

Crawford H. Greenewalt papers, 1951-1993

ANSP.2010.010

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April 23, 2012

Describing Archives: A Content Standard

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Summary Information

Repository	Academy of Natural Sciences, Philadelphia
Creator	Greenewalt, Crawford H., 1902-1993
Title	Crawford H. Greenewalt papers
Date [inclusive]	1951-1993
Extent	23.6 Linear feet 40 containers
Language	English
Abstract	Crawford Hallock Greenewalt (1902-1993) was a chemical engineer and the President of the DuPont Company from 1948 to 1962. He had a passion for the natural sciences, and combined his love of ornithology with photography. He was especially known for his high speed photographs of hummingbirds. His ornithological interests included bird songs, the radiance of hummingbird feathers and the evolution of shapes and sizes of birds in relation to their flight abilities. The Crawford H. Greenewalt papers document Greenewalt's personal study of ornithology, primarily his work on hummingbirds. The collection dates from 1951 to 1993 and consists primarily of photographs taken by Greenewalt, and technical data collected by Greenewalt. The images photographed by Greenewalt exist in many different formats throughout the collection, including prints, negatives, and slides. The technical data in this collection represents Greenewalt's research into the physiology of hummingbirds, and the development of his high-speed photographic technique. In addition to Greenewalt's research material, this collection houses drafts and edits of some of Greenewalt's original publications. The collection also includes awards, certificates, honorary degrees and some camera equipment.

Preferred Citation note

[Description and date of item], [Box/folder number], 2010.010, Crawford H. Greenewalt papers, 1951-1993, Academy of Natural Sciences, Philadelphia.

Historical note

Crawford Hallock Greenewalt (1902-1993) was a chemical engineer and the President of the DuPont Company from 1948 to 1962. He had a passion for the natural sciences, and combined his love of ornithology with photography. He was especially known for his high speed photographs of hummingbirds. His ornithological interests included bird songs, the radiance of hummingbird feathers and the evolution of shapes and sizes of birds in relation to their flight abilities.

Born August 16, 1902 in Cummington, Massachusetts, Crawford H. Greenewalt was the son of Frank Lindsay and Mary Elizabeth Hallock Greenewalt. He graduated from William Penn Charter School in Philadelphia and earned a BS in chemical engineering from Massachusetts Institute of Technology (MIT) in 1922.

Immediately after graduating from MIT, Greenewalt began a life long career with the DuPont Company. He began working as a control chemist in the Philadelphia Works of the Paint, Lacquer and Heavy Chemicals Department, moved to Central Research and Development Department and was assigned to the Experimental Station, of which he became, in 1939, the assistant director. In January of 1942, he was elected director of the DuPont Company.

During World War II, the DuPont Company was recruited by General Leslie R. Groves (1896-1970) to participate in the war effort. Greenewalt was on the Reviewing Committee, which was charged with investigating the atomic bomb. Greenewalt "was technical director of the DuPont plutonium plant at Hansford, Washington ... and witnessed the first controlled atomic reaction at the University of Chicago stadium," (*Auk*). His involvement with the Manhattan Project required him to work as a liaison between the University of Chicago physicists, such as J. Robert Oppenheimer and Enrico Fermi, and the DuPont engineers and construction crews.

In 1945, he became the assistant director of the Development Department, and, later that year, the Assistant General Manager of the Pigments Department. Greenewalt was elected as Vice President of the DuPont Company on May 19, 1947 and as President of the DuPont Company on January 19, 1948. He served as president from 1948 to 1962. He served as a board chairman from 1962 to 1967 and as chairman of the Finance Committee from 1962 to 1973. Greenewalt "played major roles in the development of nylon and in the birth of DuPont's atomic energy program," (MIT). He is credited with "build[ing] basic research strength, making [DuPont] one of the strongest science-based companies in the world," (MIT).

In addition to his success at DuPont, Greenewalt was also highly successful in the fields of ornithology and photography. Greenewalt photographed his first hummingbird in 1953 in Delaware. In his book, *Hummingbirds*, he writes; "I had read of the hummingbird's extremely rapid wing beat and was interested primarily in seeing whether a technique I had developed for photographing small birds in flight would produce satisfactory results with these darting acrobats. To my surprise, wing action was adequately 'stopped' and the pictures were charming and much admired. So it was I caught hummingbird fever," (Greenewalt, p. ix). According to *Academy News*, Greenewalt, "unraveled secrets of song production by birds, of the structural basis of vivid hummingbird colors, of the evolution of shapes and

sizes of birds in relation to their flight abilities, particularly the understanding of the energy requirements of the rapid movements of a hummingbird's wings which appear to most as a hazy blur," (*Academy News*).

Greenewalt wrote in his book, *Bird song: Acoustics and Physiology*, "Since I cannot qualify as an ornithologist, an acoustical physicist, or as an expert on modern instrumentation, I have had to solicit much assistance in all three categories. . . ." (Greenewalt). However, ornithology was more than hobby and Greenewalt "devised photographic equipment to determine ... rate of acceleration to flight speed ... [and] in cooperation with the late Harold E. Edgerton of the Massachusetts Institute of Technology and engineers of the DuPont company ... developed high-speed photography capable of 'freezing' the rapid wing beats of hummingbirds," (*Auk*). He has made significant contributions to stop-action and time-lapse photography.

His enthusiasm as a naturalist brought about his involvement with the Academy of Natural Sciences. Greenewalt served on the Board of Trustees for the Academy of Natural Sciences from 1940 to 1966 and as an honorary from 1966 till his death. In 1951, the Atomic Energy Commission enlisted DuPont to construct a plutonium production plant on the Savannah River in South Carolina. Greenewalt was concerned about the environmental impact and worked with the Academy of Natural Sciences botanist and limnologist, Ruth Patrick to study the condition of the water and assess the effects of the proposed plant on the ecosystem. Patrick was appointed to DuPont's Board of Trustees and Greenewalt would not build the plant without the Academy's approval.

In 1979, Greenewalt worked with the Academy's Director of Ornithology, Frank Gill to establish the Visual Resources of Ornithology (VIREO), which is the Academy of Natural Science's world-wide bird photograph collection, and has become the world's most comprehensive collection of ornithological images. Greenewalt's photographs were the seed collection for the project. He also provided VIREO with an endowment.

