

FACTS ON FILE SCIENCE LIBRARY

ENCYCLOPEDIA OF

WORLD SCIENTISTS

REVISED EDITION

ELIZABETH H. OAKES

The background features a periodic table of elements with a world map overlay. Three inset photographs are placed over the table:

- A black and white portrait of a man in a suit, likely a scientist.
- A color portrait of a woman in a green jacket, likely a scientist.
- A color portrait of a woman in an orange astronaut suit holding a helmet, likely an astronaut.

Encyclopedia of
WORLD SCIENTISTS
Revised Edition

ELIZABETH H. OAKES

 **Facts On File**
An imprint of Infobase Publishing

Encyclopedia of World Scientists, Revised Edition

Copyright © 2007 by Infobase Publishing
This is a revised edition of **Encyclopedia of World Scientists**
Copyright © 2001 by Infobase Publishing
and **International Encyclopedia of Women Scientists**
Copyright © 2002 by Infobase Publishing

All rights reserved. No part of this book may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage or retrieval systems, without permission in writing from the publisher. For information contact:

Facts On File, Inc.
An imprint of Infobase Publishing
132 West 31st Street
New York NY 10001

Library of Congress Cataloging-in-Publication Data

Oakes, Elizabeth H., 1964–
Encyclopedia of world scientists/Elizabeth H. Oakes.—Rev. ed.
p. cm.
Includes bibliographical references and index.
ISBN-13: 978-0-8160-6158-7
ISBN-10: 0-8160-6158-0
1. Scientists—Biography—Encyclopedias. I. Title.
Q141.025 2007
509.2—dc22
[B] 2007006076

Facts On File books are available at special discounts when purchased in bulk quantities for businesses, associations, institutions, or sales promotions. Please call our Special Sales Department in New York at (212) 967-8800 or (800) 322-8755.

You can find Facts On File on the World Wide Web at <http://www.factsonfile.com>

Text design by Erika K. Arroyo
Cover design by Salvatore Luongo
Chronology by Dale Williams

Printed in the United States of America

VB MSRF 10 9 8 7 6 5 4 3 2 1

This book is printed on acid-free paper.

CONTENTS

Acknowledgments	iv
Introduction	v
List of Entries	vii
Biographical Essays A–Z	1
Bibliography	803
Entries by Field	805
Entries by Country of Birth	814
Entries by Country of Major Scientific Activity	820
Entries by Year of Birth	827
Chronology	834

ACKNOWLEDGMENTS

For assistance with photographs and biographical information, I thank those scientists who graciously responded to my requests and the many libraries and archives who helped. I would also like to express my gratitude to the University of Montana Mansfield Library, where much of the research for this book was completed, and

to the authors of the many science reference books I consulted.

Finally, my sincerest thanks to Frank K. Darmstadt, Executive Editor, Melissa Cullen-DuPont, Assistant Editor, and Alana Braithwaite, Editorial Assistant, for their unwavering support and superb guidance throughout the project.

INTRODUCTION

Encyclopedia of World Scientists, Revised Edition is a diverse and comprehensive two-volume collection of biographies of scientists. The set includes the fascinating stories of nearly 1,000 scientists, from all scientific disciplines, and all periods of history, as far back as 600 B.C., who have contributed significantly to their fields. Among the nearly 500 women scientists, you will find those who succeeded in their work against quite impossible odds. From the example of the Greek physician Agnodice—who in the fourth century B.C. cut her hair short and dressed as a man in order to avoid arrest for breaking the law against women practicing medicine—to the contemporary example of women turned down for jobs and discouraged from pursuing their education, the reader can see how women scientists have often faced formidable obstacles. In this set for the first time, these women take their place side by side with the great male scientists. What they all hold in common is a legacy of achievement that has forever altered our understanding of the world.

Among the firsts in this book, the reader will find:

- the first female physics professor
- the first scientist to successfully clone an animal
- the first female research scientist at General Electric Corporation
- the first scientist to explain the theory of continental drift
- the first woman to win a Nobel Prize
- the first woman to head a branch of the U.S. Military,
- and the first scientist to suggest the existence of anti-matter.

The reader will also read about the discovery of the polio vaccine, the invention of the Diesel engine, the

creation of the Apgar Score System for evaluating the health of newborns, the development of the first computer languages, and the discovery of the radiocarbon-dating process. While this set brings together an array of well-known and lesser-known scientists, providing the basic biographical details of their lives, the focus is on their work, with their scientific achievements presented in everyday language that makes even the most complex concepts accessible.

THE SCIENTISTS

Encyclopedia of World Scientists, Revised Edition, includes the well-known scientific “greats” of history, as well as contemporary scientists whose work is just verging on greatness. Among these are many minority scientists who have often been excluded from books such as this. A majority of the scientists in the book represents the traditional scientific disciplines of physics, chemistry, biology, astronomy, and the Earth sciences. A smaller number represent mathematics, computer science, the philosophy of science, medicine, engineering, anthropology, and psychology. In addition to the biographical entries, the book contains more than 200 evocative black-and-white photographs and illustrations.

To compile the entrant list, I relied largely on the judgment of other scientists, consulting established reference works, such as the *Dictionary of Scientific Biography*, science periodicals, awards lists, and publications from science organizations and associations. Despite this process, I cannot claim to present the “most important” historical and contemporary figures. Time constraints and space limitations prevented the inclusion of many deserving scientists.

THE ENTRIES

Entries are arranged alphabetically by surname, with each entry given under the name by which the scientist is most commonly known. The typical entry provides the following information:

Entry Head: Name, birth/death dates, nationality, and field(s) of specialization.

Essay: Essays range in length from 500 to 1,500 words, with most totaling around 750 words. Each contains basic biographical information—date and place of birth, family information, educational background, positions held, prizes awarded, etc.—but the greatest attention is given to the scientist's work. Names within the essays set in small capitals

provide easy reference to other scientists represented in the book.

In addition to the alphabetical list of scientists, readers searching for names of individuals from specific countries or scientific disciplines can consult one of the following indexes found at the end of the book:

Field of Specialization Index: Groups entrants according to the scientific field(s) in which they worked.

Nationality Index: Organizes entrants by country of birth and/or citizenship.

Year of Birth Index: Organizes entrants according to the year they were born.

Subject Index: Lists page references for scientists and scientific terms used in the book.

