

**Edward N. Lorenz Papers**  
**A Finding Aid to the Collection in the Library of Congress**



**Manuscript Division, Library of Congress**  
**Washington, D.C.**  
**2020**

Contact information: <http://hdl.loc.gov/loc.mss/mss.contact>

Catalog Record: <https://lcn.loc.gov/mm2008085426>

Additional search options available at: <https://hdl.loc.gov/loc.mss/eadmss.ms013079>

Prepared by Manuscript Division Staff

Finding aid encoded by Library of Congress Manuscript Division, 2013  
Revised 2020 August

## Collection Summary

**Title:** Edward N. Lorenz Papers

**Span Dates:** circa 1895-2009

**Bulk Dates:** (bulk 1942-2000)

**ID No.:** MSS85426

**Creator:** Lorenz, Edward N.

**Extent:** 15,000 items

**Extent:** 44 containers plus 12 oversize

**Extent:** 17.6 linear feet

**Extent:** 1 microfilm reel

**Extent:** 1 artifact

**Extent:** 4,775 digital files (2.419 GB)

**Language:** Collection material in English

**Location:** Manuscript Division, Library of Congress, Washington, D.C.

**LC Catalog record:** <https://lccn.loc.gov/mm2008085426>

**Summary:** Meteorologist and mathematician. Correspondence, articles, scientific papers, speeches, presentations, photographs, data and data visualizations in both physical and digital formats. Material in physical format also includes military records, subject files, and book files. Material in digital format also includes games and sound recordings. The collection documents Lorenz's activities as a meteorology professor and his discovery of deterministic chaos.

## Selected Search Terms

The following terms have been used to index the description of this collection in the LC Catalog. They are grouped by name of person or organization, by subject or location, and by occupation and listed alphabetically.

### People

Arakawa, Hidetoshi, 1907-1984--Correspondence.  
Blackmon, Maurice L., 1940-2012--Correspondence.  
Blumen, William, 1931-2002--Correspondence.  
Brier, Glenn W. (Glenn Wilson), 1913- --Correspondence.  
Chelam, E. V.--Correspondence.  
Craig, Richard A.--Correspondence.  
Davies, D. A.--Correspondence.  
Davies, Thomas Vivian--Correspondence.  
Dutton, John A. (John Altnow)--Correspondence.  
Enger, Isadore--Correspondence.  
Firor, John--Correspondence.  
Gates, W. Lawrence (William Lawrence), 1928- --Correspondence.  
Ghil, Michael--Correspondence.  
Gleick, James--Correspondence.  
Hare, F. Kenneth (Frederick Kenneth), 1919- --Correspondence.  
Held, Isaac M., 1948- --Correspondence.  
Hilborn, Robert C.--Correspondence.  
Houghton, Henry G.--Correspondence.  
Jordan, Charles L. (Charles Lemuel), 1922- --Correspondence.  
Kelley, Elizabeth A.--Correspondence.  
Klein, William H., 1919- --Correspondence.  
Kraus, E. B. (Eric Bradshaw), 1913- --Correspondence.  
Leith, Cecil E., 1923- --Correspondence.  
Lorenz, Edward N.  
MacDonald, Gordon J. (Gordon James), 1929-2002--Correspondence.  
Malone, Thomas F.--Correspondence.  
Mintz, Yale--Correspondence.

Muench, H. Stuart--Correspondence.  
Nordø, Jack, 1923- --Correspondence.  
Peixoto, José Pinto--Correspondence.  
Rasool, S. I., 1933- --Correspondence.  
Roberts, Walter Orr--Correspondence.  
Schereschewsky, P. L.--Correspondence.  
Sellers, William D.--Correspondence.  
Shorr, Bernard--Correspondence.  
Smagorinsky, J. (Joseph)--Correspondence.  
Spengler, Kenneth C., 1915-2010--Correspondence.  
Thompson, Philip Duncan--Correspondence.  
Trenberth, Kevin E.--Correspondence.  
Yorke, James A.--Correspondence.

### **Organizations**

Massachusetts Institute of Technology.  
Massachusetts Institute of Technology. Department of Meteorology and Physical Oceanography.  
United States. Army Air Forces.

### **Subjects**

Chaotic behavior in systems.  
Climatology--Data processing.  
Climatology--Mathematical models.  
Deterministic chaos.  
Long-range weather forecasting.  
Meteorology in aeronautics.  
Meteorology--Data processing.  
Meteorology.  
Numerical weather forecasting.  
Weather forecasting.

### **Occupations**

Educators.  
Mathematicians.  
Meteorologists.

## **Acquisition Information**

The papers of Edward N. Lorenz were given to the Library of Congress by his children, Cheryl A. Lorenz, Nancy J. Lorenz, and Edward H. Lorenz, in 2008, Kerry A. Emanuel in 2009, and Robert C. Hilborn in 2014.

## **Custodial History**

A Delta Dimension XPS R450 computer, labeled "Edward Lorenz, work@home, 1999-2001", was received as a part of the Edward N. Lorenz papers. The computer was not solely used by Lorenz. Examination of the computer indicates the computer was in use after his death until approximately 2008 by multiple individuals including his son, Edward H. Lorenz.

## **Processing History**

The paper portion of the collection was arranged and described in 2012 by Joseph K. Brooks with the assistance of Brian McGuire and Jewel McPherson. Digital files and a small paper addition were arranged and described in 2018 by Kathleen O'Neill. The description of digital files in the finding aid was updated in 2020 by Kathleen O'Neill

Digital files were received as part of the Edward N. Lorenz papers on a variety of storage media, each of which was assigned a unique digital ID number. Use the digital ID number to request access copies of the files associated with each media. A description of the standard processes taken on all born digital files can be found in the Processing History Note: Born Digital Collection Material at <https://hdl.loc.gov/loc.mss/eadmss.digital>.

Additional processes on the Delta Dimension XPS R450 computer include creating a disk image, extracting files from the image, and removing empty files, temporary files, and extraneous program files.

Files were scanned for viruses before being saved to long-term storage. Positive virus results occurred during a scan of Lorenz's computer files (digital ID mss85426\_047\_001). Five files were quarantined and removed.