Greenewalt is the author of three monograph works: *The Uncommon Man: the Individual in the Organization*, published in 1959; *Hummingbirds*, published in 1960; and *Birdsong: Acoustics and Physiology*, published in 1968. He also authored numerous articles in a variety of publications, such as National Geographic and the Transactions of the American Philosophical Society. He served as: a member of the Academy of Natural Sciences, the president of the American Philosophical Society, a fellow in the American Academy of Arts and Sciences, a member emeritus of the Board of Trustees of the National Geographic Society, a trustee of the Carnegie Institution of Washington and a life member of the MIT Council. He received the Gold Medal of Merit of the Wharton School Alumni Society in 1952; the William Proctor Prize for Scientific Achievement by the Scientific Research Society of America in 1957; the 1958 Medal for Advancement of Research by the American Society of Metals; the Gold Medal Award of the American Institute of Chemists in 1959; the Poor Richard Club's Gold Medal of Achievement in 1959; the Economic Club's Gold Medal Award in 1961; the John Fritz Medal by the American Institute of Chemical Engineers in 1961; the Society Medal by the Society of Chemical Industry in 1963; the Robert E. Wilson award by the American Institute of Chemical Engineers in 1967; and the Academy of Natural Sciences' Richard Hopper Day Medal in 1980. He also held honorary degrees from many institutions.

In 1926, Greenewalt married Margaretta Lammot DuPont and they were the parents of three children: David, Crawford, Jr. and Nancy. Margaretta Lammot DuPont Greenewalt died in 1991. Crawford H.

Greenewalt died on September 27, 1993. He is remembered as “a rare individual—one of the leading chief executives of his time who was also a fine scientist and a discerning humanist,” (MIT).

Bibliography:

Academy News. “Day Medal 1980: Crawford Greenewalt,” Winter, Volume 3 (4), 1980.

Author and Source Unknown. Biography of Crawford Hallock Greenewalt (Academy of Natural Sciences of Philadelphia Biographical File).

Auk. “In Memoriam: Crawford H. Greenewalt, 1902-1993,” by Albert E. Conway. Volume 111 (1): 188-189, 1994.

Greenewalt, Crawford H. *Bird song : Acoustics and Physiology*. Washington : Smithsonian Institution Press, 1968.

Massachusetts Institute of Technology. “Crawford Greenewalt of DuPont Dies,” <http://web.mit.edu/newsoffice/1993/greenewalt-0929.html> (accessed December 16, 2009).

Scope and Contents note

This collection documents Crawford H. Greenewalt's personal study of ornithology, primarily his work on hummingbirds. The materials date from 1951 to 1993 and are arranged into the following series: "Manuscripts/writing/publications," "Photographs, proofs and contact sheets," "Photographs, mounted prints," "Slides and transparencies," "Negatives," "Microscope slides," "Sketches for 1960 publication *Hummingbirds*," "Awards" and "Objects." The collection consists primarily of photographs taken by Greenewalt and technical data collected by Greenewalt. The images photographed by Greenewalt exist in many different formats throughout the collection, including prints, negatives and slides. The technical data in this collection represents Greenewalt's research into the physiology of hummingbirds, and the development of his high-speed photographic technique. In addition to Greenewalt's research material, this collection also houses drafts and edits of some of Greenewalt's original publications.

Photographs constitute the bulk of this collection, most of which are undated. When there are dates associated with an image, it is not certain whether those dates refer to the moment the picture was taken or when the print was created. Greenewalt's field notes are the most promising component of this collection for determining photograph dates. These forty-four notebooks contain documentation of photo sessions between the years 1956 and 1983, including the name of the bird, location and date. Researchers concerned with knowing the exact date of any particular image should consult Greenewalt's field notes for clues.

This collection is of great research value as it documents the process of innovating high-speed photography techniques, amateur ornithological methodology and Greenewalt's research process. This

collection also demonstrates wide-spread recognition that Greenewalt's efforts in ornithology received from contemporary academic and professional institutions.

Administrative Information

Publication Information

Academy of Natural Sciences, Philadelphia

Conditions Governing Access note

This collection is open for research.

Conditions Governing Use note

Copyright restrictions may apply. Please contact the Archives with requests for copying and for authorization to publish, quote or reproduce the material.

Processing Information note

The processing of this collection was made possible through generous funding from The Andrew W. Mellon Foundation, administered through the Council on Library and Information Resources' "Cataloging Hidden Special Collections and Archives" Project.

This collection was *minimally processed* in 2009-2011, as part of an experimental project conducted under the auspices of the Philadelphia Area Consortium of Special Collections Libraries to help eliminate processing backlog in Philadelphia repositories. A minimally processed collection is one processed at a less intensive rate than traditionally thought necessary to make a collection ready for use by researchers. When citing sources from this collection, researchers are advised to defer to folder titles provided in the finding aid rather than those provided on the physical folder.

Employing processing strategies outlined in Mark Greene's and Dennis Meissner's 2005 article, *More Product, Less Process: Revamping Traditional Processing Approaches to Deal With Late 20th-Century Collections*, the project team tested the limits of minimal processing on collections of all types and ages, in 23 Philadelphia area repositories. A primary goal of the project, the team processed at an average rate of 2-3 hours per linear foot of records, a fraction of the time ordinarily reserved for the arrangement and description of collections. Among other time saving strategies, the project team did not extensively review the content of the collections, replace acidic folders or complete any preservation work.

Related Materials

Related Archival Materials note

Academy of Natural Sciences of Philadelphia: Visual Resources for Ornithology records.

Hagley Museum and Library: Crawford H. Greenewalt personal papers.

Controlled Access Headings

Corporate Name(s)

- Academy of Natural Sciences of Philadelphia.
- E.I. du Pont de Nemours & Company.
- Massachusetts Institute of Technology.
- Visual Resources for Ornithology (Organization).

Genre(s)

- Audiovisual materials
- Awards
- Black-and-white photographs
- Black-and-white slides
- Clippings
- Manuscripts
- Negatives (photographic)
- Photographs
- Research notes
- Sketches
- Slides (photographs)
- Stereoscopic photographs

Personal Name(s)

- Greenewalt, Crawford H., 1902-1993

Subject(s)

- Birds
- Birds--Flight
- Birds--Songs and music
- Hummingbirds
- Ornithology
- Ornithology--Methodology
- Ornithology--Research
- Photography
- Photography, High-speed

Collection Inventory

Manuscripts/writings/publications 1951-1993

Scope and Contents note

The "Manuscripts/writing/publications" series contains research on the various fields of interest conducted by and collected by Crawford Greenewalt. There are five main areas of interest on which Greenewalt has published works. The material in this series reflects Greenewalt's research and editing processes for these publications. This series is divided into six subseries, five of which are dedicated to a single area of research and one subseries of "Personal papers." The subseries are "Photography", "Hummingbird Project", "Feather reflectance", "Flight", and "Birdsong."

The "Photography" subseries contains material related to Greenewalt's photography experimentation and technique development. The first part of the subseries is a collection of notebooks referred to by Greenewalt as "Field Notes." Notebook entries document photo shoots, providing information on the location, subject, name, date and technical information about camera setup and use. The collection of notebooks as a whole provides a detailed account of Greenewalt's photographic efforts from 1956 to 1983. These notebooks are arranged chronologically.

The second portion of the "Photography" subseries contains Greenewalt's collection of equipment operation manuals and test data. The manuals and the test data associated with the specific pieces of equipment are arranged alphabetically by object name.