LIST OF ENTRIES

- Abbe, Cleveland
Ackerman, Thomas P.
Adamson, Joy
Agassiz, Elizabeth Cabot Cary
Agassiz, Jean Louis Rodolphe
Agnesi, Maria Gaetana
Agnodice
Agricola, Georgius
Aiken, Howard Hathaway
Ajakaiye, Deborah Enilo
Alder, Kurt
Alexander, Hattie Elizabeth
Alfvén, Hannes Olof Gösta
Allen, Paul
Altman, Sidney
Alvarez, Luis Walter
Alvariño, Angeles
Ampère, André-Marie
Anastasi, Anne
Ancker-Johnson, Betsy
Andersen, Dorothy Hansine
Anderson, Carl David
Anderson, Elda Emma
Anderson, Elizabeth Garrett
Anderson, Gloria Long
Anfinsen, Christian Boehmer
Anning, Mary
Apgar, Virginia
Arber, Agnes Robertson
Archimedes
Aristarchus of Samos
Aristotle
Arrhenius, Svante August
Aston, Francis William
Audubon, John James
Auerbach, Charlotte
Avery, Mary Ellen
Avery, Oswald Theodore
Avicenna
Avogadro, Lorenzo Romano Amedeo Carlo
Ayrton, Hertha (Phoebe Sarah Marks)
Babbage, Charles
Baekeland, Leo Hendrik
Baeyer, Adolf von
Bailey, Florence Merriam (Florence Augusta Merriam)
Baker, Sara Josephine
Banks, Harvey Washington
Banting, Sir Frederick Grant
Bárány, Robert
Bari, Nina Karlovna
Barney, Ida
Barton, Clara
Barton, Derek H. R.
Bascom, Florence
Bassi, Laura Maria Catarina
Bateson, William
Bechtereva, Natalia Petrovna
Becquerel, Antoine-Henri
Bell (Burnell), Susan Jocelyn
Bellow, Alexandra
Benedict, Ruth Fulton
Benerito, Ruth Mary Roan
Bennett, Isobel Ida
Berg, Paul
Bergius, Friedrich
Berkowitz, Joan B.
Bernard, Claude
Bernoulli, Daniel
Bernstein, Dorothy Lewis
Bertozzi Andrea
Berzelius, Jöns Jakob
Best, Charles Herbert
Bethe, Hans Albrecht
Bilger, Leonora Neuffer
Binet, Alfred
Binnig, Gerd
Birman, Joan S.
Bishop, Katharine Scott
Blackburn, Elizabeth Helen
Blackwell, Elizabeth
Blagg, Mary Adela
Bloch, Felix
Blodgett, Katharine Burr
Blum, Lenore Epstein
Boden, Margaret
Bodley, Rachel Littler
Bohr, Niels Henrik David
Boivin, Marie-Anne-Victoire Gallain
Bok, Bart Jan
Boltzman, Ludwig Eduard
Bondar, Roberta Lynn
Boole, George
Boole, Mary Everest
Bordet, Jules-Jean-Baptiste-Vincent
Borlaug, Norman Ernest
Born, Max
Bosch, Carl
Bose, Satyendranath
Bothe, Walther Wilhelm Georg
Bovet, Daniel
Bowman, Sir William
Boyle, Robert
Bozeman, Sylvia
Brady, St. Elmo
Brahe, Tycho
Brandege, Mary Katharine Layne (“Kate”)
Branson, Herman Russell

- Braun, Emma Lucy
 Braun, Karl Ferdinand
 Breckenridge, Mary
 Brewster, Sir David
 Brill, Yvonne Claeys
 Britton, Elizabeth Gertrude Knight
 Broca, Pierre-Paul
 Broglie, Louis-Victor-Pierre-Raymond,
 prince and seventh duc de
 Brongniart, Alexandre
 Brønsted, Johannes Nicolaus
 Brooks, Harriet
 Brown, Rachel Fuller
 Browne, Barbara Moulton
 Browne, Marjorie Lee
 Buchner, Eduard
 Bunsen, Robert Wilhelm
 Burbank, Luther
 Burbidge, Eleanor Margaret Peachey
 Burnet, Sir Frank Macfarlane
 Burton, Leone
 Butenandt, Adolf
 Buys Ballot, Christoph Hendrik
 Diedrik
 Caldicott, Helen
 Caldwell, Mary Letitia
 Calvin, Melvin
 Cambra, Jessie G.
 Campbell-Swinton, Alan Archibald
 Canady, Alexa I.
 Cannizzaro, Stanislao
 Cannon, Annie Jump
 Cantor, Georg Ferdinand Ludwig
 Philipp
 Cardús, David
 Carnot, Nicolas-Léonard-Sadi
 Carothers, E. (Estella) Eleanor
 Carothers, Wallace Hume
 Carr, Emma Perry
 Carrel, Alexis
 Carruthers, George R.
 Carson, Benjamin S.
 Carson, Rachel Louise
 Carver, George Washington
 Caserio, Marjorie Constance Beckett
 Cassini, Giovanni Domenico
 Cauchy, Augustin-Louis, Baron
 Cavendish, Henry
 Celsius, Anders
 Chadwick, Sir James
 Chain, Sir Ernst Boris
 Chandrasekhar, Subrahmanyan
 Chang, Min-Chueh
 Chang, Sun-Young Alice
 Charpak, Georges
 Chase, Mary Agnes Meara
 Chasman, Renate Wiener
 Châtelet, Gabrielle-Emilie du
 Cherenkov, Pavel Alekseyevich
 Chinn, May Edward
 Cho, Alfred Y.
 Chu, Paul Ching-Wu
 Clapp, Cornelia M.
 Clark, Eugenie
 Clark, Josiah Latimer
 Clarke, Edith
 Clay-Jolles, Tettje Clasina
 Claypool, Edith Jane
 Cleopatra the Alchemist
 Cobb, Jewel Plummer
 Cohen, Stanley H.
 Cohn, Mildred
 Colborn, Theodora
 Colden, Jane
 Cole, Rebecca J.
 Colmenares, Margarita Hortensia
 Colwell, Rita Rossi
 Colwin, Laura North Hunter
 Comstock, Anna Botsford
 Conway, Lynn Ann
 Conwell, Esther Marly
 Conybeare, William Daniel
 Cooper, Leon Neil
 Copernicus, Nicolaus
 Cori, Gerty Theresa Radnitz
 Coriolis, Gustave-Gaspard
 Cornforth, John Warcup
 Cousteau, Jacques-Yves
 Cowings, Patricia Suzanne
 Cox, Geraldine Anne Vang
 Cox, Gertrude Mary
 Cremer, Erika
 Crick, Francis Harry Compton
 Crookes, William
 Crosby, Elizabeth Caroline
 Crutzen, Paul J.
 Curie, Marie Sklodowska
 Curie, Pierre
 Cuvier, Georges-Léopold-Chrétien-
 Frédéric-Dagobert, Baron
 Daily, Gretchen
 Dalton, John
 Daly, Marie Maynard
 Dana, James Dwight
 Daniell, John Frederic
 Darden, Christine
 Darwin, Charles Robert
 Darwin, Erasmus
 Daubechies, Ingrid
 Davis, Margaret B.
 Davis, Marguerite
 Davy, Sir Humphry
 Debye, Peter Joseph William
 Delbrück, Max
 Descartes, René du Perron
 De Vries, Hugo
 DeWitt, Lydia Maria Adams
 Dewitt-Morette, Cécile-Andrée-Paule
 Diacumakos, Elaine
 Dicciani, Nance K.
 Dick, Gladys Rowena Henry
 Dicke, Robert Henry
 Diels, Otto
 Diesel, Rudolf
 Diggs, Irene
 Dirac, Paul Adrien Maurice
 Dolan, Louise Ann
 Domagk, Gerhard
 Doppler, Christian Johann
 Doubleday, Neltje Blanchan De Graff
 Douglas, Allie Vibert
 Dresselhaus, Mildred Spiewak
 Dubos, René
 Dunham, Katherine Mary
 Duplaix, Nicole
 Dyer, Helen M.
 Earle, Sylvia Alice
 Eastwood, Alice
 Eccles, Sir John
 Eckerson, Sophia Hennion
 Eddy, Bernice
 Edelman, Gerald M.
 Edinger, Johanna Gabrielle Ottelie
 ("Tilly")
 Edison, Thomas
 Edwards, Cecile Hoover
 Edwards, Helen T.
 Egas Moniz, António Caetano de
 Abreu Freire
 Ehrenfest-Afanaseva, Tatiana
 Ehrlich, Paul
 Eigen, Manfred
 Eigenmann, Rosa Smith
 Einstein, Albert
 Einthoven, Willem
 Elgood, Cornelia Bonté Sheldon
 Amos
 Elion, Gertrude Belle ("Trudy")
 Emeagwali, Dale Brown
 Emerson, Gladys Anderson
 Enders, John Franklin
 Erasistratus of Chios

