, I came away with a richer knowledge of his background. Some of his childhood weather experience, like doing a journal based on the newspaper weather map and own observations, will resonate with fellow travelers in meteorology who read the article. Interestingly, my dad shared the same concerns about my weather watching career as did Bob's!

Substantive Comments:

[Current Sec. 2e. College bound] Most readers would have no idea who Gordon Hammons and Tice Wagner are. Maybe touch on their (also successful) careers in the NWS?

Brief statements about the careers of Gordon Hammons and Tice Wagner have now been inserted.

[Current Sec. 2i. Research continued] I would expand on Bob's landmark research on northwest flow/derecho events. Include reference to the 1982, 1984 and 1987 (with Hirt) papers he published. I think this work was on a par with Maddox's definition of MCCs as far as advancing the field of operational mesoscale forecasting, not just at NSSFC, but in the WFOs also.

A new section titled "Research Continued" has been added that elaborates on Johns' contributions to forecasting and understanding northwest flow/derecho events.

There is no mention of anything during his time as the SOO at SELS 1994-2001?

Despite the wide range of subject matter contained in the interview, a discussion of Mr. Johns' job as SOO at SELS was absent. I did not bring up the subject as the interviewer since my focus was on elements that lead to excellence in severe storms forecasting — not so much about the duties as a supervisor of forecasters. Although this subject may be of interest to some readers, it fell outside my focal point and accordingly I did not include it.

The Epilogue seems to me to be a rather lengthy restatement of what was just written. Perhaps shorten then end with a statement about Bob John's legacy, which is he instilled his work ethic and forecasting techniques in the generation of forecasters that follow him.

I have shortened the Epilogue in accord with your suggestion. I'm reluctant to end with a "legacy statement" since commentary by Larry Wilson and Steve Corfidi in the previous section ("Vignettes") covered this ground in an exemplary fashion. A short summary statement on this component in the Epilogue would not strengthen their statements. I wanted to end on a note that pertained to all those in the severe forecasting business or those who aspire to such positions. Thus, I made the statements with reference to the two outstanding forecasters who were mentioned in the paper, C.K.M. Douglas and Robert Johns.