## Additional Description

A complete list of digital files in this collection can be found in [Appendix A: File Directory Listings](#).

## Transfers

Items have been transferred from the Manuscript Division to other custodial divisions of the Library. Some photographic slides and posters have been transferred to the Prints and Photographs Division. Audio cassettes, VCR tapes, and a phonograph record have been transferred to the Motion Picture, Broadcasting, and Recorded Sound Division. All transfers are identified in these divisions as part of the Edward N. Lorenz Papers. Patrons are encouraged to contact these divisions in advance of a research visit.

## Copyright Status

Copyright in the unpublished writings of Edward N. Lorenz in these papers and in other collections of papers in the custody of the Library of Congress has been dedicated to the public.

## Access and Restrictions

The papers of Edward N. Lorenz are open to research. Researchers are advised to contact the Manuscript Division Reading Room prior to visiting. Many collections are stored off-site and advance notice is needed to retrieve these items for research use. Access to digital content is available onsite only in the Manuscript Reading Room and requires advanced notice. Consult reference staff in the Manuscript Division for more information.

## Physical Characteristics and Technical Requirements

Digital content in the Lorenz papers was created primarily in a Windows 98 operating system. The bulk of the files are image, web page, and text files accessible with file viewers and sound files accessible with open source audio players. Math Reader 5.0 or Wolfram CDF Player can be used to access and run Mathematica graphs embedded in the paper by Robert J. Lurie (digital ID mss85426\_059\_005). DOSBox was used to access and run most of the chaos theory data visualization software. The software from digital ID mss85426\_059\_003 and digital ID mss85426\_060\_002 was opened in DOSBox, however, the software did not respond to inputs. The web page with animation (digital ID mss85426\_059\_001) mostly likely needs Java version J2SE 5.0 and Netscape 3.0 to render properly. An 8" floppy disk and a 1" computer tape, labeled "Passed NCAR Test Limits," are currently unprocessed due to lack of required hardware and not available for research. Email, though currently unprocessed and unavailable, can be accessed in Outlook or viewed with a file viewer tool.

## Microfilm

Microfilm on one reel was received as part of the papers of Edward N. Lorenz and is listed and described in this finding aid. This microfilm is not available for interlibrary loan.

## Preferred Citation

Researchers wishing to cite this collection should include the following information: Container, reel number, or digital ID number, Edward N. Lorenz Papers, Manuscript Division, Library of Congress, Washington, D. C.

## Biographical Note

Date	Event
1917, May 23	Born, West Hartford, Conn.
1938	A.B. in mathematics, Dartmouth College, Hanover, N.H.
1940	A.M. in mathematics, Harvard University, Cambridge, Mass.
1942-1946	Weather forecaster, United States Army Air Forces
1948	Sc.D in meteorology, Massachusetts Institute of Technology, Cambridge, Mass. Married Jane Loban
1955-1956	Assistant professor of meteorology, Massachusetts Institute of Technology, Cambridge, Mass.
1961	Discovered deterministic chaos while working with computer models of weather systems
1956-1962	Associate professor of meteorology, Massachusetts Institute of Technology, Cambridge, Mass.
1962-1987	Professor of meteorology, Massachusetts Institute of Technology, Cambridge, Mass.
1977-1981	Head, Department of Meteorology and Physical Oceanography, Massachusetts Institute of Technology, Cambridge, Mass.
1981-1987	Emeritus status, Massachusetts Institute of Technology, Cambridge, Mass.
1983	Awarded Crafoord Prize, Stockholm, Sweden
1987	Retired, Massachusetts Institute of Technology, Cambridge, Mass.
1991	Awarded Kyoto Prize, Kyoto, Japan
2008, Apr. 16	Died, Cambridge, Mass.

## Scope and Content Note

The papers of Edward Norton Lorenz (1917-2008) span 1895-2009 with the bulk of the collection dating from 1942 to 2000. Lorenz's early academic background was in mathematics, but during World War II he trained as a meteorologist with the United States Army Air Forces and continued in that profession through a long career at the Massachusetts Institute of Technology, where he eventually rose to head the Department of Meteorology and Physical Oceanography. Late in 1961, while working with computer models of weather systems, he had the insight that led to his promulgation of the deterministic chaos theory that had a profound effect on the physical sciences and other fields such as economics. The papers are arranged in nine series: [Correspondence](#), [Science File](#), [Organizations](#), [Speeches and Writings](#), [Digital Files](#), [Miscellany](#), [Addition](#), [Oversize](#), and [Artifact](#).

Much of the [Correspondence](#) series is the product of the Massachusetts Institute of Technology meteorology department or of projects Lorenz managed under the aegis of the department, so correspondence, especially in the earlier years, is sometimes between parties other than Lorenz. Much of the Correspondence relates to professional tasks such as organizing conferences, job recommendations for students and colleagues, speaking engagements and professional travel, requests for reprints of papers, and personnel matters. Topics covered in the correspondence include chaos theory, computer programming for weather and climate modeling, long-range weather prediction, and numerically based weather forecasting. Correspondents include Hidetoshi Arakawa, Maurice L. Blackmon, William Blumen, Glenn W. Brier, E. V. Chelam, Richard A. Craig, D. A. Davies, Thomas Vivian Davies, John A. Dutton, Isadore Enger, John Firor, W. Lawrence Gates, Michael Ghil, James Gleick, F. Kenneth Hare, Isaac M. Held, Henry G. Houghton, Charles L. Jordan, Elizabeth A. Kelley, William H. Klein, E. B. Kraus, Cecil E. Leith, Gordon J. MacDonald, Thomas F. Malone, Yale Mintz, H. Stuart Muench, Jack Nordø, José Pinto Peixoto, S. I. Rasool, Walter Orr Roberts, P. L. Schereschewsy, William D. Sellers, Bernard Shorr, J. Smagorinsky, Kenneth C. Spengler, Philip Duncan Thompson, Kevin E. Trenberth, and James A. Yorke.

The [Correspondence](#) series also includes files copied from storage media found within the general correspondence during the course of processing. The contents include chaos theory data visualization software from James A. Yorke and a web page and powerpoint presentation from John A. Dutton.

