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JEROME NAMIAS

1910—1996

A Biographical Memoir by

JOHN O. ROADS

Biographical Memoir

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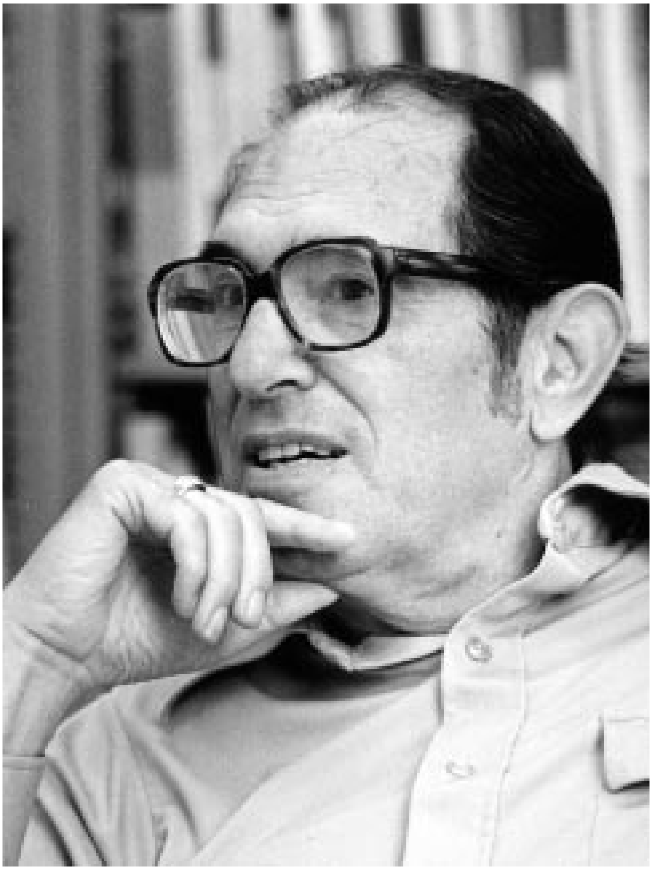

Courtesy of Scripps Institution of Oceanography

Jerome Namias

JEROME NAMIAS

March 19, 1910–February 10, 1997

BY JOHN O. ROADS

JEROME NAMIAS WAS one of the world's greatest long-range forecasters of what he liked to call the world's second most complex problem.[1] Hecht (1986) described him as "a man who gives good reasons for any long-range forecast and even better reasons for why it fails . . . a man who is an infinite source of good ideas . . . who thinks fast on his feet . . . is always a scholar . . . and a gentleman." While lacking formal meteorological training, Namias eventually received the highest awards of the American Meteorological Society and helped to found the long-range forecasting branch of the U.S. National Weather Service and the Climate Research Division and the Experimental Climate Prediction Center at the Scripps Institution of Oceanography. In November 1989 Namias suffered a stroke. Although he was aware of events around him, he was partially paralyzed and was unable to speak or write thereafter. His loving wife Edith, daughter Judith Immenschuh, and grandchildren Dylan and Sionna survive him.

FALL RIVER

Jerome Namias grew up in Fall River, Massachusetts, the son of Joseph and Sadie (Jacobs) Namias. He became enthusiastic about the weather because of a high school physics teacher and the town's amateur meteorologist, who was a cooperative observer for the weather bureau and a wealthy broker. Eventually Namias set up his own weather station, using instruments he bought from his earnings as a door-to-door salesman and a jazz drummer. When Namias heard about the American Meteorological Society, founded by Charles F. Brooks in 1919 and that its requirements for membership were modest ("a sincere interest and annual dues of $2 per year"), he immediately joined. Although his friends thought that Namias was getting into meteorology because of the money,[2] his father initially saw little or no chance of Namias making a living on what he thought was a hobby.[3] Namias began his "hobby" by keeping records and drawing weather maps from reports published in the daily newspaper, but soon he began making forecasts for his friends, a practice he was to carry out to the extreme for the rest of his life.[4]

On graduation from high school, Namias was offered a four-year scholarship to Wesleyan University in Connecticut; however, because of his father's illness and the Great Depression, Namias decided to stay home and try to find a job to help his family out. Namias subsequently became ill with tuberculosis and was confined to his home. Even so, his appetite for self-study soon emerged and he took many correspondence courses, including a course in meteorology given at Clark University by Charles F. Brooks. Although Namias was never to receive an undergraduate degree,[5] he eventually received an M.S. in 1941 from the Massachusetts Institute of Technology. In 1972 the University of Rhode Island awarded him an honorary Ph.D., as did Clark University in 1975.