The "Hummingbird Project" subseries contains materials related to Greenewalt's publication titled, *Hummingbirds*. These materials include inventories of bird photographs and slides, drafts of captions for illustrations, and marked-up proofs of the photos that were used for that monograph. As a whole, this subseries demonstrates Greenewalt's editing process for this project. The materials are arranged chronologically.

The "Feather reflectance" subseries consists almost entirely of technical data and publications that Greenewalt referenced while doing research for his own publication on the physical properties of hummingbird feathers. In addition to this research material, this subseries also contains a group of

Photography

electron microscope images of hummingbird feathers. The material in this subseries is arranged chronologically.

The "Flight" subseries contains a good deal of technical data related to the physics of bird flight, including notebooks containing flight sketches showing wingtip movement, wingtip movement analysis data, and information about physical proportions. This subseries contains some published material that Greenewalt used for research, as well as drafts and final versions of his own publications on the topic. The materials in this subseries are arranged alphabetically.

The majority of the materials contained in the "Birdsong" subseries is technical data. Specifically, there are large amounts of harmonic measurements or oscillograms of various bird calls, which Greenewalt has called "birdsong," and writings that analyze and describe these measurements. This subseries also includes phonographic recordings of bird calls and Greenewalt's published material on the topic. This subseries emphasizes the research aspect of Greenewalt's writing, rather than the editing process. This subseries is arranged chronologically.

The "Personal papers" series contains some correspondence and other personal ephemera.

Because materials in this series are arranged in a chronological manner, researchers interested in correspondence with specific individuals and/or subjects, should review the entire folder list.

Photography 1956-1993

Field notebooks 1956-1983

	Box	Volume
Books	1	2-45

Observation notes 1973

Photography

	Box	Folder
Text	1	1

Acopian DC power supplies operating manual undated

	Box	Folder
Text	2	1

Bausch and Lomb StereoZoom Microscope operating manual undated

	Box	Folder
Text	2	2

Bird cage photographic techniques circa 1969

	Box	Folder
Text	2	3

Bird cage photographic techniques correspondence 1965

	Box	Folder
Text	2	4

Photography

Bird cage photographs undated

	Box	Folder
Text	2	5

Bird cage photography technique diagrams undated

	Box	Folder
Text	2	6

Braun F-80 Strobe parts list and performance data 1966, 1977, 1987

	Box	Folder
Text	2	7

Braun F-80 Strobe test notes 1976

	Box	Folder
Text	2	8

Data book on camera and strobes 1956

Photography

	Box	Folder
Text	2	9

Data books on bird photography techniques circa 1969

	Box	Folder
Text	2	10

Edgerton, Inc. "Performance Data on High-speed Stroboscope" undated

	Box	Folder
Text	2	11

Edgerton strobe lamps angle view data undated

	Box	Folder
Text	2	12

Eumig Supers Projector manual undated

	Box	Folder
Text	2	13

Photography

General Radio Company stroboscopy publications 1970

	Box	Folder
Text	2	14

General Radio Company strobolumy operating manual undated

	Box	Folder
Text	2	15

Hasselblad camera 500EL "Register for Assembly and Adjustment" 1965, 1966

	Box	Folder
Text	2	16

Hasselblad camera wiring diagrams 1968-1970

	Box	Folder
Text	2	17

Hasselblad camera lenses and strobe calculation notes undated

Photography

	Box	Folder
Text	2	18

Havahart Traps manual undated

	Box	Folder
Text	2	19

Hewlett-Packard bird song console performance data 1964

	Box	Folder
Text	2	20

Hewlett-Packard oscillator operating manual undated

	Box	Folder
Text	2	21

Hoell circuit data to measure time on Hasselblad shutters 1969

	Box	Folder
Text	2	22

Photography

Hoell charging unit data 1969

	Box	Folder
Text	2	23

Hot splicer information specifications 1979

	Box	Folder
Text	2	24

Inventory: hummingbirds selected mono pictures, 1955 undated

	Box	Folder
Text	2	25

Inventory: hummingbirds selected stereopictures, 1961 undated

	Box	Folder
Text	2	26

Inventory: Australia and New Guinea slides, 1969-1971 undated

Photography

	Box	Folder
Text	2	27

Inventory: Australia and New Guinea selected pictures, 1969,1971,1973 undated

	Box	Folder
Text	2	28

Inventory: East Africa, Caribbean, and selected pictures, 1974, 1982 undated

	Box	Folder
Text	2	29

Inventory: Master list of bird species photographed by Greenewalt 1975

	Box	Folder
Text	2	30

Inventory: Ecuador selected pictures, 1980 undated

	Box	Folder
Text	2	31

Photography

Inventory: Photographs copied from Sickles camera, 1981 undated

	Box	Folder
Text	2	32

Inventory: South America mono and stereo photographs, 1982-1983 undated

	Box	Folder
Text	2	33

Inventory: Sweden, Europe, and selected photographs, 1982-1983 undated

	Box	Folder
Text	2	34

Inventory of slides, adapted from James L. Peters' *Check-list of Birds of the World* undated