The [Science File](#) includes chart records and computer readouts documenting Lorenz's discovery of the chaos phenomenon in which infinitesimal differences in data inputs yield wildly divergent results in the predictions of the behavior of chaotic systems such as the weather. He proved that accurate weather forecasting outside of a small time increment, perhaps as narrow as one week, was impossible even with constantly improving measuring and computer technology.

The [Organizations](#) series documents Lorenz's early experiences as a weather forecaster in the Army Air Forces and his career at the Massachusetts Institute of Technology.

The [Speeches and Writings](#) series primarily contains scientific papers and both overhead and slide presentations. The series also includes bibliographies, reviews, and materials relating to Lorenz's books *The Essence of Chaos*, *A Method of Applying the Hydrodynamic and Thermodynamic Equations to Atmospheric Models*, and *The Nature and Theory of the General Circulation of the Atmosphere*.

The [Speeches and Writings](#) series also includes digital files copied from storage media found within the paper files during the course of processing. The series also includes scans of Lorenz's published papers, chaos theory data visualization software from James A. Yorke and a paper entitled, "A Review and Demonstration of The Essence of Chaos by Edward N. Lorenz" by Robert M. Lurie. This paper contains embedded graphs created with a *Mathematica* program.

The [Digital Files](#) series contains chaos theory and strange attractor data visualization software, computational software and accompanying data files, presentations, text files, audio files, games, and email. The digital files were copied from storage media found independent of the paper files. In instances where digital materials were found with the collection's paper content, the digital materials are listed and described alongside the paper.

The [Miscellany](#) includes biographical material and files relating to his awards including the Crafoord and Kyoto prizes.

The [Addition](#) contains correspondence primarily between Robert C. Hilborn and Edward N. Lorenz concerning Hilborn's efforts to ascertain the origin of the term "butterfly effect." Other correspondents include P.G. Drazin, Philip Merilees, and Heinz Georg Schuster. The series also contains a 1972 speech given by Lorenz wherein he first uses the term "butterfly effect" and Hilborn's paper, "Sea gulls, butterflies, and grasshoppers: A brief history of the butterfly effect in nonlinear dynamics," published in 2004.

The remaining series includes [Oversize](#) and [Artifact](#) material.

## Arrangement of the Papers

The collection is arranged in nine series:

- [Correspondence, 1952-2009](#)
- [Science File, 1961-1996](#)
- [Organizations, 1942-2003](#)
- [Speeches and Writings, 1941-2008](#)
- [Digital Files, 1987-2008](#)
- [Miscellany, circa 1895-2008](#)
- [Addition, 1990-2004](#)
- [Oversize, 1937-2008](#)
- [Artifact, circa 1961](#)

## Description of Series

<b>Container</b>	<b>Series</b>
BOX 1-13	<p><b><u>Correspondence, 1952-2009</u></b></p> <p>Professional and personal correspondence. Includes digital files copied from storage media found in the correspondence during the course of processing. Digital content include chaos theory data visualization software, web pages, and a presentation.</p> <p>Arranged in three groupings: professional, general, and postcard and greeting card files, the professional file is in reverse chronological order and the general correspondence and postcard and greeting card files are in regular chronological order. Digital files are listed according to the box and folder in which the storage media was filed. Files structures were maintained as received.</p>
BOX 14-15	<p><b><u>Science File, 1961-1996</u></b></p> <p>Computer printouts, computer graphics, computer programs, chart records, drawings, conference material, printed matter, notes, photographs, and miscellaneous material.</p> <p>Arranged alphabetically by type of material or topic.</p>
BOX 15-18	<p><b><u>Organizations, 1942-2003</u></b></p> <p>Military personnel records, subject files, contracts, proposals, teaching files, printed matter, material relating to World War II reunions, and miscellaneous material.</p> <p>Arranged alphabetically by name of organization.</p>
BOX 19-39	<p><b><u>Speeches and Writings, 1941-2008</u></b></p> <p>Articles, scientific papers, book files, speech files, overhead and slide presentations, reviews, bibliographies, and digital files including chaos theory data visualization software. The digital files were copied from storage media found within the paper files in the course of processing.</p> <p>Arranged alphabetically by type of material. Digital files are listed according to the box and folder in which the storage media was filed. Files structures were maintained as received.</p>
DF	<p><b><u>Digital Files, 1987-2008</u></b></p> <p>Chaos theory and strange attractor data visualization software, computational software and accompanying data files, presentations, text documents, audio files, games, and email. The digital files were copied from storage media found independent of the paper files including Lorenz's personal computer and a variety of disks. In instances where digital materials were found with the collection's paper content, the digital materials are listed and described alongside the paper records.</p> <p>File structure is largely maintained as received. Listed chronologically.</p>
BOX 39-44	<p><b><u>Miscellany, circa 1895-2008</u></b></p> <p>Awards, biographical material, photographs, printed matter, high school yearbook and other material relating to Lorenz's grade school and undergraduate education.</p> <p>Arranged alphabetically by type of material or topic.</p>
BOX 44	<p><b><u>Addition, 1990-2004</u></b></p> <p>Correspondence primarily between Robert C. Hilborn and Edward N. Lorenz concerning Hilborn's efforts to ascertain the origin of the term "butterfly effect." The series also includes a 1972 speech by Lorenz, and published paper by Hilborn</p> <p>Arranged alphabetically by name.</p>

BOX OV 1-OV 13

**Oversize, 1937-2008**

Awards, card indexes, computer graphics, computer printouts, chart records, photographs, and poster.

Arranged and described according to the series, containers, and folders from which the material was removed.

BOX VA 1

**Artifact, circa 1961**

Chart record.

Arranged and described according to the series, containers, and folders from which the item was removed.