FIRST METEOROLOGICAL JOB

At the end of his confinement, Namias wrote letters to many meteorologists asking for a job, citing his study of their papers and books. He was unsuccessful until H. H. Clayton at the Blue Hill Observatory, who was working with Charles G. Abbot, secretary of the Smithsonian Institution, finally offered Namias a job. Clayton interviewed Namias by asking him to extract station pressures from the isobars on some random weather maps. Clayton took the same test and, when the results were in, he found that both he and Namias made one mistake. Namias was hired on the spot and sent to the weather bureau in Washington, D.C., where the data was (and still is). This position involved getting data for compilation of world weather records, an internationally known series put out by the Smithsonian, and for solar weather studies. Namias took this opportunity to read and meet the many famous meteorologists whose articles and books he had previously read. In the weather bureau library, Namias soon discovered the many scholarly papers of the Norwegian or Bergen School,[6] and these papers were to influence his later research. Namias also found the initial set of scientific reports issued by Carl G. Rossby's newly founded department of meteorology at the Massachusetts Institute of Technology (MIT) and with colossal nerve wrote a letter to Rossby politely questioning a couple of his statements in one of his papers. Soon Namias received a response from Rossby saying that Namias was partially correct, and would Namias stop by and see him when he got a chance.

MIT

Rossby was to have a major influence on Namias's life. To help out with undergraduate tuition, Rossby arranged a job for Namias. Namias began to take and analyze the recordings of the research aircraft instruments used by the department at the East Boston Airport. Sometimes, Namias's work entailed fourteen-hour days, which included tracking balloon runs with the help of a theodolite to determine wind directions and speeds at various altitudes. This was sometimes dangerous work. According to Namias (1986), "On one occasion, a hometown friend came to visit at the airport, and I encouraged him to watch me send up the pilot balloons. He came into the shed where balloons were inflated. Shortly thereafter I noted that he was smoking, while I was inflating the balloons from the tank of hydrogen!"

Namias became interested especially in the structure of air masses and fronts as determined by the rapidly expanding aerological network of airplane soundings and pilot balloon wind soundings made in Boston, as well as at other places like Detroit and Chicago. These new soundings made it possible for Namias to construct cross-sections through the fronts by combining ascents in time and space (1934). Some of the central ideas for Namias's analysis of the frontal structure stemmed from the work of J. Bjerknes, who had pioneered aerological studies of cyclones over Europe and from research carried on at MIT by Prof. Hurd Willett, an authority on American air masses and fronts. Namias eventually was to write a series of introductory articles on stability and air mass properties (1936).[7]

In 1934, with the advent of the rapidly expanding airline industry and its desire to establish meteorological departments,[8] Namias (on the advice of Rossby) accepted a job at Trans World Airlines, first at Newark and then at Kansas City. In these assignments, Namias got a taste of the real world of meteorology: round-the-clock work shifts and stressful forecasting for early transcontinental flights. Problems involved icing on aircraft; low ceilings; zero visibility due to fog; blowing dust in the Dust Bowl area; and hazardous winds. There was no time for scientific investigations or for Namias to continue his undergraduate education. He eventually got the impression that airline meteorologists were "second-class citizens around the air terminals, who often served as scapegoats for weather-related accidents." Therefore, when TWA had to downsize temporarily due to the curtailment of government airmail service, Namias was happy to return to part-time work at MIT and Blue Hill Observatory, even though he had to learn to live on student pay once again.