Eratosthenes	Gaillard, Mary Katharine	Harris, Mary Styles
Erlanger, Joseph	Galdikas, Biruté M. F.	Harrison, Anna Jane
Esaki, Leo	Galen	Harvey, Ethel Browne
Esau, Katherine	Galilei, Galileo	Harvey, William
Estrin, Thelma	Gamow, George	Harwood, Margaret
Euclid	Gardner, Julia Anna	Hassel, Odd
Euler, Leonhard	Garmany, Catharine Doremus	Hawes, Harriet Ann Boyd
Evans, Alice Catherine	Gasser, Herbert Spencer	Hawking, Stephen William
Ewing, William Maurice	Gauss, Karl Friedrich	Haworth, Walter
Faber, Sandra Moore	Gay-Lussac, Joseph Louis	Hay, Elizabeth Dexter
Fahrenheit, Gabriel Daniel	Geller, Margaret Joan	Hay, Louise Schmir
Falconer, Etta Zuber	Germain, Marie-Sophie	Hazen, Elizabeth Lee
Faraday, Michael	Giblett, Eloise Rosalie	Hazlett, Olive Clio
Farquhar, Marilyn Gist	Gilbert, Grove Karl	Healy, Bernadine
Farr, Wanda K.	Gilbert, Walter	Heezen, Bruce C.
Fawcett, Stella Grace Maisie	Gilbreth, Lillian Evelyn Moller	Heisenberg, Werner Karl
Federoff, Nina V.	Giliani, Alessandra	Heloise
Fell, Honor Bridget	Glashow, Sheldon Lee	Herophilus of Chalcedon
Fenselau, Catherine Clarke	Gleditsch, Ellen	Herrad of Landsberg
Ferguson, Margaret Clay	Glusker, Jenny Pickworth	Herschel, Caroline Lucretia
Fermi, Enrico	Goddard, Robert Hutchings	Herschel, Sir John Frederick William
Feynman, Richard Philip	Goldberg, Adele	Herschel, Sir William
Fibonacci, Leonardo Pisano	Goldhaber, Gertrude Scharff	Hershey, Alfred Day
Fieser, Mary Peters	Goldhaber, Sulamith	Hertz, Gustav
Fischer, Emil Hermann	Golgi, Camillo	Hertz, Heinrich Rudolf
Fischer, Ernst Otto	Good, Mary Lowe	Herzberg, Gerhard
Fischer, Hans	Goodall, Jane	Herzenberg, Caroline Stuart Little
Fisher, Elizabeth F.	Goodenough, Florence Laura	Hess, Victor Francis Franz
Fleming, Sir Alexander	Gould, Stephen Jay	Hess, Walter Rudolf
Fleming, Williamina Paton Stevens	Gourdine, Meredith Charles	Hewish, Antony
Florey, Howard Walter	Graham, Thomas	Hewitt, Jacqueline N.
Flory, Paul	Granville, Evelyn Boyd	Heyrovský, Jaroslav
Flourens, Pierre	Grasselli Brown, Jeanette G.	Hibbard, Hope
Flügge-Lotz, Irmgard	Green, Arda Alden	Hildegard of Bingen
Foot, Katharine	Grignard, François-Auguste-Victor	Hill, Sir Archibald Vivian
Forrester, Jay	Grimaldi, Francesco Maria	Hill, Dorothy
Fossey, Dian	Gross, Carol A.	Hill, Henry Aaron
Foucault, Jean-Bernard-Léon	Guillaume, Charles-Édouard	Hinshelwood, Cyril
Fowler, William Alfred	Gullstrand, Allvar	Hipparchus
Franck, James	Gurdon, John Bertrand	Hippocrates of Cos
Frank, Ilya Mikhailovich	Guthrie, Mary Jane	Hobby, Gladys Lounsbury
Franklin, Benjamin	Gutierrez, Orlando A.	Hodgkin, Alan Lloyd
Franklin, Rosalind Elsie	Haber, Fritz	Hodgkin, Dorothy Crowfoot
Fraunhofer, Joseph von	Hadley, George	Hoffleit, Ellen Dorrit
Free, Helen Murray	Hahn, Dorothy Anna	Hoffmann, Roald
Freedman, Wendy Laurel	Hahn, Otto	Hogg, Helen Battles Sawyer
Freud, Sigmund	Hale, George Ellery	Hollerith, Herman
Friedel, Charles	Hall, James	Hollinshead, Ariel Cahill
Friend, Charlotte	Hall, Lloyd Augustus	Holmes, Arthur
Frith, Uta Auernhammer	Halley, Edmond	Hoobler, Icie Gertrude Macy
Fukui, Kenichi	Hamerstrom, Frances	Hopkins, Donald
Gabor, Dennis	Hamilton, Alice	Hopper, Grace Brewster Murray
Gadgil, Sulochana	Harden, Arthur	Horney, Karen Danielsen
Gage, Susanna Phelps	Hardy, Harriet	Horstmann, Dorothy Millicent