# Container List

<b>Container</b>	<b>Contents</b>
<b>BOX 1-13</b>	<b>Correspondence, 1952-2009</b> Professional and personal correspondence. Includes digital files copied from storage media found in the correspondence during the course of processing. Digital content include chaos theory data visualization software, web pages, and a presentation. Arranged in three groupings: professional, general, and postcard and greeting card files, the professional file is in reverse chronological order and the general correspondence and postcard and greeting card files are in regular chronological order. Digital files are listed according to the box and folder in which the storage media was filed. Files structures were maintained as received.
<b>BOX 1</b>	Professional
<b>BOX 1</b>	1952-1963 (5 folders)
<b>BOX 2</b>	1964-1969 (7 folders)
<b>BOX 3</b>	1971-1970 (6 folders)
<b>BOX 4</b>	1974-1977 (6 folders)
<b>BOX 5</b>	1978-1982 (9 folders)
<b>BOX 6</b>	1983-1984 (6 folders)
<b>BOX 7</b>	1985-1986 (5 folders)
<b>BOX 7</b>	1987 (2 folders)
<b>BOX 8</b>	(1 folder)
<b>BOX 8</b>	1988-1989 (4 folders)
<b>BOX 8</b>	1990 (1 folder)
<b>BOX 9</b>	(1 folder)
<b>BOX 9</b>	1991 (2 folders)
<b>BOX 9</b>	1992 (2 folders)
<b>BOX 10</b>	(1 folder)
<b>BOX 10</b>	1993-1994 (5 folders)
<b>BOX 10</b>	1995 (1 folder)
<b>BOX 11</b>	(1 folder)

## Correspondence, 1952-2009

Container	Contents
BOX 11	1996-2003 (6 folders)
BOX 12	2004-2009 (5 folders)
BOX 13	General, 1955-2008, undated (3 folders) Attachments to correspondence included a 5.25" floppy disk and a CD-R. Digital files files copied from these media are described below. Yorke, James A., "Dynamics 12/85 with Lyap. This computes up to 3 exponents for process #6," data visualization software, 1985 <b>Digital ID:</b> mss85426_059_003 Dutton, John A., "Fundamental Theorem," lecture, presentation, and web page, 2005 <b>Digital ID:</b> mss85426_059_001
BOX 13	Postcards and greeting cards, 1957-2008, undated (2 folders)
BOX 14-15	<b>Science File, 1961-1996</b> Computer printouts, computer graphics, computer programs, chart records, drawings, conference material, printed matter, notes, photographs, and miscellaneous material. Arranged alphabetically by type of material or topic.
BOX 14	Computer graphics, chart records, and drawings
BOX 14	Miscellaneous, 1979-1991, undated <i>See also Oversize</i> (2 folders)
BOX 14	Moist model runs, 1981
BOX 14	"Chaos 25 Years Ago," chart record, circa 1961 <i>See Artifact</i>
BOX 14	"Some Strange Birds . . .," display, undated <i>See Oversize</i>
BOX 14	Computer printouts, 1961-1987 <i>See Oversize</i>
BOX 14	Computer programs, 1974, 1980
BOX 14	Conferences, 1963-2003
BOX 14	Notes, undated (2 folders)
BOX 15	Photographs, undated
BOX 15	Printed matter, 1963, 1996
BOX 15	Toronto Pearson International Airport, Canada, weather data, 1970-1972 <i>Available only on microfilm. Shelf no. 23,490</i>
BOX 15	Royal McBee Corp., computer, 1958-1961
BOX 15-18	<b>Organizations, 1942-2003</b> Military personnel records, subject files, contracts, proposals, teaching files, printed matter, material relating to World War II reunions, and miscellaneous material. Arranged alphabetically by name of organization.
BOX 15	Massachusetts Institute of Technology, Cambridge, Mass.
BOX 15	Charney, Jule G.
BOX 15	Interviews, 1982-1986 (3 folders)
BOX 15	Miscellany, 1967, 1981-1986

## Organizations, 1942-2003

### Container

### Contents

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BOX 15	Scientific papers presented in his honor, 1983 (1 folder)
BOX 16	(1 folder)
BOX 16	Contracts and proposals
BOX 16	Department of Commerce, 1966-1969
BOX 16	Miscellaneous, 1963, 1976-1977, 1988
BOX 16	National Science Foundation, 1968-2000
BOX 16	United States Air Forces, 1955-1968, 1985-1987, undated (5 folders)
BOX 17	United States Navy, 1951-1956 (2 folders)
BOX 17	Curry, James H., 1978-1988
BOX 17	Miscellany, 1977-2003
BOX 17	Phone lists, 1887, 1997
BOX 17	Printed matter, 1977-1988, 1987, 1991
BOX 17	Retirement, 1987
BOX 17	Teaching file
BOX 17	Class 19.962, 1983-1984
BOX 17	Miscellany
BOX 17	1959-1981 (2 folders)
BOX 18	1984-1991
BOX 18	Miscellaneous, 1955, 1977-1979
BOX 18	National Academy of Sciences, 1972-1973, 2006
BOX 18	Society of Industrial and Applied Mathematics, 1979
BOX 18	United States Army Air Forces, World War II service
BOX 18	Miscellany, 1942-1954 (3 folders)
BOX 18	Reunions, 1942, 1978-1996 (2 folders)
BOX 19-39	<b>Speeches and Writings, 1941-2008</b> Articles, scientific papers, book files, speech files, overhead and slide presentations, reviews, bibliographies, and digital files including chaos theory data visualization software. The digital files were copied from storage media found within the paper files in the course of processing. Arranged alphabetically by type of material. Digital files are listed according to the box and folder in which the storage media was filed. Files structures were maintained as received.
BOX 19	By Lorenz
BOX 19	Articles
BOX 19	Alphabetical file
BOX 19	“An Alternative Layered Model,” undated
BOX 19	“Application of the Angular Momentum Principle to Cyclones,” 1952
BOX 19	“An Attractor Embedded in the Atmosphere,” undated
BOX 19	“Atmospheric Predictability Experiments with a Large Numerical Model,” 1982
BOX 19	“Atmospheric Predictability: Do We Have a Mathematical Theory?,” undated
BOX 19	“Atmospheric Predictability: The Formulation of a Theory,” undated