Namias, by this time, was known as an expert forecaster. He gave advice to Piccards in connection with his record-setting high-altitude balloon flights. He helped out at the national gliding and soaring contest in New York, where Dupont made a distance record for the United States by using Namias's forecast of a strong frontal passage to glide all the way to Boston. According to Namias (1986), "I still marvel at his courage and my colossal nerve in proposing such a dangerous flight path!" Namias was not infallible. Asked to forecast for the Harvard tercentennial, Namias forecast a light rain, which turned into a ruinous downpour. Bad forecasts[9] would disappoint, but they would never stop Namias, who felt that forecasts were one of the best teaching tools a meteorologist had. Gilman (1986), who succeeded Namias as chief of the weather bureau, would later stress the probabilistic nature of forecasts, which is especially important when dealing with the growing uncertainty at long ranges.

Namias then decided to finally get his undergraduate degree, enrolled at the University of Michigan, where tuition was more affordable than at MIT. Unfortunately, serious physical problems (pleural effusion) forced him once again to abandon his undergraduate plans and return to Fall River, where he again proceeded with self-study and also published a seminal paper on atmospheric inversions (1936). Again impressed, Rossby offered Namias a graduate assistantship beginning with the 1936 fall term at MIT. Rossby had just begun working on his theory of long waves on the westerlies and was trying to convince people of its validity. One of the main difficulties in applying Rossby's ideas involved the lack of data aloft, particularly over the oceans. At Rossby's suggestion, Namias constructed a trial upper-level map by judicial extrapolations, estimating quantitatively the flow patterns aloft over the North Atlantic, as well as the United States. Namias was later one of the unnamed contributors to Rossby's paper (1939).[10]

At MIT Namias met Edith Paipert, who was to become his wife in the fall of 1938. Harry Wexler, his best friend since grammar school, had married her sister Hannah, and years earlier Namias had introduced Harry to Rossby and the field of meteorology.[11] Edith was an artist[12] and had a feel for symmetry, balance, and aesthetics, and would comment on the aesthetics (or lack thereof) of Namias's weather maps. "It soon became clear that the parts of my analysis that she did not like were incorrect and could be made both more artistically satisfying and scientifically correct by modification. It was then that I realized the close association between art and science. In fact, in a couple of courses I taught at MIT, this philosophy was stressed, much to the chagrin of a few of my contemporaries."

Namias made a name for himself at MIT with his isentropic analyses (1938), which was the basis for his getting the first Meisinger Award of the American Meteorological Society in 1938. Namias reasoned that isentropic analysis was an exceptionally valuable tool for precipitation forecasting, particularly when the moist and dry tongues were clear and easily identified. Isentropic trajectories often carried the high-level moisture southward into the southern states, even though the surface winds were blowing from the south. Thunderstorms occurred where the deep moist air enhanced convection, which normally is impeded by entrainment of dry air aloft. Summer thunderstorms over the Great Plains of the United States did not occur haphazardly, but they frequently moved in clusters in upper-air moist currents that flowed in great anticyclonic systems in mid-troposphere. Eliassen (1986) noted later that he and his contemporaries, who had studied Namias's aerological papers before the war, were amazed to see that someone their age (twenty-three) had written such extraordinary papers. Eliassen further noted that isentropic analysis has provided the basis for much of modern meteorological instability theory developed later by Charney and others.

EXTENDED-RANGE FORECASTS

It was another aspect of Namias's research, though, that was to capture his attention and eventually become part of his identity. Namias was the junior member (graduate assistant) of the team that was trying to develop extended forecasting on time scales on the order of a week. According to Hecht (1986), this was reported in the *New York Times* as: "The weather bureau has enlisted the aid of experts from several universities in starting a study of long-range forecasting." According to Namias (1986), "It soon became clear that none of us knew what we were doing, other than coloring charts with red and blue crayons." In fact, Namias was instrumental in developing the scientific basis for experimental forecasts for times (then) as far as five days into the future.[13]

WORLD WAR II

The military services became especially interested in MIT's extended forecast work (1941), and it was eventually decided to shift the extended forecasting project to Washington, where it would be closer to defense preparations for the looming war. Namias was asked to take a one-year leave of absence from MIT and head up the controversial project. According to Namias (1986), "Our reception by some of the weather bureau personnel was not exactly cordial . . . attempting forecasts for a period of five days in advance was [thought to be] utterly foolish." Namias was to head the extended-range forecast division for the next thirty years, and he wrote a monograph on extended forecasting techniques, which was promptly stamped confidential. A few years later, this monograph was declassified, brought up to date, and printed for general distribution (1947).