- Hounsfield, Godfrey Newbold
 Hoyle, Sir Fred
 Hrdy, Sarah Blaffer
 Huang, Alice Shih-Hou
 Hubbard, Ruth
 Hubble, Edwin Powell
 Hubel, David Hunter
 Hückel, Erich
 Hudson, Mary K.
 Humboldt, Alexander von
 Hutton, James
 Huxley, Sir Andrew Fielding
 Huygens, Christiaan
 Hyatt, Gilbert
 Hyde, Ida Henrietta
 Hyman, Libbie Henrietta
 Hypatia of Alexandria
 Ildstad, Suzanne
 Imes, Elmer Samuel
 Itakura, Keiichi
 Jackson, Shirley Ann
 Jacobi, Mary
 Jacobs, Aletta Henriette
 Jacquard, Joseph-Marie
 Jansky, Karl Guthe
 Jeans, Sir James Hopwood
 Jemison, Mae Carol
 Jenner, Edward
 Jex-Blake, Sophia Louisa
 Jobs, Steven
 Johnson, Katherine Coleman Goble
 Johnson, Virginia E.
 Joliot-Curie, Frédéric
 Joliot-Curie, Irène
 Jones, Mary Ellen
 Joshee, Anandibai
 Joule, James Prescott
 Joullié, Madeleine M.
 Jung, Carl Gustav
 Just, Ernest Everett
 Kapitsa, Pyotr Leonidovich
 Karle, Isabella L.
 Karrer, Paul
 Kastler, Alfred
 Kato, Tosio
 Kaufman, Joyce Jacobson
 Keller, Evelyn Fox
 Kelsey, Frances Oldham
 Kelvin, William Thomson, Lord
 Kendrew, Sir John Cowdery
 Kepler, Johannes
 Kessel, Mona
 Khayyám, Omar
 Khorana, Har Gobind
 Kil, Chung-Hee
 King, Helen Dean
 King, Louisa Boyd Yeomans
 King, Mary-Claire
 King, Reatha Clark
 Kipping, Frederic Stanley
 Kirch, Maria Winkelmann
 Kistiakowsky, Vera E.
 Kittrell, Flemma Pansy
 Kivelson, Margaret Galland
 Klein, Christian Felix
 Klein, Melanie Reizes
 Klieneberger-Nobel, Emmy
 Klug, Aaron
 Knopf, Eleanora Bliss
 Koehl, Mimi A. R.
 Kolff, Willem J.
 Koller, Noemie Benczer
 Kornberg, Arthur
 Kovalevskaia, Sofia Vasilyevna
 (“Sonya”)
 Krebs, Sir Hans Adolf
 Krieger, Cecelia
 Krim, Mathilde
 Kübler-Ross, Elisabeth
 Kuhlmann-Wilsdorf, Doris
 Kuhn, Richard
 Kuiper, Gerard Peter
 Kuperberg, Krystyna
 Kwolek, Stephanie L.
 Lachapelle, Marie-Louise
 Ladd-Franklin, Christine
 Laird, Elizabeth Rebecca
 Lamarck, Jean-Baptiste-Pierre-
 Antoine de Monet, chevalier de
 Lancefield, Rebecca Craighill
 Langmuir, Irving
 Laplace, Pierre-Simon de, Marquis
 Laveran, Charles-Louis-Alphonse
 Lavoisier, Antoine-Laurent
 Lavoisier, Marie-Anne-Pierrette
 Paulze
 Lawes, John Bennett
 Lawrence, Ernest Orlando
 Leakey, Louis Seymour Bazett
 Leakey, Mary Douglas Nicol
 Leakey, Richard Erskine Frere
 Leavitt, Henrietta Swan
 Le Beau, Désirée
 Leblanc, Nicolas
 Lebon, Philippe
 Lee, Tsung-Dao
 Lee, Yuan Tseh
 Leeuwenhoek, Antoni van
 Lehmann, Inge
 Lehn, Jean-Marie
 Leibniz, Gottfried Wilhelm
 Leloir, Luis Federico
 Lenard, Philipp Eduard Anton von
 Leopold, Aldo
 Leopold, Estella Bergere
 Lepeshinskaia, Ol’ga Borisovna
 Protopova
 L’Esperance, Elise Depew Strang
 Lester, William Alexander, Jr.
 Levi-Montalcini, Rita
 Levy, Jerre
 Levy, Julia
 Lewis, Gilbert Newton
 Lewis, Margaret Adaline Reed
 Li, Ching Chun
 Libby, Leonora Woods Marshall
 Libby, Willard Frank
 Lim, Robert Kho-seng
 Lin, Ch’iao-chih
 Linnaeus, Carl
 Lipmann, Fritz Albert
 Lipscomb, William Nunn, Jr.
 Lister, Joseph
 Lloyd, Ruth Smith
 Logan, Martha Daniell
 Logan, Myra Adele
 Long, Irene Duhart
 Lonsdale, Kathleen Yardley
 Love, Susan
 Lovelace, Augusta Ada Byron
 Lovelock, James Ephraim
 Lowell, Percival
 Lubchenco, Jane
 Lucid, Shannon W.
 Luria, Salvador Edward
 Lyell, Sir Charles
 Lyon, Mary Frances
 Maathai, Wangari Muta
 MacGill, Elsie Gregory
 Mach, Ernst
 Mack, Pauline Beery
 Macklin, Madge Thurlow
 Macleod, John James Rickard
 Maiman, Theodore
 Makhubu, Lydia Phindile
 Maltby, Margaret Eliza
 Mandl, Ines Hochmuth
 Mangold, Hilde Proescholdt
 Manton, Sidnie Milana
 Manzolini, Anna Morandi
 Marconi, Guglielmo
 Marcy, Geoffrey
 Margulis, Lynn Alexander
 Maria the Jewess (Mary, Miriam)
 Marrack, Philippa