## Speeches and Writings, 1941-2008

### Container

### Contents

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BOX 19	“Attractor Sets and Quasi-Geostrophic Equilibrium,” 1980
BOX 19	“Available Energy in a Moist Atmosphere,” undated
BOX 19	“Available Potential Energy and the Maintenance of the General Circulation,” 1954
BOX 19	“Barotropic Instability of Rossby-Wave Motion,” undated
BOX 19	“Can Chaos and Intransitivity Lead to International Variability,” undated
BOX 19	“Chaos and Climate,” 1993-1994
BOX 19	“Chaos and the Limitations to Prediction,” undated
BOX 19	“Chaos and Weather Prediction,” 1991
BOX 19	“The Circulation of the Atmosphere,” undated
BOX 19	“Climate Is What You Expect,” undated
BOX 19	“Climate Sensitivity and long-Period Temperature Fluctuations,” 1987
BOX 19	“Computational Chaos—a Prelude to Computational Instability,” 1988
BOX 19	“Computational Periodicity as Observed in a Simple System,” undated
BOX 19	“Compound Windows on the Hénon-Map,” undated
BOX 19	“Construction of a 3-Component G. C. M.,” undated
BOX 19	“Designing chaotic Models,” 2004
BOX 19	“Deterministic and Stochastic Aspects of Atmosphere Dynamics,” 1987
BOX 19	“Deterministic Nonperiodic Flow,” 1963
BOX 19	“Dimensionality of Weather and Climate Attractors,” undated
BOX 19	“Dynamical Systems with Strange Attractors and Strange Repellers,” undated
BOX 19	“Effects of Analysis and Model Errors on Routine Weather Forecasts,” undated
BOX 20	“Energetics of Atmosphere Circulation,” undated
BOX 20	“Energy and Numerical Weather Prediction,” 1960
BOX 20	“Entropy as a Measure of Atmospheric Uncertainty,” undated
BOX 20	“Estimates of Atmospheric Predictability at Medium Range,” undated
BOX 20	“Evolution of Dynamic Meteorology,” undated
BOX 20	“Expected Inverses of Covariance Matrices,” undated
BOX 20	“An Experiment in Nonlinear Statistical Weather Forecasting,” 1976
BOX 20	“The Feasibility of a Low-Order Model of Moist General Circulation,” 1980
BOX 20	“Formulation of a Low-Order Model of a Moist General Circulation,” 1984
BOX 20	“Fluid Models in Geophysics,” 1953
BOX 20	“Forecast for Another Century of Weather Progress,” undated
BOX 20	“The Future Quality of Weather Forecasting,” 1969
BOX 20	“The General Circulation of the Atmosphere: An Evolving Problem,” 1991
BOX 20	“Generation of Available Potential Energy and the Intensity of the General Circulation,” 1955
BOX 20	“A Generalization of the Dirac Equations,” 1941
BOX 20	“The Growth of Errors in Prediction,” 1985
BOX 20	“A History of Prevailing Ideas about the Circulation of the Atmosphere,” undated
BOX 20	“How Complicated Is the Circulation of the Earth's Atmosphere,” undated
BOX 20	“How Good Can Weather Forecasting Become? The Start of a Theory,” undated
BOX 20	“The Index Cycle Is Alive and Well,” undated
BOX 20	“The Interaction between a Mean Flow and Random Disturbances,” 1952
BOX 20	“Investigations of Atmospheric Predictability,” undated
BOX 20	“Large-Scale Motions of the Atmosphere: Circulation,” undated
BOX 20	“The Local Structure of a Chaotic Attractor,” 1983

## Speeches and Writings, 1941-2008

Container	Contents
BOX 20	“A Look at Some Details of the Growth of Initial Uncertainties,” undated
BOX 20	“Low Order Models Representing Realizations of Turbulence,” 1971
BOX 20	“Lyapunov Numbers and the Local Structure of Attractors,” 1984
BOX 21	“The Mathematical Basis of Climate,” undated
BOX 21	“The Mechanics of Vacillation,” 1963
BOX 21	“Model Bending,” undated
BOX 21	“The Nature of the Global Circulation of the Atmosphere: A Personal View,” 1970
BOX 21	“An N-Cycle Time Differencing Scheme for Stepwise Numerical Integration,” 1971
BOX 21	“A Nine-Variable Primitive-Equation Model with a Quadratic Energy Invariant,” undated
BOX 21	“Noisy Periodicity and Reverse Bifurcation,” 1980
BOX 21	“Nonlinearity, Weather Prediction, and Climate Deduction,” 1966
BOX 21	“A Note on Extended Range Predictability,” 1973
BOX 21	“Notes on Atmospheric Energy,” undated
BOX 21	“Notes on Numerical Solution on the Equations of Geophysics,” undated
BOX 21	“Numerical Simulations of Climatic Modifications,” 1970
BOX 21	“On the Nonexistence of a Slow Manifold,” 1987
BOX 21	“On the Possible Reasons for Long-Period Fluctuations of the General Circulation,” undated
BOX 21	“On the Prevalence of Aperiodicity in Simple Systems,” 1981
BOX 21	“On the Range of Atmospheric Predictability,” undated
BOX 21	“Optimal Sites for Supplementary Weather Observations: Simulations with a Small Model,” 1996
BOX 21	“Persistence of Atmospheric Circulation,” undated
BOX 21	“Predictability—A Problem Partly Solved,” 2006
BOX 21	“Predictability and Periodicity: A Review and Extension,” undated
BOX 21	“The Predictability of the Climate System,” undated
BOX 21	“The Predictability of Geophysical Phenomena,” undated
BOX 21	“The Predictability of Hydrodynamic Flow,” 1963
BOX 21	“The Predictability of Flow which Possesses Many Scales of Motion,” 1969
BOX 22	“The Problem of Deducing the Climate from the Governing Equations,” 1964
BOX 22	“The Prospects for Improved Weather Forecasting,” undated
BOX 22	“Prospects for Statistical Weather Forecasting,” 1959
BOX 22	“A Rapid Procedure for Inverting Del-Square with Certain Computers,” undated
BOX 22	Reflections on the Conception, Birth, and Childhood of Numerical Weather Prediction,” 2006
BOX 22	“A Route to Computational Chaos Revisited,” 1997
BOX 22	“Seasonal and Irregular Variations of the Northern Hemisphere Sea-Level Pressure Profile,” 1950
BOX 22	“A Simple System Exhibiting Long-Period Oscillations,” undated
BOX 22	“Simplified Dynamic Equations and Their Use in the Study of Atmospheric Predictability,” undated
BOX 22	“The Simplest Chaotic Hamiltonian System,” undated
BOX 22	“The Slow Manifold—What Is It,” undated
BOX 22	“Some Aspects of Atmospheric Predictability,” undated
BOX 22	“Some Comments on Climate and Climatic Change,” undated
BOX 22	“Some Reflections on the Arrival of Numerical Weather Prediction,” 2003