During the war, Namias supervised an historical sea-level map project;[14] lectured Air Force cadets, Navy officers, and civilians at various university training centers; and made extended predictions for many wartime events. Namias received a citation from Navy Secretary Frank Knox for his sea-state forecasts for the North African invasion.[15] Namias also made forecasts for favorable periods for the transfer of disabled vessels to other ports for repair; estimates of the likely course of incendiary balloons from Japan; favorable and unfavorable conditions for the possible invasion of Japan; and certain aspects of the meteorology for bombing raids.[16]

NUMERICAL WEATHER PREDICTION

After the war, meteorology changed to a more computational science. At the Institute of Advanced Study in Princeton, Johnny von Neumann initiated a project in numerical forecasting with the use of the supercomputer of the day. This project involved Jule Charney, Phil Thompson, Johnny Freeman, Hans Panofsky, Ragnar Fjortoft, Arnt Eliassen, Joe Smagorinsky, Norm Phillips, and many others. Charney developed the first successful numerical forecast using the barotropic model, which Namias had been employing for several years following Rossby's classical 1939 work. Namias (1986) was fond of noting that "at the first meeting to discuss the new Princeton endeavor, to which about 35 of the nation's top meteorologists were invited to give advice, no one suggested, as a starting point, the barotropic model!" Although Namias was photographed with the group that made the first forecast (see Namias, 1986), he was really only peripherally involved. His role was mainly to make sure the computer-generated forecasts resembled the real atmosphere.[17]

CONFLUENCE

Rossby, who returned to Sweden after the war to found the International Institute of Meteorology, subsequently invited Namias to Stockholm.[18] There Namias investigated variations in upper airflow patterns. Particularly noteworthy was his study (1949) of confluence with his long-time colleague Phil Clapp. Confluence and diffluence qualitatively describe asymmetric variations in the upper-level winds. At the upper levels, the strongest climatological winds or jets occur off the coast of Eurasia and North America (and over North Africa). In the entrance region to these jets, a thermodynamically direct circulation occurs. That is, warm air rises in the south and sinks in the north. In the diffluent regions over the ocean, an opposite indirect circulation occurs. As discussed by Newton (1986) confluence theory has been increasingly studied in recent meteorological literature (jet streaks) and its popularity will grow as we gain more experience understanding vertical circulations.

INDEX CYCLE

Namias's stay in Sweden resulted in another notable paper, a study of the index cycle (1950), the slow wintertime phenomenon when the westerlies first slowly decline and then recover in a cycle of about four to six weeks. As noted by Lorenz (1986) the zonal index, or blocking variations, appears to happen at about the same time each spring and carry with it alterations in the positions and intensities of the centers of action. Implicit in this and other work was the fact that synoptic scale systems often went through a cycle in about a week, only to return in similar form in the following week or so, suggesting quasi-periodicity, although Lorenz noticed that the motions were actually chaotic. Lorenz further noted that these kinds of studies were forgotten for some time because of the advent of numerical prediction. It was only much later that people began to realize that even these kinds of slowly varying and seemingly predictable phenomena were in fact quite sensitive to initial conditions. Models to date have not been wholly successful in predicting the onset or demise of high and low index conditions.