- Martin, Archer John Porter
 Massey, Walter Eugene
 Massie, Samuel Proctor
 Matzinger, Polly Celine Eveline
 Mauchly, John William
 Maury, Antonia Caetana
 Maury, Carlotta Joaquina
 Maury, Matthew Fontaine
 Maxwell, James Clerk
 Maxwell, Martha Dartt
 Mayer, Maria Gertrude Goeppert
 McClintock, Barbara
 McDuff, Margaret Dusa
 McMillan, Edwin Mattison
 McNally, Karen Cook
 McNutt, Marcia Kemper
 Mead, Margaret
 Medawar, Peter Brian
 Meitner, Lise
 Mendel, Johann Gregor
 Mendeleev, Dmitri Ivanovich
 Mendenhall, Dorothy Reed
 Mercator, Gerardus
 Merian, Maria Sibylla
 Mestral, George de
 Metchnikoff, Élie
 Mexia, Ynes Enriquetta Julietta
 Meyerhof, Otto Fritz
 Micheli-Tzanakou, Evangelia
 Michelson, Albert Abraham
 Miller, Elizabeth Calvert
 Minkowski, Hermann
 Minot, George Richards
 Mintz, Beatrice
 Mitchell, Maria
 Möbius, August Ferdinand
 Mohs, Friedrich
 Moissan, Ferdinand-Frédéric-Henri
 Molina, Mario
 Moore, Stanford
 Morawetz, Cathleen Synge
 Morgan, Agnes Fay
 Morgan, Ann Haven
 Morgan, Lilian Vaughan Sampson
 Morgan, Thomas Hunt
 Moss, Cynthia
 Mössbauer, Rudolph Ludwig
 Moufang, Ruth
 Muir, John
 Muller, Hermann Joseph
 Müller, Paul Hermann
 Mulliken, Robert S.
 Murphy, William Parry
 Nambu, Yoichiro
 Napier, John
 Natta, Giulio
 Néel, Louis-Eugène-Félix
 Nernst, Walther Hermann
 Neufeld, Elizabeth Fondal
 Newlands, John Alexander Reina
 Newton, Sir Isaac
 Nice, Margaret Morse
 Nichols, Roberta J.
 Nicolle, Charles-Jules-Henri
 Niepce, Joseph
 Nightingale, Dorothy Virginia
 Nightingale, Florence
 Nipkow, Paul Gottlieb
 Nirenberg, Marshall Warren
 Nobel, Alfred Bernhard
 Noddack, Ida Tacke
 Noether, Emmy
 Noguchi, Constance Tom
 Norrish, Ronald George Wreyford
 Northrop, John Howard
 Novello, Antonia Coello
 Nüsslein-Volhard, Christiane
 Nuttall, Zelia Maria Magdalena
 Nyholm, Ronald Sydney
 Ocampo-Friedmann, Roseli
 Ochoa, Ellen
 Ochoa, Severo
 Ogilvie, Ida H.
 Ohm, Georg Simon
 Olden, Kenneth
 Onsager, Lars
 Oort, Jan Hendrik
 Oppenheimer, J. Robert
 Ørsted, Hans Christian
 Osborn, Mary J.
 Ostwald, Wilhelm
 Panajiotatou, Angeliki
 Pappus of Alexandria
 Pardue, Mary Lou
 Parsons, Charles Algernon
 Pascal, Blaise
 Pasteur, Louis
 Patrick, Ruth
 Patterson, Francine
 Pauli, Wolfgang
 Pauling, Linus Carl
 Payne, Katharine Boynton (“Katy”)
 Payne-Gaposchkin, Cecilia Helena
 Pearce, Louise
 Peden, Irene Carswell
 Pellier, Laurence Delisle
 Pendleton, Yvonne
 Pennington, Mary Engle
 Penry, Deborah L.
 Perey, Marguerite-Catherine
 Perkin, William Henry
 Perlmann, Gertrude E.
 Perrin-Riou, Bernadette
 Pert, Candace Beebe
 Perutz, Max Ferdinand
 Péter, Rózsa
 Petermann, Mary Locke
 Peterson, Edith R.
 Phelps, Almira Hart Lincoln
 Phillips, Melba Newell
 Piaget, Jean
 Piazzzi, Giuseppe
 Picotte, Susan La Flesche
 Pierce, Naomi E.
 Pimental, David
 Pinckney, Eliza Lucas
 Planck, Max
 Playfair, John
 Pliny the Elder
 Poincaré, Jules-Henri
 Polanyi, Michael
 Poncelet, Jean-Victor
 Popov, Alexander Stepanovich
 Porter, Sir George
 Pregl, Fritz
 Prelog, Vladimir
 Pressman, Ada Irene
 Prichard, Diana García
 Priestley, Joseph
 Prigogine, Ilya
 Profet, Margie Jean
 Proust, Joseph-Louis
 Ptolemaeus, Claudius (Ptolemy)
 Purcell, Edward Mills
 Pythagoras
 Pytheas of Massilia
 Quimby, Edith H.
 Quinland, William Samuel
 Quinn, Helena Rhoda Arnold
 Rabi, Isidor Isaac
 Rajalakshmi, R.
 Raman, Sir Chandrasekhara Venkata
 Ramanujan, Srinivasa Iyengar
 Ramart-Lucas, Pauline
 Ramey, Estelle
 Ramón y Cajal, Santiago
 Ramsay, William
 Randoín, Lucie
 Ratner, Sarah
 Ray, Dixy Lee
 Rees, Mina S.
 Richards, Ellen Henrietta Swallow
 Richards, Theodore William
 Richardson, Jane S.
 Richter, Charles Francis