## Speeches and Writings, 1941-2008

Container	Contents
BOX 22	“The Statistical Prediction of Solutions of Dynamic Equations,” 1962
BOX 22	“Strange Attractors: Are They Still Strange,” undated
BOX 22	“Studies of Atmospheric Predictability,” 1969
BOX 22	“A Study of the Predictability of a 28-Variable Atmospheric Model,” 1965
BOX 22	“Three Approaches to Atmospheric Predictability,” undated
BOX 23	“A Two Level Two-Latitude Quasi-Geostrophic Model,” undated
BOX 23	“The Ubiquity of Chaos,” undated
BOX 23	“The Use of 'Rawin' Observations at High Levels in Synoptic and Statistical Research,” undated
BOX 23	“The Verification of Probability Forecasts,” undated
BOX 23	“A Very Narrow Spectral Band,” 1984
BOX 23	“What Is Climate,” 1994
BOX 23	Chronological file, 1953-2007 (4 folders)
BOX 23	Indexed reprints
BOX 23	Notebook 1, 1950-1979 (3 folders)
BOX 23	Notebook 2, 1980-1985
BOX 23	Bibliographies and lists of his writings, 1986, 2008 In addition to paper materials, the folder included one (1) optical disk. Digital files copied from this media are described below. Lorenz, Edward N., "Edward Norton Lorenz publications," scans of published works, 2008 <b>Digital ID:</b> mss85426_060_001
BOX 24	Books
BOX 24	<i>Essence of Chaos</i>
BOX 24	Miscellany, 1990-2006
BOX 24	Proofs, 1983 (5 folders)
BOX 24	Reviews, 1994-2006 In addition to paper materials, the folder included digital files on one (1) optical disk. Digital files copied from this media are described below. Lurie, Robert M., "Essence of Chaos Mathematica Program, 11/3/06," review and demonstration of "The Essence of Chaos," 2006 <b>Digital ID:</b> mss85426_059_005
BOX 24	<i>A Method of Applying the Hydrodynamic and Thermodynamic Equations to Atmospheric Models</i> , 1948
BOX 25	<i>Nature and Theory of the General Circulation of the Atmosphere</i> , 1967
BOX 25	Autographed edition
BOX 25	Drafts (3 folders)
BOX 25	Proofs
BOX 26	Overhead and slide presentations
BOX 26	Additions and subtractions, Seattle, Wash.
BOX 26	Analysis and model errors
BOX 26	“The Atmosphere as a Dynamic System”
BOX 26	“Can Chaos and Intransitivity Lead to Interannual Viability?”
BOX 26	Chaos and atmosphere predictability

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BOX 26	Chaos and intransitivity
BOX 26	Chaos and predictability
BOX 26	Chaos, I.A.P. course
BOX 26	Chaos, class-Rothman
BOX 26	Chaos, Cuomo
BOX 26	Chaos, computational (2 folders)
BOX 27	Chaos, miscellaneous (4 folders)
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BOX 27	Chaos, "Ubiquity of Chaos"
BOX 27	Chaos, unpredictability and strange attractors
BOX 27	Chaos, extra figures, butterfly effect
BOX 27	Chaos, yesterday and today
BOX 27	Climate chaos and predictability
BOX 27	Climate, duplicate figures
BOX 27	"Climate Is What You Expect"
BOX 27	Article
BOX 27	Overheads
BOX 27	Climate, miscellaneous (2 folders)
BOX 27	Climate predictability
BOX 27	Climate, spontaneous climatic changes
BOX 28	Colby College, Waterville, Maine
BOX 28	"Compound Windows of the Hénon Map"
BOX 28	Conference on Mechanisms of Interannual and Longer Term Climate Variations, Melbourne, Australia
BOX 28	Designing chaotic models
BOX 28	Designing chaotic systems
BOX 28	Dimension aims
BOX 28	E.A.P.S. symposium
BOX 28	European Centre for Medium-Range Weather Forecasting
BOX 28	Presentation
BOX 28	Seminar
BOX 28	Enhanced predictability
BOX 28	Fiftieth reunion
BOX 28	First Sloan workshop, Savannah, Ga.
BOX 28	Forecasting and nonlinearity
BOX 28	Fort Collins, Colo.
BOX 28	Generations, Reading, England
BOX 29	Global change
BOX 29	I.A.P. course (4 folders)
BOX 29	"Irregularity: A Fundamental Property of the Atmosphere"
BOX 29	"Low-Dimensional Weather and Climate Attractors"
BOX 29	Low order models
BOX 29	Lyapunov numbers