Because of their potential for prediction, people will continue to search for these and other periodicities. Namias (1986) wrote that Irving Langmuir, the Nobel laureate, had tried to show that his seeding of clouds in New Mexico was responsible for establishing a weekly periodicity in many meteorological elements as far away as the Ohio Valley. Langmuir became greatly interested in Namias's work and invited him to spend a few days with him at General Electric Company's Knolls Laboratories near Schenectady, N.Y. "Although he worked hard to convince me that the periodicity found over the Ohio Valley was due to seeding in New Mexico, I was able to demonstrate in this and in other cases that periodicity could be explained in terms of the evolution of the general circulation on the appropriate time scales."

Based on the low frequency variations in the index cycle and other evidence, Namias (1953) decided to expand the five-day predictions, which were by then routine, to thirty days. He also began to issue advisory statements about hurricane probabilities a month in advance. Namias reasoned that changes in the large-scale wind patterns could be used to determine whether or not small-scale hurricanes would be more or less threatening to the U.S. East Coast. A lot of publicity was generated, which resulted in the establishment of the National Hurricane Center (Taba, 1988). Namias's advisories were later stopped, because it was claimed they were harming the tourist trade. Even though Namias (Taba, 1988) considered his advisories a progressive public service (which put him in the limelight during his regular TV appearances) his efforts were always at the hazy frontier and were not popular at the more conservative weather bureau. These efforts, as well as the many previously mentioned efforts, resulted in his being given in 1955 the highest award of the American Meteorological Society, the Award for Extraordinary Scientific Achievement. [19]

LAND INFLUENCES

In 1955 Namias also received the Rockefeller Public Service Award, which made it possible for him to spend a year at a place of his choice, and he once again chose Stockholm. As summarized by Walsh (1986) and Anthes and Kuo (1986), Namias began to write there about the influence of the land and snow on the atmosphere. Namias (1955) suggested that the soil moisture in the Great Plains of the United States played an important role in the Great Plains drought by varying the heat input to the overlying atmosphere. That is, heat could be used for sensible heating of the soil or for producing long period lags in the general circulation. This paper also stressed that the drought-producing upper-level high-pressure cell over the Great Plains is dependent on similar anomalous cells over both the North Pacific and North Atlantic, operating through teleconnections. Once this triple cell pattern was established, soil moisture deficits could feed back to help maintain the continental high cell. These effects later were exploited by Van den Dool and others and are still being explored in modern coupled (air-land) hydrologic experiments started by GEWEX (Global Energy and Water Cycling Experiment).

OCEAN INFLUENCES

A major turning point for Namias occurred at the 1957 Rancho Santa Fe CalCOFI (California Cooperative Fisheries) conference of the Scripps Institution of Oceanography. Invited by John Isaacs to speak about the anomalous period that had sparked the conference, Namias (1959) gave a standard climate diagnostics talk about the anomalous mid-altitude events and then sat back to listen to the other speakers (Bjerknes, Charney, Munk, and Stommel, among others). A remarkable oceanic warming (which we now all know as El Niño) had occurred over the eastern Pacific. Southern fish were being caught in northern waters, unusual typhoons were observed, and, in general, both atmosphere and ocean were far from normal. This sea-surface-temperature abnormality also included anomalies in the marine biota, the California Current, and some marine chemical properties. Namias (1986) wrote, “The inter-associations quickly became clear, and it struck me that some of the secrets of long-range weather forecasting might lie in the coupled air-sea system. It was especially noteworthy that the mismatch of time scales in the two media, air and sea, could account for the frequently observed long-term memory required for long-range problems."

Namias thereafter began to draw on the influence of the ocean surface in other studies; however, it was really to be several years before he could actually begin to work full time on the large-scale air-sea interaction and persistent boundary condition problem, efforts that were to occupy him the rest of his life. His mentor Rossby and his best friend and brother-in-law Harry Wexler passed away from heart problems. Namias also had a heart attack in 1963 and in the summer of 1964 he was involved in a bad automobile accident in Boston. Growing increasingly tired of all the budget battles,[20] he decided to retire from the weather bureau the same year.[21]