- Ride, Sally K.
 Rigas, Harriet B.
 Robbins, Frederick Chapman
 Roberts, Dorothea Klumpke
 Robinson, Julia Bowman
 Robinson, Robert
 Rockwell, Mabel MacFerran
 Roemer, Elizabeth
 Rohrer, Heinrich
 Roman, Nancy Grace
 Röntgen, Wilhelm Conrad
 Rothschild, Miriam
 Rowland, F. Sherwood
 Rowley, Janet D.
 Rubin, Vera Cooper
 Russell, Bertrand Arthur William
 Russell, Elizabeth Shull
 Rutherford, Ernest
 Ružička, Leopold
 Sabatier, Paul
 Sabin, Alfred Bruce
 Sabin, Florence Rena
 Sagan, Carl Edward
 Sager, Ruth
 Salk, Jonas Edward
 Sanchez, Pedro Antonio
 Sanford, Katherine Koontz
 Sanger, Frederick
 Sarachik, Myriam
 Saruhashi, Katsuko
 Schafer, Alice Turner
 Scharer, Berta Vogel
 Schiaparelli, Giovanni Virginio
 Schrieffer, John Robert
 Schrödinger, Erwin
 Schwinger, Julian Seymour
 Scott, Charlotte Angas
 Seaborg, Glenn Theodore
 Seibert, Florence Barbara
 Semenov, Nikolay (Nikolayevich)
 Sessions, Kate Olivia
 Shapley, Harlow
 Shattuck, Lydia White
 Shaw, Mary
 Sherrill, Mary Lura
 Sherrington, Charles Scott
 Shiva, Vandana
 Shockley, Dolores Cooper
 Shockley, William
 Shoemaker, Eugene Merle
 Shreeve, Jean'ne Marie
 Siegbahn, Karl Manne Georg
 Sikorsky, Igor
 Silbergeld, Ellen Kovner
 Simmonds, Sofia
 Simon, Dorothy Martin
 Simpson, Joanne Malkus
 Sinclair, Mary Emily
 Singer, Maxine
 Sinkford, Jeanne C.
 Sithole-Niang, Idah
 Sitterly, Charlotte Emma Moore
 Skinner, B. F.
 Slye, Maud Caroline
 Snyder, Solomon Halbert
 Soddy, Frederick
 Solomon, Susan
 Somerville, Mary Fairfax
 Spaeth, Mary
 Sparling, Rebecca Hall
 Sperry, Elmer Ambrose
 Sperry, Pauline
 Sperry, Roger Wolcott
 Sponer, Hertha
 Spurlock, Jeanne
 Srinivasan, Bhama
 Stanley, Louise
 Stanley, Wendell Meredith
 Stark, Johannes
 Staudinger, Hermann
 Stein, William Howard
 Steitz, Joan Argetsinger
 Stephenson, Marjory
 Stern, Frances
 Stern, Otto
 Stevens, Nettie Maria
 Steward, Susan Smith McKinney
 Stewart, Alice
 Stewart, Sarah
 Stokes, William
 Stoll, Alice Mary
 Stone, Isabelle
 Stubbe, JoAnne
 Sudarkasa, Niara
 Sullivan, Betty J.
 Sumner, James Batcheller
 Sutherland, Ivan Edward
 Svedberg, Theodore
 Swinburne, James
 Swope, Henrietta Hill
 Sydenham, Thomas
 Syngé, Richard
 Szkody, Paula
 Tamm, Igor Evgenievich
 Tarski, Alfred
 Tartaglia, Niccolò
 Taussig, Helen Brooke
 Taussky-Todd Olga
 Taylor, Lucy Hobbs
 Taylor, Stuart Robert
 Telkes, Maria
 Teller, Edward
 Tereshkova, Valentina Vladimirovna
 Nikolayeva
 Tesla, Nikola
 Tesoro, Giuliana Cavaglieri
 Tharp, Marie
 Theophrastus
 Thomas, Martha Jane Bergin
 Ting, Samuel Chao Chung
 Tinsley, Beatrice Muriel Hill
 Tiselius, Arne Wilhelm Kaurin
 Todd, Alexander Robertus, Baron
 Tolbert, Margaret E. M.
 Tombaugh, Clyde William
 Tomonaga, Shinichiro
 Tonegawa, Susumu
 Trotter, Mildred
 Trotula of Salerno
 Tsiolkovsky, Konstantin Eduardovich
 Tsui, Lap-Chee
 Tull, Jethro
 Turing, Alan Mathison
 Turner, Charles Henry
 Uhlenbeck, Karen Keskulla
 Urey, Harold Clayton
 Van der Meer, Simon
 Van Dover, Cindy Lee
 Vassy, Arlette
 Vennesland, Birgit
 Venter, J. Craig
 Virtanen, Artturi Ilmari
 Vivian, Roxana Hayward
 Vold, Marjorie Jean Young
 Volta, Count Alessandro Giuseppe
 Antonio Anastasio
 Von Mises, Hilda Geiringer
 Von Neumann, John Louis
 Von Sachs, Julius
 Vrba, Elisabeth
 Vyssotsky, Emma T. R. Williams
 Waelsch, Salome Gluecksohn
 Schoenheimer
 Wagner-Jauregg, Julius
 Waldeyer-Hartz, Heinrich Wilhelm
 Gottfried von
 Walker, Mary Edwards
 Wallace, Alfred Russel
 Wallach, Otto
 Washburn, Margaret Floy
 Washington, Warren M.
 Watson, James Dewey
 Wattleton, Alyce Faye
 Weertman, Julia
 Wegener, Alfred Lothar

Weinberg, Steven
Weisburger, Elizabeth Amy Kreiser
Weller, Thomas Huckle
Werner, Abraham Gottlob
Werner, Alfred
Wethers, Doris L.
Wexler, Nancy Sabin
Wheatstone, Sir Charles
Wheeler, Anna Johnson Pell
Wheeler, Emma Rochelle
Whipple, Fred Lawrence
Whipple, George Hoyt
White, Gilbert
Whiting, Sarah Frances
Widnall, Sheila E.
Wiesel, Torsten Nils
Wiles, Andrew John
Wilkins, J. Ernest, Jr.
Wilkins, Maurice Hugh Frederick
Wilkinson, Sir Geoffrey

Williams, Anna Wessels
Williams, Cicely Delphin
Williams, Heather
Williams, Oswald S.
Willson, Lee Anne Mordy
Wilson, Charles Thomson Rees
Wilson, John Tuzo
Witkin, Evelyn Maisel
Wittig, Georg
Wöhler, Friedrich
Wong-Staal, Flossie
Wood, Elizabeth Armstrong
Woods, Geraldine Pittman
Woodward, Robert Burns
Wozniak, Stephen
Wright, Jane Cooke
Wrinch, Dorothy Maud
Wu, Chien-Shiung
Wu, Sau Lan
Wyse, Rosemary

Xie, Xide
Yalow, Rosalyn Sussman
Yang, Chen Ning
Yener, Kutlu Aslihan
York, James Wesley, Jr.
Young, Grace Chisholm
Young, Judith Sharn
Young, Lai-Sang
Young, Roger Arliner
Young, Thomas
Yukawa, Hideki
Zakrzewska, Marie Elizabeth
Ziegler, Karl
Zinder, Norton David
Zoback, Mary Lou
Zsigmondy, Richard Adolf
Zuber, Maria T.
Zworykin, Vladimir

~ BIOGRAPHICAL ESSAYS ~

A-Z



Abbe, Cleveland

(1838–1916)

American

Meteorologist

Cleveland Abbe ushered in the modern era of meteorology by instituting a national system of daily weather reports and forecasts that served as the prototype for the U.S. Weather Bureau, which he also helped to organize. Abbe helped transform the reporting of weather from a highly localized phenomenon based on conjecture into a coordinated system based on observed facts and informed projections of potential weather developments. Abbe's "probabilities," as he initially called them, acted as the precursor to the present-day weather forecast.