	Box	Folder
Text	2	35

Kodak neutral test card undated

Photography

	Box	Folder
Text	2	36

Kodak movie deck projector operating manual undated

	Box	Folder
Text	2	37

Lamp output measurements undated

	Box	Folder
Text	2	38

Lansing speakers manual undated

	Box	Folder
Text	2	39

Leicina Special Super-8 Cine Camera operating manual 1971

	Box	Folder
Text	2	40

Photography

MaxiFlash Unit instructions undated

	Box	Folder
Text	2	41

Miller Fluid Heads product information 1975, undated

	Box	Folder
Text	2	42

Nagra tape recorder instruction manuals 1963

	Box	Folder
Text	2	43

Nikon lens tests 1972

	Box	Folder
Text	2	44

Nikon lens test notes undated

Photography

	Box	Folder
Text	2	45

Nikon lenses operating manuals undated

	Box	Folder
Text	2	46

Published article on bird photography by Paul Schwartz undated

	Box	Folder
Text	2	47

Sony Electret Condenser Microphone instruction manuals undated

	Box	Folder
Text	2	48

Sony tape recorder instruction manual undated

	Box	Folder
Text	2	49

Photography

Stereo geometry calculations 1959, 1975

	Box	Folder
Text	2	50

Stereo geometry calculations undated

	Box	Folder
Text	2	51-52

Stereo viewer instructions undated

	Box	Folder
Text	2	53

Strobes wiring data by R.P. Schwenker 1960-1961

	Box	Folder
Text	2	54

Thoren's turntable mounting template undated

Photography

	Box	Folder
Text	2	55

Thoren's turntable and MacIntosh 700 receiver manuals undated

	Box	Folder
Text	2	56

Trigger to flash notes 1969, 1976

	Box	Folder
Text	2	57

Trigger circuit wiring diagram 1974

	Box	Folder
Text	2	58

Trigger stereo wiring diagram 1974

	Box	Folder
Text	2	59

Hummingbird Project

VIREO collection and equipment papers 1980-1993

	Box	Folder
Text	2	60-61

Hummingbird Project 1966, 1977, undated

Preliminary mounted prints circa 1966

	Box	Folder
Text	2	62

Caption for prints circa 1977

	Box	Folder
Text	2	63

Annotated proofs 1-50 undated

	Box	Folder
Text	2	64-65

Hummingbird Project

Annotated proofs 51-100, 104-159 undated

	Box	Folder
Text	3	1-2

Mounting materials undated

	Box	Folder
Text	3	3

Caption edits undated

	Box	Folder
Text	3	4

Preliminary index undated

	Box	Folder
Text	3	5

Type proofs undated

Feather reflectance

	Box	Folder
Text	3	6

Feather reflectance 1951-1962

Published article, "Research on the Structure of Hummingbird Feathers," by Jean Dorst 1951

	Box	Folder
Text	3	7

Electron photographs and graphs 1955

	Box	Folder
Text	3	8

Electron photographs and graphs 1957

	Box	Folder
Text	3	9

Published article, "Reflection Coefficient of Optically Inhomogeneous Layers," by Joseph Hall, Jr., 1957 1958

	Box	Folder
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Feather reflectance

Text	3	10
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Electron microscope images of *Thalurania furcata* circa 1958

	Box	Folder
Text	3	11

Electron microscope images of *Heliangelus viola* gorget 1958

	Box	Folder
Text	3	12

Electron microscope image of *Eriocnemis vestita* gorget 1958

	Box	Folder
Text	3	13

Electron microscope image of *Agelaiocercus kingi* crown and *Heliangelus strophianus* gorget 1958

	Box	Folder
Text	3	14

Wing tip movement analysis drawings 1958

Feather reflectance

	Box	Folder
Text	3	15

Electron microscope images of Clytolaema rubricauba 1959

	Box	Folder
Text	3	16

Electron microscope images of Helianthea bronapartei 1959

	Box	Folder
Text	3	17

Electron microscope images of Helianthea helianthea 1959

	Box	Folder
Text	3	18

Electron microscope images of Chrysolampis elatus 1959

	Box	Folder
Text	3	19

Feather reflectance

Electron microscope images and analysis 1959

	Box	Folder
Text	3	20

Stereograph electron microscope images of cross-sections 1959

	Box	Folder
Text	3	21

Electron microscope images of *Thaluria furcata*, cross-sections of barbules 1959

	Box	Folder
Text	3	22

Electron microscope images of *Clytholaena rubricauda* feather cross-sections 1959

	Box	Folder
Text	3	23

Electron microscope images of *Calypte costae* feather cross-sections 1959

Feather reflectance

	Box	Folder
Text	3	24

Electron microscope images of *Chrysolampis elatus* feather cross-sections 1959

	Box	Folder
Text	3	25

Electron microscope images of *Clytolaema rubricauda* feather cross-sections 1959

	Box	Folder
Text	3	26

Electron microscope images of various species circa 1959

	Box	Folder
Text	3	27

Drafts, "Iridescent Colors of Hummingbird Feathers," by Crawford H. Greenewalt, Werner Brandt and D.D. Friel circa 1959

	Box	Folder
Text	3	28

Feather reflectance

Photomicrographs of feathers circa 1960

	Box	Folder
Text	3	29-33

Letter from Chicago Natural History Museum regarding feather identification 1962

	Box	Folder
Text	3	34

Published article, "Results of Some Studies on the Iridescence of Feathers," by Wilhelm Joseph Schmidt, 1948 undated

	Box	Folder
Text	3	36

Hummingbird feather reflectance data analysis by species undated

	Box	Volume
Text	4	1-14

Hummingbird species alphabetical index undated

Flight

	Box	Folder
Text	4	15

Flight 1954-1986

Sequence photographic prints (spiral bound) 1953 August 17

	Box	Folder
Text	7	1

Collected data on weights of flight muscles 1954

	Box	Folder
Text	5	1

Published article, "Flight of the Black-Capped Chickadee and the White-Breasted Nuthatch," by Crawford H. Greenewalt 1955

	Box	Folder
Text	5	2

Wing tip motion sketches 1959

	Box	Folder
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Flight

Text	5	6
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Wing tip motion data 1959

Text	Box	Folder
	5	7

Equations, graphs and data on the physics of bird flight 1960

Text	Box	Folder
	5	8

Published article, "The Wings of Insects and Birds as Mechanical Oscillators," by Crawford H. Greenewalt 1960

Text	Box	Folder
	5	9

Manuscript, "Dimensional Relationships of Flying Animals," by Crawford H. Greenewalt 1960

Text	Box	Folder
	5	10

Flight

Wing beat rates analysis 1968

	Box	Folder
Text	5	11

Hummingbirds original data 1969

	Box	Folder
Text	5	12

Hummingbirds original data stereographs circa 1969

	Box	Folder
Text	5	13

Articles on flight by Clarence P. Cone 1970

	Box	Folder
Text	5	14

Flapping rates of storks and calculations 1971

Flight

	Box	Folder
Text	5	15

Hootnanny Hypotrochoid Programs examples 1972

	Box	Folder
Text	5	16

Draft, "Hummingbirds. Why no Larger? Why No Smaller?" by Crawford H. Greenewalt circa 1972

	Box	Folder
Text	5	17

Draft of paper on dimensional relationships section I circa 1972

	Box	Folder
Text	5	18

Draft of paper on dimensional relationships section I figures circa 1972

	Box	Folder
Text	5	19

Flight

Draft of paper on dimensional relationships section I technical data circa 1972

	Box	Folder
Text	5	20

Second draft of paper on dimensional relationships section I text circa 1972

	Box	Folder
Text	5	21

Draft of paper on dimensional relationships section II figures circa 1972

	Box	Folder
Text	5	22

Correspondence with R.H. Miller regarding paper on dimensional relationships section II 1972

	Box	Folder
Text	5	23

Correspondence with Cone and Kirchner regarding paper on dimensional relationships section II 1972

Flight

	Box	Folder
Text	5	24

Correspondence with V.A. Tucker regarding paper on dimensional relationships section II 1972

	Box	Folder
Text	5	25

Draft of paper on dimensional relationships section III text 1974

	Box	Folder
Text	5	26

Draft of paper on dimensional relationships section III original charts and mounted copies circa 1974

	Box	Folder
Text	5	27

Draft of paper on dimensional relationships section III bibliography and appendix circa 1974