SCRIPPS

Actually, Namias never retired; he just changed locations.[22] Namias's earlier work increasingly had drawn the attention of many diverse groups of scientists, including John Isaacs at the Scripps Institution of Oceanography, where he had earlier been stimulated to begin working on ocean atmosphere problems. Namias (1986) wrote, "My new friends were most receptive to fresh ideas about low frequency phenomena in the upper ocean and lower atmosphere. Consequently, I returned each of the succeeding three years for six months at a time before deciding to retire from NOAA [National Oceanic and Atmospheric Administration] and live in La Jolla, a decision I never regretted." In the years following his move to La Jolla, many air-sea problems attracted his interest in the newly formed climate research group, which he founded with the help of Director Bill Nierenberg. That group initially included Tim Barnett, and later became a separate research division under Richard

Somerville. Initial studies were concerned with defining the time and space scales of large-scale air-sea interactions (1970, 1972), and Namias put out several important large-scale air-sea atlases (1975, 1979, 1981) that were used by many other researchers. Namias would use his long experience with climate variations to carefully diagnose low frequency atmospheric and oceanic behavior.[23]

From a number of carefully analyzed case studies (e.g., 1976), it became evident to Namias that, if abnormally warm water were generated at high latitudes during the summer, the Aleutian Low in the subsequent fall would be intense. Similarly, cold water in the summer would lead to abnormally high pressure in the fall. He reasoned that warm anomalies would amplify cyclones by destabilizing cool air masses by the contributions of the surface sensible and latent heat, whereas the opposite situation would occur over the cold anomalies. Namias further suggested that pools of anomalous water might be hidden at depths below the surface thermocline during the warm season. With the onset of increased fall storminess these subsurface anomalies could be mixed vertically again, thus providing for generation of surface anomalies unaccounted for by other factors. In 1981 Namias received the Sverdrup Gold Medal of the American Meteorological Society for his pioneering efforts on air-sea interactions.

Namias's air-sea interaction theories were not universally accepted. As noted by Haney (1986), a number of subsequent papers by Hasselmann, Frankignoul, Davis, and others showed that it was much easier to produce SST anomalies from atmospheric anomalies than it was to produce atmospheric anomalies from SST anomalies. A number of early general circulation model (GCM) sensitivity experiments by Kutzbach, Huang, Chervin, Houghton, and others also showed a remarkable insensitivity[24] to mid-latitude

SST anomalies, whereas these same early GCM experiments at least showed some sensitivity to tropical SSTs.

Namias sometimes has been identified as a strict proponent of only mid-latitude SST effects, in part because he was somewhat skeptical that influences from remote tropical SSTs could overwhelm influences from local SST anomalies. According to Smagorinsky (1986), this discounting of tropical effects was due in part to the standard weather bureau Northern Hemisphere maps, to which Namias had access.[25] Still, when the TOGA (Tropical Ocean, Global Atmosphere) program was launched, Namias was a strong supporter, although he probably would have been a stronger supporter if it had been named GOGA (global ocean, global atmosphere). Namias's many teleconnection and mid-latitude air-sea studies had convinced him that knowledge of the global ocean and global atmosphere ultimately would be required. Despite Namias's tropical skepticism, he did do some seminal ENSO (El Niño Southern Oscillation) work. As noted by van Loon (1986), Namias (1976) was the first person to describe both extremes of the ENSO cycle, as well as its association with temperate latitude wind systems over the North Pacific. Perhaps more characteristically though, Namias and Dan Cayan (1984) demonstrated the lack of uniqueness in middle latitudes for different El Niño years. In much of his work (mid-latitude and equatorial), Namias had the encouragement of J. Bjerknes, the great pioneer in El Niño and Southern Oscillation studies, who was stationed nearby at the University of California, Los Angeles, and who worked with Namias on the NORPAX program.[26]

SEASONAL FORECASTS

Even though Namias officially had retired from government service in 1971, several requests for forecast information from high government sources continued. Among these requests were estimates of the character of the forthcoming winter over the East during the oil embargo of 1974. After several cold winters, Namias predicted that this critical winter would be mild and on the basis of that prediction, the Carter administration decided not to issue gas-rationing cards.