Abbe was born on December 3, 1838, in New York City, brother of Robert Abbe, the pioneer in plastic surgery who introduced radiation therapy to the United States. Growing up in the city, he became enthralled with weather by reading articles by Joseph Henry (among others) in the daily newspapers. In the summer of 1857, he read William Ferrel's classic article on the theories of storms and winds in the *Mathematical Monthly*, which guided him into the study of meteorology. That year, he graduated from the Free Academy (now the College of the City of New York) and proceeded to conduct graduate studies in astronomy under F. Brunow at Ann Arbor, Michigan, until 1860, and then under B. A. Gould at Cambridge, Massachusetts, until 1864. Abbe spent the next two years studying and working as an assistant under astronomer Otto Struve at the Observatory of Pulkova in Russia.

Upon his return to the United States, he worked briefly at the Naval Observatory before taking up the directorship of the Cincinnati Observatory. In his inaugural address on May 1, 1868, he outlined his intention of establishing a system of weather reports. John Gano, president of the Cincinnati Chamber of Commerce, pledged his sup-

port for such a project, and the Western Union Telegraph Company donated transmissions over its telegraph lines of weather reports from the 40 volunteer meteorological correspondents enlisted by Abbe.

The first Cincinnati Weather Bulletin was dispatched on September 1, 1869. In October 1869, Abbe devised a code of cipher for abbreviating the weather reports. Abbe's Cincinnati Weather Bulletin served as the prototype for the nationalization of a weather-reporting system, which Smithsonian observer Increase Allen Lapham of Milwaukee urged Congress to establish under the auspices of the Signal Corps of the Army. The U.S. Congress announced a joint resolution supporting the measure on February 2, 1870, and on February 9, President Ulysses S. Grant signed the initiative into law, charging the secretary of war with establishing it under the Army Signal Service.

Abbe married on May 10, 1870, in the midst of preparations for the institution of the weather report, which went into effect in November 1870. On January 3, 1871, Abbe was appointed civilian assistant to the chief signal officer, General Albert J. Myer. Together they organized the Weather Bureau of the Army Signal Service, which oversaw the national weather reports. The reports consisted of daily synopses of current weather conditions, along with "probabilities," or forecasts of possible atmospheric developments. Abbe devised a system to reduce traffic on the electromagnetic telegraph wires by having all of the reporters at the major stations opening up their lines at specific appointed times, each to give a report and then listen to others' reports, thereby disseminating all the necessary information in a mere 20- to 30-minute interchange. Despite the efficiency of such a system, Western Union refused to dispatch all weather reports on March 4, 1871, forcing the Weather Bureau to use competing telegraph companies for their transmissions. Abbe continued to impose order on the system he innovated, determining the altitude above sea level of all Signal Service barometers

in 1872. The next year, he launched the *Monthly Weather Review*, a slim bulletin of weather statistics that expanded in some 20 years into one of the most respected meteorological journals in the world under Abbe's editorship. Also in 1873, the International Meteorological Congress established the "Daily Bulletin of Simultaneous International Meteorological Observations," based on Abbe's national system.

Abbe published prolifically. His most important papers included "Treatise on Meteorological Apparatus and Methods," published in 1887, and "Preparatory Studies for Deductive Methods in Storm and Weather Prediction," published in 1889. Other important titles included *Solar Spots and Terrestrial Temperature; A Plea for Terrestrial Physics; Atmospheric Radiation*; and *Treatise on Meteorological Apparatus*. Abbe was duly recognized for his contributions to science. For example, he was elected to the National Academy of Sciences in 1879. Perhaps the most distinguished honor was his receipt of the Marcellus Hartley medal for Eminence in the Application of Science to the Public Welfare on April 17, 1916. He was unable to attend the ceremony, however, due to ill health. Half a year later, Abbe died at his home in Chevy Chase, Maryland, on October 28, 1916. In his honor, flags in front of the Department of Agriculture and the Weather Bureau in Washington, D.C., were flown at half-mast on the day of his funeral. In his memory, the American Meteorological Society named the Cleveland Abbe Award for Distinguished Service to Atmospheric Sciences by an Individual after him.

Ackerman, Thomas P.

(1947–)

American
Meteorologist

The theory of nuclear winter, or the catastrophic atmospheric consequences wrought by nuclear war, elicited a sea change in the public perception of the viability of actually employing nuclear weapons tactically. Thomas Ackerman participated on the team that proposed a scientific model for a nuclear winter scenario in the early 1980s. The theory's reception varied along political lines: antinuclear activists embraced it as evidence of the insanity of maintaining nuclear arsenals, while the conservative contingent attacked its scientific limitations.

Thomas P. Ackerman was born in 1947. He graduated with a degree in physics from Calvin College, then went on to attend the University of Washington, earning his master of science degree in physics in 1971 and his Ph.D. in atmospheric science in 1976. After receiving his doctorate, he went to work as a research scientist at the National Aeronautics and Space Administration (NASA) Ames Research Center.

In 1982, the Swedish environmental journal *Ambio* published an article in which Paul Crutzen and John W. Birks coined the term "nuclear winter" to describe the aftereffects of a nuclear war. Interestingly, they theorized that the resulting environmental effects would eclipse the destructiveness of the actual explosions, as carbon soot from the resulting fires would blanket the atmosphere, preventing sunlight from reaching the Earth's surface. When CARL SAGAN read this account, he grasped the political implications of such a theory, and he realized that the scientific community could offer the antinuclear movement the ultimate deterrent: a description of mutually assured destruction, or global suicide.