	Box	Folder
Text	5	28

Flight

Draft of paper on dimensional relationships unused figures circa 1974

	Box	Folder
Text	5	29

Manuscript, "Flight of Birds," by Crawford H. Greenewalt circa 1974

	Box	Folder
Text	5	30-32

Fronts piece images for paper on dimensional relationships 1975

	Box	Folder
Text	5	33

Published article: "Flight of Birds," by Crawford H. Greenewalt (author's copy) 1975

	Box	Folder
Text	5	34-36

Published article, "Flight of Birds," by Crawford H. Greenewalt 1975 July

Flight

	Box	Folder
Text	5	37

Correspondence with V.A. Tucker 1975

	Box	Folder
Text	5	38

Reprints of articles on hummingbirds and other nectar eating birds circa 1979

	Box	Folder
Text	5	39

Draft and publication, "Energetics of Animal Locomotion- is small size really disadvantageous," by Crawford H. Greenewalt 1976

	Box	Folder
Text	5	40

Data on flight power, free flight and wing loading 1979

	Box	Folder
Text	5	41

Flight

Hummingbird wing disc loading material 1980

	Box	Folder
Text	5	42

Cost of transport per unit length of animals and artifacts circa 1980

	Box	Folder
Text	5	43

Calculations based on Pete Myers data 1982-1984

	Box	Folder
Text	6	1

Herman Goldstine's calculations 1983

	Box	Folder
Text	6	2

Greenewalt computer use notes 1984-1985

Flight

	Box	Folder
Text	6	3

Dimensional relationships of saunderlings, ruby throated hummingbirds, black-capped chickadees, and myrtle warblers circa 1984

	Box	Folder
Text	6	4

Summary of data on black-capped chickadee circa 1984

	Box	Folder
Text	6	5

Land birds report circa 1985

	Box	Folder
Text	7	2

Pete Myers' wings and weights data 1986

	Box	Folder
Text	6	6

Bird song

Three articles on bird flight (spiral bound), 1932, 1934, 1935 undated

	Box	Folder
Text	6	7

Bird song 1965-1987

Bird song oscillogram circa 1965

	Box	Folder
Text	6	8

Graphs of bird song modulations 1966

	Box	Folder
Text	6	9

Letter from Rogers T. Peterson 1966 December 28

	Box	Folder
Text	6	10

Bird song

Manuscript, "Acousitics and Physiology of Bird Song," by Crawford H. Greenewalt 1968

	Box	Folder
Text	6	11

Published article, "How Birds Sing," by Crawford H. Greenewalt 1969 November

	Box	Folder
Text	6	12

Bird song recording index circa 1971

	Box	Folder
Text	6	13

Synthetic speech materials 1972

	Box	Folder
Text	6	14

Bird song analysis and examples 1973

Bird song

	Box	Folder
Text	6	15

Correspondence with Robert Capranica regarding bird song 1986-1987

	Box	Folder
Text	6	16

Bird song sound catalogs undated

	Box	Folder
Audio	6	17

Hummingbird wing beat oscillograms undated

	Box	Folder
Text	6	18

Oscillograms undated

	Box	Folder
Graphic materials	6	19

Personal papers

Personal papers 1945-1985

Publication, "Field-List of the Birds of Essex County Massachusetts" 1945 April

	Box	Folder
Text	6	20

Romanche trench photos and letter 1956

	Box	Folder
Text	6	21

Correspondence regarding hummingbird at Guantanamo Bay 1960

	Box	Folder
Text	6	22

Letter accompanying gift of Venezuelan hummingbird postage stamps 1961 September 26

	Box	Folder
Text	6	23

Personal papers

Collection of poetry about hummingbirds 1971 April 16

	Box	Folder
Text	6	24

Birthday card from "Tuss" and Delmarva Ornithological Society Honorary Membership 1972, 1973

	Box	Folder
Text	6	25

Robert Cushman Murphy memorial article from *Auk* 1974

	Box	Folder
Text	6	26

Bird population estimates from recapture data 1974

	Box	Folder
Text	6	27

Letter from John Wacham 1977 September 8

Photographs, proofs and contact sheets

	Box	Folder
Text	6	28

American Philosophical Society lecture notes and slides 1980

	Box	Folder
Text	6	29

Milbrey Ross wedding gift 1985

	Box	Folder
Text	6	30

Series of out of context citations and illegible unrelated letter undated

	Box	Folder
Text	6	31

Photographs, proofs and contact sheets circa 1953-1982, undated**Scope and Contents note**

The "Photographs, proofs and contact sheets" series contains what could be considered rough drafts of the more finished photographic prints that are found in the "Photographs, mounted prints" series. Many of the images in this series appear elsewhere in the collection in various formats. The majority of the photographic prints in this series are undated and the subjects are unidentified. The prints in this series

Photographs, proofs and contact sheets

are arranged chronologically, based on dates that are associated with these images either on their original housing or elsewhere in the collection.

circa 1953-1965

	Box	Folder
Graphic materials	8	1-31

circa 1963-1982, undated

	Box	Folder
Graphic materials	9	1-38

5x7, sequence shots undated

	Box	Folder
Graphic materials	10	1-2

11x14, sequence shots undated

	Box	Folder
Graphic materials	10	3

Photographs, mounted prints

Photographs, mounted prints circa 1955-1971, undated

Scope and Contents note

The "Photographs, mounted prints" series contains color prints mounted on mat board. There are three sets of prints that are included in this series. Each of the three sets is a different size, and each size constitutes its own subseries.

The "8 x 10 mounted prints" subseries contains colored prints of a wide variety of birds. The birds are identified on most of the prints. There seems to be two groups of prints in this subseries - those dated 1964, and those dated 1969 to 1971. It is not clear if those dates represent the years the photos were taken, or the years the prints were made. Prints with dates between 1969 and 1971 attributed to them tend to have more information about the subject than do the rest of the prints in this subseries, including species, gender, location and date.

The second subseries, "8.5 x 11 mounted prints," are arranged into six volumes. Identification is inconsistent and less explicit than that provided in the "8 x 10" subseries. Most of the prints provide the species name of the subject.

The "10 x 15 mounted prints" subseries is a twenty one volume set of color prints. The set features hummingbirds almost exclusively, except for the final two volumes which contain many of the same images that appear in the smaller sets. Identification is provided for all but a few of the subjects in this set.

The "Stereographs" subseries contains color, and black and white stereographs of a small variety of birds at different angles. These images have been mounted on mat board cards. Most of the cards in this series are numbered 1 to 579, with large gaps in the 500s. This series also contains a group of unnumbered, unidentified stereographs. Some of the birds represented in this series have been identified. Some of the stereographs have dates marked on them, which are probably the dates that the pictures were taken. All of the cards, with the exception of the few unmarked cards at the end of the series, contain some technical data which seems to relate to some function of the camera during the photograph session. The cards seem to have been organized into groups according to an "M" value, and then numbered sequentially.

Original order for the entire "Mounted prints" series has been maintained.