More weather and climate aberrations occurred during the winter of 1976-77, when the Far West suffered a severe drought and the eastern two-thirds of the nation was very cold, with frequent snows. These abnormalities were associated with large anomalies in upper-air wind patterns and in North Pacific sea-surface temperatures. The pressure patterns had a strong ridge in the Far West and a strong trough over the East. Namias wrote, "These patterns were remarkably stable from month to month over a six-month interval from fall to winter, so that a persistence forecast would have been quite successful. Of course, one would have had to know in advance that the period was to be so persistent." Namias (1978) suggested that several premonitory signs showed up in the fall of 1976, including the forcing Pacific SST patterns, atmospheric flow patterns with strong teleconnections, an El Niño in the tropics, and some early snows, providing enhanced baroclinicity along the eastern seaboard. All of these factors and the suggested enhancement by the normal general circulation led to an excellent forecast for the 1976-77 winter.

Many numerical studies of this abnormal winter have since been conducted. At a large NATO-sponsored workshop in Italy both Joe Smagorinsky of GFDL and Namias were invited to speak. Namias discussed the synoptic and statistical characteristics of the meteorological situation, as well as his intuitive forecast. Smagorinsky then described the results obtained by Miyakoda, a member of Smagorinsky's staff at Princeton, which employed a sophisticated model to predict the weather for the entire month of January 1977, using the data of January 1, 1977, as initial data. Impressed by Miyakoda's predictions, Namias stated that he felt privileged to be present at this public unveiling, much as he had been present on the occasion of the first numerical forecast made a few decades earlier in Princeton. Later, less skillful numerical forecasts reinforced his often-stated opinion that machines would never replace human forecasters; rather, they would be only a tool forecasters used at long ranges.

To conclude, one of Namias's major accomplishments at Scripps was to help develop an experimental climate forecast center where novel techniques could be developed and tested before being put into operation by the weather services. Namias was among several meteorologists who testified before congressional committees about the desirability of passage of this act, and he was especially impressed by the interest and questions of Senator Hubert Humphrey and Representative Charles Mosher, as well as those of Senators Alan Cranston, Adlai Stevenson, Jr., among others. Eventually the National Climate Act was passed, and in the ensuring competition among peers, Namias and Scripps colleagues obtained the first such center for Scripps beginning in 1981. This center has continued to thrive, as has the Climate Research Division, which he founded earlier.

Namias's work thus had come full circle. From the earliest beginnings at MIT, where he was a junior member of a project devoted to making experimental five-day forecasts, to the Scripps Experimental Climate Prediction Center, where he started experimental seasonal forecasting efforts, Namias was the extreme forecaster.

Namias was so much more than his modest description of himself (Namias, 1986): "A good synoptic meteorologist who was fortunate enough to have been on the scene when great advances were being made—and one who . . . participated in some of the advances." Namias was an inspiration to several generations[27] of meteorologists and climatologists, not only from the podium of a large lecture hall, but also in one-on-one conversations. He, therefore, rightly gathered a number of honors over the years. The most gratifying of all these honors was his election to the National Academy of Sciences. Namias wrote, "Something I thought would never happen because of the fuzzy nature of my field of research and my poor formal background. . . . It is an honor that strengthens my belief in our system, where a person is judged solely on the basis of his contributions."

EDUCATION

Durfee High School, Fall River, Massachusetts
Massachusetts Institute of Technology, 1932-34, 1940-41, M.S. degree
University of Michigan, 1934-35
University of Rhode Island, honorary D.Sc., 1972
Clark University, honorary D.Sc., 1984

AWARDS

1938 Meisinger Award, American Meteorological Society
1943 Citation from Navy Secretary Frank Knox for weather forecasts in connection with the invasion of North Africa
1950 Meritorious Service Award, U.S. Department of Commerce
1955 Award for Extraordinary Scientific Accomplishment, American Meteorological Society
Rockefeller Public Service Award
1965 Gold Medal Award, U.S. Department of Commerce
1972 Rossby fellow, Woods Hole Oceanographic Institution
1977 Visiting scholar, Rockefeller Study and Conference Center, Bellagio, Italy
1978 Headliner Award (Science), San Diego Press Club
1981 Sverdrup Gold Medal, American Meteorological Society
1984 Compass Distinguished Achievement Award, Marine Technology Society