## Speeches and Writings, 1941-2008

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BOX 29	McGill University, Montreal, Quebec, Canada
BOX 29	Models
BOX 29	N-Var plus 3-var
BOX 29	National Center for Atmospheric Research, 1988, 1993 (2 folders)
BOX 29	New Haven, Conn., presentation
BOX 29	Nonlinear statistical weather prediction
BOX 30	“On the Existence of a Slow Manifold”
BOX 30	“Optimal Sites for Auxiliary Observations: A Low-Order Simulation”
BOX 30	Predictability
BOX 30	“Predictability in a System with Regimes”
BOX 30	Predictability meeting, La Jolla, Calif.
BOX 30	Predictability conference, Sigtuna, Sweden
BOX 30	Princeton University, Princeton, N.J.
BOX 30	Regimes
BOX 30	“Regimes in a Simple Dynamical System”
BOX 30	Savannah, Ga., presentation
BOX 30	Simple and complicated systems
BOX 30	Simple Hamiltonian Chaos
BOX 30	Slides
BOX 30	“Some Reflections on the Arrival of Numerical Weather Prediction”
BOX 30	Southern Connecticut State University, New Haven, Conn.
BOX 30	Special, Climate Research Division seminar
BOX 30	Strange attractors
BOX 31	Strange figures
BOX 31	Stein and Ulam
BOX 31	Theories of general circulation
BOX 31	Three-variable spectral Q-G channel model
BOX 31	Today
BOX 31	Toronto, Canada, presentation
BOX 31	Trade winds
BOX 31	Turbulence
BOX 31	Typical features
BOX 31	Uncertainty (2 folders)
BOX 31	Miscellaneous (7 folders)
BOX 32	(17 folders)
BOX 33	(19 folders)
BOX 34	(16 folders)
BOX 35	Reviews of scientific articles and proposals, 1965-1993
BOX 35	Speeches, 1949-2006, undated <i>See also Oversize</i> (7 folders)
BOX 35	Fragments, undated
BOX 36	By others
BOX 36	“A” miscellaneous, 1964, 1985
BOX 36	Bryan, Kirk W., 1957



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BOX 36	“B” miscellaneous, 1996, 2004
BOX 36	Charney, Jule G., 1949-1963
BOX 36	Christensen, R. A., 1981-1985
BOX 36	“C” miscellaneous, 1979-1991
BOX 36	Dabby, Diana S., 1996
BOX 36	“E” miscellaneous, 1980-1989, 2002
BOX 36	“F” miscellaneous, 1984, 2002
BOX 36	Gedzelman, Stanley David, 1991
BOX 36	Gleick, James, 1987
BOX 36	“G” miscellaneous, 1984, 1997, 2002
BOX 36	Hantel, Michael, 1998-2000
BOX 36	Haynes, Peter H., 1985-1987
BOX 36	Hicle, Raymond, 2000-2004
BOX 36	Hoffman, Ross N., 2000
BOX 37	“H” miscellaneous, 1984, 2001
BOX 37	“I-J” miscellaneous, 2001 (2 folders)
BOX 37	Kelly, Elizabeth A., 1958
BOX 37	Kravtsen, S., 2004
BOX 37	“K” miscellaneous, 1989, 2001
BOX 37	Lorenz, Ralph, 2001-2003
BOX 37	“L” miscellaneous, 1982-1987
BOX 37	Maloney, Eric D., 2000-2002
BOX 37	<i>McGraw-Hill Encyclopedia of Science and Technology</i> , 1993
BOX 37	McIntyre, Michael E., 1970
BOX 37	Mesinger, Fedor, 1995-1996
BOX 37	“M” miscellaneous, 2002-2004
BOX 37	Palmer, T. M., 1986, 2000
BOX 37	Peixoto, José Pinto, and Abraham Oort, <i>Physics of Climate</i> , 1989
BOX 38	Phillips, Norman A., undated
BOX 38	Poon, Chi-Sang, 2001
BOX 38	Pu, Zhao-Xia, 1996-1997
BOX 38	“P” miscellaneous, 1996
BOX 38	Qing-Cum, Zeng, 1980-1981
BOX 38	“R” miscellaneous, 1987
BOX 38	Salzman, Barry, 1961-1968
BOX 38	Schröder, W., 1948-1955, 1987
BOX 38	Segal, L. A., 1962
BOX 38	Smith, Leonard A.
BOX 38	Sreenivasan, K. R., 1984
BOX 38	Starr, Victor P., 1948-1974 (2 folders)
BOX 38	“S” miscellaneous, 1987-2005
BOX 39	Thompson, Philip Duncan, 1983-1984
BOX 39	“T” miscellaneous, undated
BOX 39	“V” miscellaneous, 1985

## Speeches and Writings, 1941-2008

Container	Contents
BOX 39	Washington, Warren, 1968-1970
BOX 39	Weiner, Jonathon, 1984
BOX 39	Weiner, Robert, 1953-1955
BOX 39	Weiss, N. D., 1981, 1987
BOX 39	“W” miscellaneous, 1982-2007
BOX 39	“Y” miscellaneous, 1987, 2004 In addition to paper materials, the folder included digital files on one (1) 5.25" floppy disk. Digital files files copied from this disk are described below. Yorke, James A., "Dynamics by J. Yorke, 11/16/1987," data visualization software, 1987 <b>Digital ID:</b> mss85426_060_002
BOX 39	Zupanski, Milija, 1997
BOX 39	Card indexes to works on meteorology, undated <i>See Oversize</i>
DF	<b>Digital Files, 1987-2008</b> Chaos theory and strange attractor data visualization software, computational software and accompanying data files, presentations, text documents, audio files, games, and email. The digital files were copied from storage media found independent of the paper files including Lorenz's personal computer and a variety of disks. In instances where digital materials were found with the collection's paper content, the digital materials are listed and described alongside the paper records. File structure is largely maintained as received. Listed chronologically.  "Edward Lorenz, work@home, 1999-2001," personal computer files, 1987-2008 <b>Digital ID:</b> mss85426_047_001 Files exported from a disk image of a Delta Dimension XPS R450 personal desktop computer labeled "Edward Lorenz, work@home, 1999-2001". The computer was in use until 2008 by multiple individuals including his son, Edward H. Lorenz. The content includes "The Attractor," a 2004 Windows application for visualizing strange attractor data. The software was developed by Robert Cornett under the supervision of Lorenz. Computational software applications include Absoft Fortran 77 and 90, and Microsoft FORTRAN PowerStation Version 1.0a. There are data files accompanying these programs. Printouts of some of this data can be found in the Science File series. Also included are text documents, games, image files, and scans of Lorenz's published papers as well as material by Lorenz's son, Edward H. Lorenz. Email <b>Digital ID:</b> mss85426_047_001_email Email files copied from Delta Dimension XPS R450 personal computer. Email files are currently unprocessed and unavailable. Page, Mike & Jim Holsapple, "IBM - Chaos Water Wheel, Kriebel," data visualization software created for Mahlon E. Kriebel, copied from a 5.25" floppy disk, 1990-1992 <b>Digital ID:</b> mss85426_060_003 Jackson, E. Atlee, "Demonstrations of Several Controls of the Rossler and Lorenz Systems," data visualization software, copied from a 3.5" floppy disk, 1991 <b>Digital ID:</b> mss85426_060_005 "In Memory of William Blumen, Fiske Planetarium, Sunday, April 28, 2002," audio files, 2002 <b>Digital ID:</b> mss85426_060_006
BOX 39-44	<b>Miscellany, circa 1895-2008</b> Awards, biographical material, photographs, printed matter, high school yearbook and other material relating to Lorenz's grade school and undergraduate education.