8 x 10 mounted prints

8 x 10 mounted prints circa 1971		Box	Object
		11	1-85
8.5 x 11 mounted prints			
			Box
Volume 1			12
Volume 2			12
Volume 3			12
Volume 4			13
Volume 5			13
Volume 6			13
10x15 Mounted prints circa 1955-1971			
Volume 1			
		Box	Object
Graphic materials		14	1-13

10x15 Mounted prints

I:1-13, Painted buntings

Volume 2

	Box	Object
Graphic materials	14	14-26

II:1-3, Tufted titmouse

II:4, Mockingbird

II:5-6, *Adelomyia melanogenys*

II:7-9, *Aglaeactis cupripennis*

II:10-11, *Aglaeocercus coelestis*

II:12-13, *Aglaeocercus kingi*

Volume 3

	Box	Object
--	------------	---------------

10x15 Mounted prints

Graphic materials	15	1-13
III:1, Aglaeocercus mocoa		
III:2, Amazilia ?		
III:3-5, Amazilia tobaci		
III:6, Amazilia tzacatl nest		
III:7-8, Amazilia tzacatl		
III:9-10, Amazilia versicolor		
III:11, Amazilia viridiceps		
III:12-13, Anthracothorax nigrocollis		

Volume 4

	Box	Object
Graphic materials	15	14-26

10x15 Mounted prints

IV:1, *Anthracothonax nigricollis*

IV:2-3, *Aphantochroa cirrochloris*

IV:4, *Archilochus alexandri* and *Calypte anna*

IV:5-7, *Archilochus alexandri*

IV:8, *Archilochus alexandri* nest

IV:9-10, *Archilochus colubris*

IV:11-13, *Augastes scutatus*

Volume 5

	Box	Object
Graphic materials	16	1-13

V:1-2, *Augastes* ?

V:3-5, *Boissonneau flavescens triochlora*

10x15 Mounted prints

V:6-10, Boissonneau jardini

V:11-13, Calliphlox amethystina

Volume 6

	Box	Object
Graphic materials	16	14-26

VI:1-5, Calypste anna

VI:6-7, Calypste costa

VI:8-9, Campylopterus falcatus

VI:10-11, Campylopterus obscurus

VI:12-13, Chlorestes notatus

Volume 7

	Box	Object
--	------------	---------------

10x15 Mounted prints

 Graphic materials

17

1-13

VII:1-2, Chlorostilbon alice

VII:3-5, Chlorostilbon aureoventris

VII:6-7, Chlorostilbon aureoventris nest

VII:8-13, Chrysolampis mosquitus

Volume 8

 Graphic materials

Box**Object**

17

14-26

VIII:1-2, Chrysolampis mosquitus

VIII:3-4, Clytolaema rubricauda

VIII:5, Coeligena lutetia

VIII:6-8, Coeligena torquata

10x15 Mounted prints

VIII:9, *Colibri coruscans*

VIII:10-11, *Colibri coruscans* nest

VIII:12-13, *Colibri cyanotus*

Volume 9

	Box	Object
Graphic materials	18	1-15

IX:1-2, *Colibri serrirostris*

IX:3-6, *Cynanthus latirostris*

IX:7-9, *Discosura longicauda*

IX:10-15, *Ensifera ensifera*

Volume 10

	Box	Object
--	------------	---------------

10x15 Mounted prints

Graphic materials

19

1-13

X:1, *Eriocnemis luciani*X:2, *Eriocnemis luciani* and *Popelairia conversii*X:3-6, *Cynanthus latirostris*X:7, *Eugenia imperatrix*X:8-9, *Eutoxeres aquila*X:10-11, *Eupetomena macroura*X:12, *Florisuga mellivora*X:13, *Claucis hirsuta*