Associates Award for Research, University of California, San Diego

1985 Department of Commerce Certificate of Appreciation

SOCIETIES

American Academy of Arts and Sciences (fellow)
American Association for the Advancement of Science (fellow)
American Geophysical Union (fellow)
American Meteorological Society (fellow), councilor 1940-42, 1950-53, 1960-63, and 1970-73
Board of Editors, Geofisica Internacional, Mexico
Explorers Club (fellow)
Mexican Geophysical Union
National Academy of Sciences
National Weather Association
Royal Meteorological Society of Great Britain
Sigma Xi
Washington Academy of Sciences (fellow)

NOTES

1. Namias liked to say that predicting human behavior was the most complex problem.

2. The cooperative observer was a millionaire.

3. His father was an optometrist for the immigrant New England Mill Workers and wanted Jerome to follow in his footsteps much like his older brother.

4. Namias would give a detailed exposition to anyone who would listen on where the climate system had been and where it was headed, while pointing out many pertinent features on some of the many synoptic maps covering his office walls.

5. Namias may be the only member of the National Academy of Sciences with no undergraduate degree.

6. C. Rossby and J. Bjerknes were members of this school.

7. As noted by Fultz (1986), Namias was instrumental in introducing air mass concepts to the U.S. community.

8. The aviation industry has always been highly dependent on and a strong supporter of the National Weather Service. Standard products and forecasts are tailored precisely for that industry.

9. A number of other bad forecasts are mentioned in Namias's

(1986) autobiography, including one on his honeymoon.

10. According to Lorenz (1986), the paper by Rossby and collaborators (1939) may be one of the best-known meteorological papers ever published.

11. Harry Wexler would eventually go on to become chief of research at the National Weather Service.

12. Among the many paintings of Edith Namias is the cover of the National Academy of Sciences' "GOALS" document.

13. Extended-range forecasts at five days are standard weather service medium-range forecast products; the weather service, as well as many other groups, are now making even longer range seasonal forecasts.

14. As noted in a Namias memorial talk given by van den Dool at the 22nd Annual Climate Diagnostics Workshop, this was really the first major reanalysis project. All the major numerical weather prediction centers have since carried out major reanalyses, which now involve both model predictions as well as observations.

15. Sverdrup and Munk developed the oceanographic prediction techniques, which depended on estimates of the wind systems over much of the North Atlantic several days in advance.

16. According to Edith Namias, because men's lives were at stake, this was the most stressful period of Namias's life.

17. Many years previously (ca. 1920) the great British scientist Richardson made the world's first numerical forecast and was notably wrong by many orders of magnitude.

18. According to Edith Namias, because of Rossby and all his parties, their stay in Sweden was very pleasant.

19. Later re-named the Rossby Research Medal.

20. Rasmusson (1998) noted that the field of numerical weather prediction then developing eclipsed empirical research for the next several decades, which resulted in a real decline in budget dollars for Namias's empirical efforts.

21. His long-time collaborator Phil Clapp was also retiring at the same time, and Clapp also passed away in 1997, a few weeks after Namias.

22. As noted by Cayan (1998), Namias's collected works (1984) contain the same number of papers before Scripps (73) as the number written after his work began there (72).

23. Namias was among the first to describe interdecadal variabil-

ity, which was later amplified by other collaborators (e.g., Dickson and Namias, 1976; Douglas et al., 1982) and is now being reinvestigated with modern coupled models and improved data sets.

24. Some of this insensitivity was probably due to the model used, which was part of the early generation of general circulation models. Other models have since shown greater sensitivity to global SSTs.

25. Not too many years ago, only information north of 20N was included in almost all weather map displays.

26. NORPAX was an outgrowth of the Scripps North Pacific Studies started earlier by John Isaacs.

27. Namias often mentioned the time when someone came up to him after a lecture and congratulated him on following in his father's footsteps.

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