## Miscellany, circa 1895-2008

### Container

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Arranged alphabetically by type of material or topic.

BOX 39	Addresses and phone numbers, card file, undated <i>See Oversize</i>
BOX 39	Appointment books, 2006-2008
s BOX 39	Awards
BOX 39	Crafoord Prize, 1983
BOX 39	Elliott Cresson Medal, 1989-1992
BOX 39	Kyoto Prize, 1991
BOX 39	Bound ceremonial presentation <i>See Oversize</i>
BOX 39	Miscellany
BOX 39	News clippings
BOX 39	Program
BOX 39	Scrapbook <i>See Oversize</i>
BOX 40	Miscellaneous, 1943-2005 <i>See also Oversize</i>
BOX 40	Biographical material
BOX 40	Interviews, 1986-2000
BOX 40	Miscellany, 1917-2008
BOX 40	Childhood and early education
BOX 40	Chess, 1920, 1931-1934
BOX 40	Safety First match cover collection, circa 1925
BOX 40	<i>West Hill Gazette</i> , West Hartford, Conn., 1930
BOX 40	William H. Hall High School, West Hartford, Conn., 1934
BOX 40	Christmas greeting drawing "to Eddie," undated
BOX 40	Ericsson, Kerstin, affidavit of support, undated
BOX 40	Friends and family, 1928-2002
BOX 41	Lists, business and membership cards, ephemera, undated
BOX 41	Mountaineering, 1965-1980
BOX 41	Newspaper clippings, 1959-2005
BOX 41	Ninetieth birthday, 2007
BOX 41	Parkview Heights Elementary School, Lavista, Nebr., letters, 2007
BOX 41	Passports and other travel documents, 1957-1987
BOX 41	Photographs
BOX 41	Exhibit photographs of Lorenz and his family, undated <i>See Oversize</i>
BOX 41	Lorenz and others
BOX 41	circa 1895-2007 <i>See also Oversize</i>
BOX 42	Undated
BOX 42	Lorenz portraits, circa 1934-1999
BOX 42	Others, circa 1940, 1981-2007, undated
	(2 folders)
BOX 42	Scenic and documentary photographs
BOX 42	Floods and snow storms, circa 1930-circa 1939
BOX 42	Miscellaneous, 1936-circa 2005
	(3 folders)
BOX 43	Honeymoon, 1948
BOX 43	Negatives, undated
BOX 43	Printed matter, 1957, 1979-1980, 1987-2006
	(2 folders)

## Miscellany, circa 1895-2008

Container	Contents
BOX 43	Sudoku puzzle books, 2005-2006
BOX 43	University education and honorary degrees
BOX 43	Dartmouth College, Hanover, N.H.
BOX 43	1934-1938
BOX 44	1938, 1963, 1981, 1992
	Miscellany, 1941, 1948, 1988-2003
BOX 44	<b>Addition, 1990-2004</b> Correspondence primarily between Robert C. Hilborn and Edward N. Lorenz concerning Hilborn's efforts to ascertain the origin of the term "butterfly effect." The series also includes a 1972 speech by Lorenz, and published paper by Hilborn Arranged alphabetically by name.
BOX 44	Hilborn, Robert C., correspondence, 1990-1992, 2004
BOX OV 1-OV 13	<b>Oversize, 1937-2008</b> Awards, card indexes, computer graphics, computer printouts, chart records, photographs, and poster. Arranged and described according to the series, containers, and folders from which the material was removed.
BOX OV 1	Science File Computer graphics, chart records, and drawings Miscellaneous, undated (Container 14)
BOX OV 2	"Some Strange Birds . . .," display, undated (Container 14)
BOX OV 3-OV 6	Computer printouts, 1961-1989, undated (Container 14)
BOX OV 7	Speeches and Writings By Lorenz Speeches Poster, "Ubiquity of Chaos," University of South Carolina, Columbia, S.C. (Container 35)
BOX OV 8	Card indexes to works on meteorology No. 1, undated (Container 39)
BOX OV 9	No. 2, undated (Container 39) Miscellany Addresses and phone numbers card file, undated (Container 39)
BOX OV 10	Awards Kyoto Prize Bound ceremonial presentation, 1991 (Container 39) Scrapbook, 1991 (Container 39)
BOX OV 11	Miscellaneous, 1937-2008 (Container 40)
BOX OV 12	Photographs Exhibit photographs of Lorenz and his family, undated (Container 41) Lorenz with others "Army Air Force Training Detachment M.I.T.," 1942 (Container 41)
BOX VA 1	<b>Artifact, circa 1961</b> Chart record.

**Artifact, circa 1961**

**Container**

**Contents**

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Arranged and described according to the series, containers, and folders from which the item was removed.

**BOX VA 1**

“Chaos 25 Years Ago,” chart record, circa 1961 (Container 14)

## Appendix A: File Directory Listings

The attached [PDF file](#) lists the digital ID number, the series, storage media format (e.g 3.5" floppy, DVD, etc.), media label information, and a file directory listing for each storage media. The file directory listing includes the file names and paths, date and time stamps, and the number of bytes for each file.

Digital files in the Edward N. Lorenz papers were copied from a variety of storage media. Each storage media was assigned a unique digital ID number. Access to digital content is available onsite only in the Manuscript Reading Room and requires advance notice. Use the digital ID number to request access copies of the files; consult reference staff in the Manuscript Division for more information.