Volume 11

Graphic materials

Box**Object**

19

14-26

10x15 Mounted prints

XI:1-2, *Heliactin cornuta*

XI:3, *Heliangelus strophianus*

XI:4-6, *Heliangelus wilsonii*

XI:7-8, *Heliomaster furcifer*

XI:9, *Heliomaster longirostris*

XI:10-11, *Heliothryx aurita*

XI:12-13, *Hylocharis chrysura*

Volume 12

	Box	Object
Graphic materials	20	1-14

XII:1-2, *Hylocharis chrysura*

XII:3-5, *Hylocharis cyanus*

10x15 Mounted prints

XII:6, *Hylocharis cyanus rostrata*

XII:7, *Hylocharis grayi*

XII:8-9, *Hylocharis sapphirina*

XII:10, *Lafresnaya saul*

XII:11-14, *Lampornis clemenciae*

Volume 13

	Box	Object
Graphic materials	20	15-27

XIII:1-2, *Lesbia victoriae*

XIII:3-4, *Lesbia victoriae* nest

XIII:5, *Leucochloris albicollis*

XIII:6-8, *Lophornis magnifica*

10x15 Mounted prints

XIII:9-10, *Lophornis magnifica* nest

XIII:11-12, *Melanotrochilus fuscus*

XIII:13, *Metallura tyrianthina*

Volume 14

	Box	Object
Graphic materials	21	1-13

XIV:1-2, *Microchera alboconata*

XIV:3-7, *Ocreatus underwoodii*

XIV:8-13, *Oreotrochilus chimborazo*

Volume 15

	Box	Object
Graphic materials	21	14-26

10x15 Mounted prints

XV:1-2, *Oxypogon guerinii*

XV:3, *Pabagona gigas*

XV:4-5, *Phaethornis augusti*

XV:6, *Phaethornis hispidus*

XV:7, *Phaethornis hispidus* and *Lophornis magnificus*

XV:8, *Phaethornis idaliae*

XV:9-10, *Phaethornis nattereri*

XV:11, *Phaethornis pretrei*

XV:12-13, *Phaethornis ruber*

Volume 16

	Box	Object
Graphic materials	22	1-13

10x15 Mounted prints

XVI:1-3, *Phaethornis yaruqui*

XVI:4, *Popelairia conversii*

XVI:5-6, *Popelairia conversii*

XVI:7-9, *Ramphomicron microrhynchum*

XVI:10, *Schistes albogularis*

XVI:11-13, *Selasphorus platycercus*

Volume 17

	Box	Object
Graphic materials	22	14-26

XVII:1, *Selasphorus platycercus* nest

XVII:2, *Selasphorus rufus*

XVII:3-4, *Stellula calliope*

10x15 Mounted prints

XVII:5-8, *Stephanoxis lalandi*

XVII:9-10, *Stephanoxis loddigesii*

XVII:11, *Thalurania furcata*

XVII:12-13, *Thalurania glaucopis*

Volume 18

	Box	Object
Graphic materials	23	1-13

XVIII:1-4, *Thalurania watertonii*

XVIII:5, *Threnetes ruckeri*

XVIII:6-9, *Topaza pella*

XVIII:10-13, *Trochilus polytmus*

Volume 19

10x15 Mounted prints

	Box	Object
Graphic materials	23	14-19
XIX:1-3, <i>Trochilus polytmus</i>		

XIX:4-5, *Urochroa bougueri*

XIX:6, *Urosticte benjamini*

Volume 25

	Box	Object
Graphic materials	24	1-30

XXV:1, *Gallicolumba rufigola*

XXV:2, *Ptilinopus coronulatus*

XXV:3, *Goura victoria*

XXV:4, *Psitteuteles goldiei*

XXV:5, *Charmosyna pulchella*

10x15 Mounted prints

XXV:6, *Psitttrichas fulgidus*

XXV:7, *Ceyx lepidus*

XXV:8, *Melidora macrorrhina*

XXV:9, *Dacelo leachi*

XXV:10, *Halcyon sancta*

XXV:11, *Tanysptera galatea*

XXV:12, *Tanysptera nympha*

XXV:13, *Morops ornatus*

XXV:14-15, *Arses telescopthalmus*

XXV:16, *Grallina cyanoleucos*

XXV:17, *Manucodia chalybatus*

XXV:18, *Phonygamus iceraudrenii*

10x15 Mounted prints

XXV:19-21, *Epimachus mayeri*

XXV:22, *Astrapia mayeri*

XXV:23-24, *Astrapia stephaniae*

XXV:25, *Lophorina superba*

XXV:26-28, *Diphyllodes magnificus*

XXV:29-30, *Cicinnurus regius*

Volume 26

	Box	Object
Graphic materials	24	31-62

XXVI:1, Unidentified bird

XXVI:2, *Lophorina superba*

XXVI:3, *Merops ornatus*

10x15 Mounted prints

XXVI:4, *Halcyon sancta*

XXVI:5, *Cicinnurus regius*

XXVI:6-12, *Paradisea raggiana*

XXVI:13, *Paradisea minor*

XXVI:14-15, *Paradisea guilelmi*

XXVI:16, *Archboldia papuensis*

XXVI:17, *Chlamydera lauterbachii*

XXVI:18, *Ailuroedus buccoides*

XXVI:19-20, *Ailuroedus crassirostris*

XXVI:21, *Sericulus chrysocephalus*

XXVI:22-23, *Ptilonorhynchus violaceus*

XXVI:24-26, *Chlamydera nuchalis*

Stereographs

XXVI:27, *Melipotes ater*

XXVI:28, *Philemon novaeguineae*

XXVI:29, *Aegintha temporalis*

XXVI:30-32, *Cyanosylvia svecica*

Stereographs 1959 May 9-1960 August 21, undated

2-47: Ruby throat sideways 1959 May 9

	Box	Folder
Graphic materials	25	1

48-68: Ruby throat sideways 1959 May 9

	Box	Folder
Graphic materials	25	2

69-101: Ruby throat head on 1959 May 10

Stereographs

	Box	Folder
Graphic materials	25	3

102-144: Chickadee 1959 May 16

	Box	Folder
Graphic materials	25	4

146-153: Chickadee at nest 1959 May 16

	Box	Folder
Graphic materials	25	5

154-172: Unidentified hummingbird 1959 May 16

	Box	Folder
Graphic materials	25	6

173-205: Chickadee 1959 May 23

	Box	Folder
Graphic materials	25	7

Stereographs

206-228: Bluebird 1959 May 24

	Box	Folder
Graphic materials	25	8

229-267: Ruby throat head on 1959 June 27

	Box	Folder
Graphic materials	25	9

268-330: Broad tail sideways 1959 July 31

	Box	Folder
Graphic materials	25	10

331-402: *Selasphorus platycerus* 1959 July 31

	Box	Folder
Graphic materials	25	11

403-433: *Selasphorus rufus* 1959 August 1

Stereographs

	Box	Folder
Graphic materials	25	12

434-477: Selasphorus platycercus and Selasphorus rufus 1959 August 1

	Box	Folder
Graphic materials	25	13

478-492: Wren 1959 August 23

	Box	Folder
Graphic materials	25	14

493-525: Wren 1960 August 21

	Box	Folder
Graphic materials	25	15

526-545: Cedar waxing 1960 August 13

	Box	Folder
Graphic materials	25	16

Slides and transparencies

546-579: Ruby throat one wing beat from above 1959 August 23

	Box	Folder
Graphic materials	25	17

Various unidentified bird species and duplicates 1959 August 23

	Box	Folder
Graphic materials	25	18

Slides and transparencies undated

Scope and Contents note

The "Slides and transparencies" series contains various images of birds, some of which can be found in other locations in this collection in various formats. This series is divided into four subseries according to subject and /or medium.

The "Personal collection" subseries contains sets of photographic slides, which seem to be of a personal nature. The slides portray images from family vacations and wildflowers. Also represented in this subseries are some of Greenewalt's early experiments with time lapse photography.

The "Slides of Birds of the World" subseries is a large collection of slides which seems to constitute Greenewalt's attempt to fulfill James L. Peters' *Check-list of Birds of the World*, an adaptation of which can be found in the first series of this collection. The birds are arranged taxonomically by order. There are multiple images of every bird, and each bird is identified.

Personal collection

The "Transparencies" subseries consists of two small boxes filled with images of birds that Greenewalt photographed in Ecuador. This subseries also includes a set of large glass and plastic transparencies used during the printing of an article about Greenewalt entitled "Bird Watching with an Electronic Eye."

The "Lantern slides" subseries contains two sizes of three distinct sets of images: "Wrens feeding", "Bluebird" and "Slides for high speed camera."

Personal collection

1: "Seconds and duplicates" undated

	Box	Bin
Graphic materials	26	1

2: "Seconds and duplicates" undated

	Box	Bin
Graphic materials	26	2

3: "Seconds and duplicates" undated

	Box	Bin
Graphic materials	26	3

12: Sequence pictures: egg to caterpillar and pupa to butterfly; fish; wildflowers undated

Personal collection

	Box	Bin
Graphic materials	26	4

13: Stereo pictures; feather micrographs undated

	Box	Bin
Graphic materials	26	5

15: Color negatives undated

	Box	Bin
Graphic materials	26	6

16: Color negatives undated

	Box	Bin
Graphic materials	27	1

30: Family vacations undated

	Box	Bin
Graphic materials	27	2

Personal collection

31: Family vacations undated

	Box	Bin
Graphic materials	27	3

32: Family vacations undated

	Box	Bin
Graphic materials	27	4

33: Wildflowers undated

	Box	Bin
Graphic materials	27	5

A: Bound local and Bermuda birds, extras and seconds

	Box	Bin
Graphic materials	28	1

B: Bound local and Bermuda birds, extras and seconds

Slides of Birds of the World

	Box	Bin
Graphic materials	28	2

C: Venezuela and Ecuador 1955, 1956

	Box	Bin
Graphic materials	28	3

D: Seminars, papers and books

	Box	Bin
Graphic materials	28	4

Slides of Birds of the World undated

Box
28-31

Scope and Contents note

Boxes 28-31 contain numerous smaller slide boxes.