Sagan set out to create a scientific model of nuclear winter, using computer software to extrapolate the effects of a nuclear holocaust. He enlisted Ackerman, along with Richard P. Turco, Owen B. Toon, and James B. Pollack, to form the team later known by the acronym TTAPS. The group developed a one-dimensional model projecting the likely outcomes of significant nuclear events. In their report, "Nuclear Winter: Global Consequences of Multiple Nuclear Explosions," published in the December 23, 1983, issue of *Science*, they proposed that nuclear weapons exploding over 100 cities, releasing an explosive power totaling as little as 100 megatons, would send so much dust and smoke into the atmosphere that the temperature would drop anywhere from five to 15 degrees, an outcome that could have catastrophic environmental consequences.

The nuclear winter theory galvanized the political community: the antinuclear movement used it as an apocalyptic rallying cry to discontinue the stockpiling of nuclear arms and, indeed, to reach disarmament treaties. However, the conservative faction seized upon the theory's limitations, pointing out that it did not take into account the division of the Earth's surface into water and land (which would create heat transfer), the difference between daytime and nighttime sunlight (TTAPS postulated 24-hour sunlight at one-third strength), and the limitations of existing computers to take into account the multiple variables factoring into a realistic scenario. Conservatives further accused the TTAPS team of sacrificing scientific integrity in order to advance a political agenda, a position confirmed by the opinions of leading scientists (including Nobel laureate Richard Feynman) who criticized the study's methodologies.

The TTAPS team, along with Crutzen and Birks, received the 1985 Leo Szilard Lectureship Award from the American Physical Society, reaffirming their scientific integrity. In 1988, Ackerman joined the faculty of Pennsylvania State University as a professor of meteorology and associate director of the Earth System Science Center and then held a concurrent position on NASA's MISR (Multi-angle Imaging SpectroRadiometer) science team and as a site scientist for the Tropical Western Pacific site in the Department of

Energy's Atmospheric Radiation Measurement Program. In 1995, he became a full professor at Penn State.

Ackerman also continued to collaborate with the TTAPS team, conducting further research on the nuclear winter question. In 1990, the group published a follow-up article in *Science*, in which they defended their original theory by offering more sophisticated modeling (available due to more sophisticated computer programs) and taking into account more realistic variables.

Since then, with the demise of the Soviet Union and the melting of the cold war, little research has been applied to the nuclear winter theory. However, the theory lodged itself in the collective consciousness, exerting a significant influence on public policy as well as personal angst. The reception of the theory demonstrated the necessity of maintaining impeccable scientific integrity, especially when scientific findings carry political implications. Ultimately, the theory's influence eclipsed the question of its scientific validity, as it forced a more considered approach to the question of the destructive capacity of nuclear weapons and the wisdom of maintaining vast nuclear arsenals in a state of readiness.

Adamson, Joy

(1910–1980)

Austrian

Naturalist

Best known for her book *Born Free: A Lioness of Two Worlds*, which detailed her experiences raising a lion cub in Africa, Joy Adamson was an artist and naturalist who did much to further the cause of wildlife preservation. Adamson raised a number of wild animals on game reserves in Kenya, where she spent the better part of her life. A film version of the highly popular *Born Free* was produced in 1964 and eventually led to a television series.

Born Friederike Viktoria Gessner on January 20, 1910, Adamson grew up in Troppau, Silesia, an area of Austria that later became part of Slovakia. Adamson's father, Viktor Gessner, was an architect and urban planner, and her mother, the former Traute Greipel, came from a wealthy family of paper manufacturers. Adamson demonstrated an interest in animals and creative pursuits from a young age; after shooting and killing a deer on the family's estate—hunting was a popular pastime on the estate—a teenaged Adamson swore she would never again kill for sport.

Adamson had varied interests and studied such subjects as psychoanalysis, painting, metalwork, music, dress-making, and archaeology at schools in Vienna. Though Adamson planned to pursue a career in medicine, she did not take her final exam. Instead, in 1935, Adamson married Victor von Klarwill, an Austrian businessman. Because Adamson's new husband was Jewish, the couple decided

to move to Kenya to escape the growing Nazi movement. Adamson went ahead of von Klarwill, and during her journey she met botanist Peter Bally. After divorcing von Klarwill, Adamson married Bally in 1938. Bally traveled through Kenya to study plant specimens, and Adamson accompanied him. She began to paint the plants Bally collected, eventually completing about 700 paintings.

Adamson's second marriage ended in divorce in 1942, and a year later she married George Adamson, a game warden. During the following years, Adamson continued her paintings of flowers and plants and also began to paint portraits of tribal members. Then, in 1956, George Adamson killed a lioness that attacked him. After discovering that the lioness was protecting three cubs, George Adamson brought home the cubs. Two were sent to the Rotterdam Zoo, but Adamson kept the third cub and named her Elsa. Adamson and her husband raised Elsa and trained her to live in the wild. Adamson chronicled these experiences in the book, *Born Free*, which was published in 1960. Elsa eventually had three cubs of her own and began to visit the Adamsons. When Elsa died at the age of five, the Adamsons trained her three cubs and set them free in Serengeti National Park. Adamson wrote about the cubs in *Living Free* and *Forever Free*, sequels to *Born Free*.

During the 1960s, Adamson worked to increase awareness of wildlife endangerment and the need for preservation, capitalizing on the popularity of her books. In 1961, Adamson established the Elsa Wild Animal Appeal Fund in the United Kingdom. Chapters in the United States and Canada followed. Adamson was also a founder of the World Wildlife Fund and among the first to boycott apparel made from animal fur. In 1962, she traveled around the world to speak about wildlife preservation. The proceeds from her activities funded the establishment of wildlife reserves and conservation efforts.

Though little was known about the behavior of cheetahs, Adamson raised and trained a cheetah, named Pippa, in the late 1960s. She detailed her experiences with Pippa in two books, *The Spotted Sphinx*, published in 1969, and *Pippa's Challenge*, published in 1972. Adamson moved to an estate outside of Nairobi in 1971, and in 1976 she focused on raising a leopard cub named Penny. This experience, too, led to a book, *Queen of Sheba: The Story of an African Leopard*, which was published in 1980.

Adamson was the recipient of numerous honors and awards for her efforts to advance the wildlife preservation movement. She was presented the Award of Merit from Czechoslovakia in 1970, the Joseph Wood Krutch Medal of the U.S. Humane Society in 1971, and the Austrian Cross of Honor for science and art in 1976. Adamson also received the 1947 Gold Grenfell Medal from the Royal Horticultural Society for her illustrations of East African plant life. Adamson was murdered by a former servant on January 3, 1980, in the Shaba Game Reserve in northern Kenya.