Transparencies

Ecuador duplicates and extras undated

	Box	Carton
Graphic materials	31	59-60

Lantern slides

Box

41

Continuous tones for William Dutton article on Greenewalt 1951

Lantern slides**Box**

31

Carton

61

Wren series undated

Bluebird series undated

Camera set-up series undated

Negatives undated**Scope and Contents note**

The "Negatives" series contains photographic negatives of many of the prints in this collection. Three pre-arranged groups of negatives have been arranged into three subseries.

The "Early high speed photographs of unidentified birds" subseries is housed in eleven booklets that have been numbered. These images seem to date from the early to mid-1950s, and the birds represented in this subseries are unidentified.

The negatives in the "Stereographs" subseries have been numbered 1 to 1000. This subseries also contains a small number of identified birds which are: the tree swallow, the house finch, the Australian finch and the cardinal.

The third subseries, "Sequence shots of unidentified birds" contains a group of heavily damaged negatives, which are numbered 1-200.

Original order has been maintained throughout the series.

Early high speed photographs of unidentified birds

Early high speed photographs of unidentified birds circa 1950	Box 32	Carton 1-11
Stereographs undated	Box 32	Carton 12
Sequence shots of unidentified birds undated	Box 32	Carton 13
Microscope slides undated	Box 31	Bin 1-4

Scope and Contents note

The "Microscope slides" series consist of four boxes filled with microscope slides, upon which are mounted hummingbird and sunbird feathers. The feathers on each slide have been identified. It does not seem that the slides are in any particular order, but no order has been imposed during processing. The cases are labeled "1" through "4."

Sketches for 1960 publication, *Hummingbirds* circa 1960**Scope and Contents note**

The "Sketches for 1960 publication *Hummingbirds*" series contains a variety of hand drawn illustrations in various sizes. This set of sketches constitutes the creation and selection process for the illustrations that appear in Greenewalt's 1960 publication *Hummingbirds*. Along with the originals, this series also contains illustrations that had not been chosen for publication, including alternate versions and unique images. This series is arranged according to the order in which the illustrations appear in the publication, with works not selected filed at the end of the series.

Page 6, "Tails" circa 1960

Box
Folder

Sketches for 1960 publication, Hummingbirds

Graphic materials	39	1-2
	Oversize	Object
Graphic materials	Drawer 89	1

Page 11, "Awake and Asleep" circa 1960

	Box	Folder
Graphic materials	39	3-4

Page 15, "Food and Drink" circa 1960

	Box	Folder
Graphic materials	39	5

Page 16, "Large and Small" circa 1960

	Box	Folder
Graphic materials	39	6
	Oversize	Object
Graphic materials	Drawer 89	3

Page 18, "Bills" circa 1960

Sketches for 1960 publication, Hummingbirds

	Box	Folder
Graphic materials	39	7-8
	Object	Object
Graphic materials	Drawer 89	2

page 18, Eutoxeres aquila; Ensifera ensifera

	Box	Folder
Graphic materials	33	1

Page 21, "Belligerence" circa 1960

	Box	Folder
Graphic materials	39	9

Pages 25 and 26, "Nests," and "Feeding Young" circa 1960

	Box	Folder
Graphic materials	39	10-11
	Oversize	Object
Graphic materials	Drawer 89	4

Page 27, Unidentified hummingbird

Sketches for 1960 publication, Hummingbirds

	Box	Folder
Graphic materials	33	2

Pages 168, 202, 240, 251, *Archilochus colubris*

	Box	Folder
Graphic materials	33	3

Page 174, Cross section of bird feathers

	Box	Folder
Graphic materials	33	4
	Oversize	Object
Graphic materials	Drawer 89	5-9

Page 205, Hummingbird wing skeleton

	Box	Folder
Graphic materials	33	5

Page 215, Wing beat rate and wing length

Box	Folder
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Sketches for 1960 publication, Hummingbirds

Graphic materials	33	6
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Page 223, Hummingbird wing patterns

	Box	Folder
Graphic materials	33	7

Page 224, Hummingbird hovering, view from above

	Box	Folder
Graphic materials	33	8

Page 225, Hummingbird hovering, side view

	Box	Folder
Graphic materials	33	9

Page 226, Wing upbeat and downbeat

	Box	Folder
Graphic materials	33	10-11

Page 227, Flying backward

Sketches for 1960 publication, Hummingbirds

	Box	Folder
Graphic materials	33	12

Page 228-229, Ruby throat in flight

	Box	Folder
Graphic materials	34	1

Page 230-231, Chickadee wing beat

	Box	Folder
Graphic materials	34	2

Page 231, Chickadee detail

	Box	Folder
Graphic materials	34	3

Page 232, Hummingbird acrobatics

	Box	Folder
Graphic materials	34	4

Awards

Page 235, Wing plane and wing velocity

	Box	Folder
Graphic materials	34	5

Unpublished versions circa 1960

	Box	Folder
Graphic materials	39	12-19

Unpublished sketches of feathers

	Box	Folder
Graphic materials	34	6

Unpublished humorous hummingbird sketches

	Box	Folder
Graphic materials	34	7

Awards endless. see oversize.

Scope and Contents note

Honorary Degrees, certificates and plaques (34 awards)

The “Awards” series provides evidence of the wide-spread recognition that Greenewalt received for his various pursuits. Greenewalt received honorary degrees from a variety of academic institutions, and medals from academic and trade organizations.

The “Awards” series is divided by medium into three subseries. The first subseries contains rolled-up and encased diplomas and certificates; the second subseries contains medals, pins, and statuettes; the final subseries contains programs from various events at which Greenewalt was recognized, such as commencements and organizational meetings. These programs are arranged chronologically. The other material is loose in the boxes.

Honorary Degrees, certificates and plaques (34 awards) 22 certificates**Box**
35-36, 40**Medals and statues****Box**
37**Object**
1-45

Lavoisier Medal for Technical Achievements. Dupont.

Programs

Convocations 1952-1971

	Box	Folder
Text	38	1-2

Ceremonies 1956, 1959, 1961, 1967

	Box	Folder
Text	38	3

Objects

Objects

Scope and Contents note

The “Objects” series contains a few artifacts related to Greenewalt’s work with ornithological photography. There is a metal camera case which contains a camera and various camera accessories. The leather case housed Greenewalt’s camera (which is now part of VIREO’s holdings, along with Greenewalt’s set), and now contains some random parts and stereograph lenses. This series also includes the Greenewalt’s aluminum camera floating action tripod. The fourth item in this series is a leather map case filled with color travel maps of various European territories.

Metal camera case and camera accessories undated

Leather camera bag and camera accessories undated

Leather case containing, maps and travel documents undated

Tripod undated