



Biodiversity and Our Future Healing Mother Earth

a benefit lecture for Canopy

E.O. Wilson

Sponsors













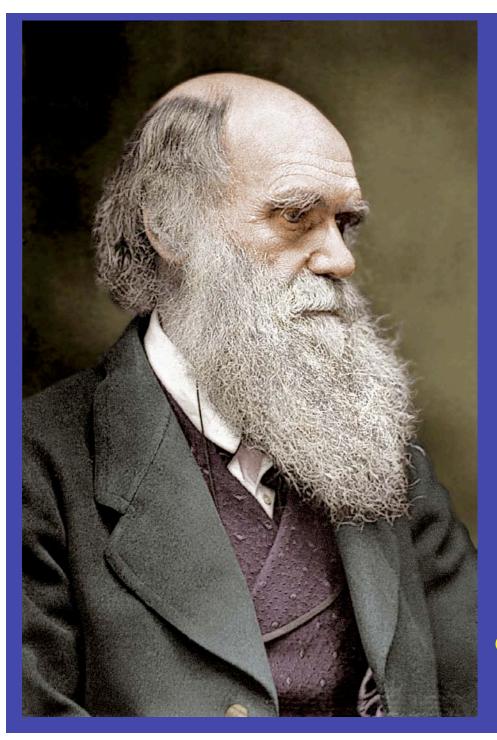












Darwin age 65 in 1874

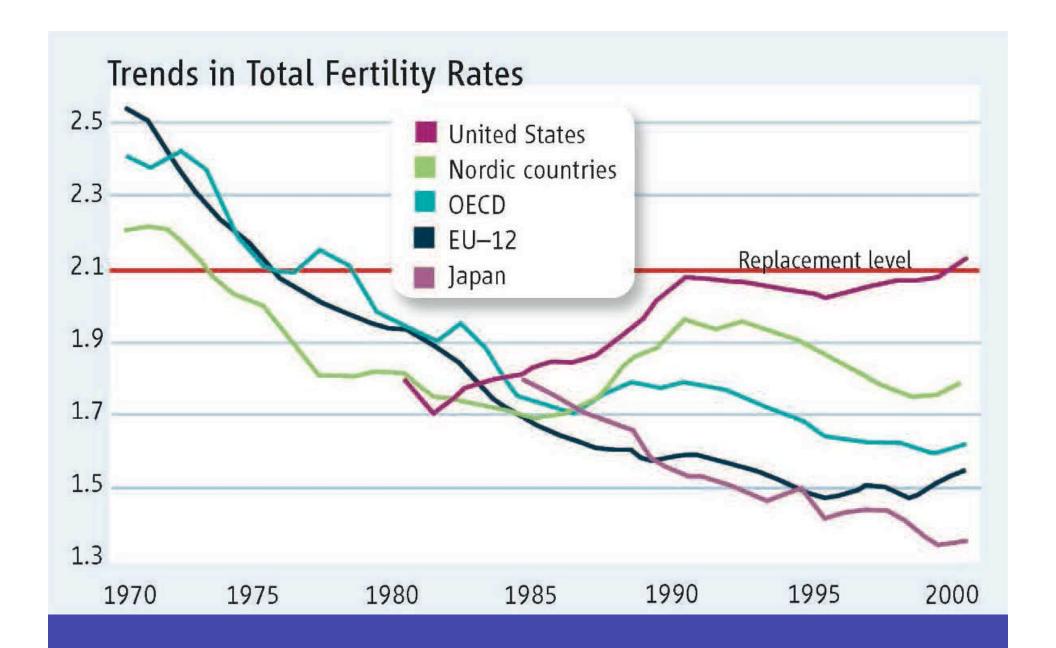
© The Natural History Museum London

Journal of Researches into the Natural History and Geology of the Countries visited during the Voyage of H.M.S. Beagle Round the World (1845)

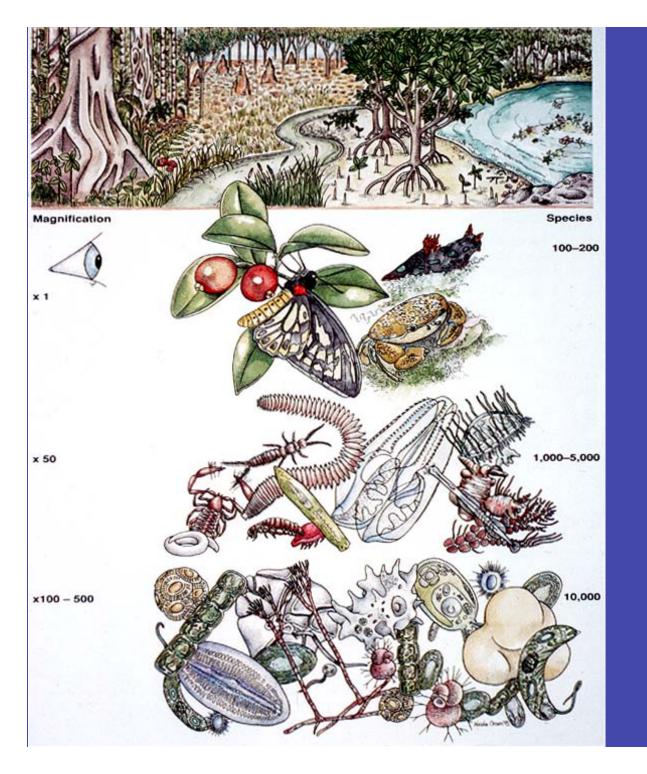
On the Origin of Species (1859)

The Descent of Man; and Selection in Relation to Sex (1871)

The Expression of the Emotions in Man and Animals (1872)



(from Michael Balter, Science 312, 1897, 2006)



Descending

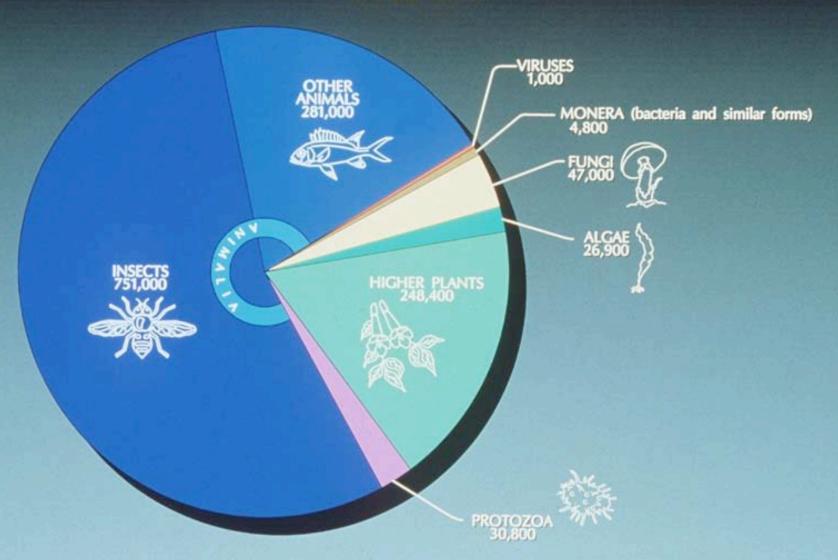
dimensions of

biodiversity

(from Andrew Beattie, Australia's Biodiversity, 1995)

Dr. E. O. Wilson, Canopy benefit lecture, 2009

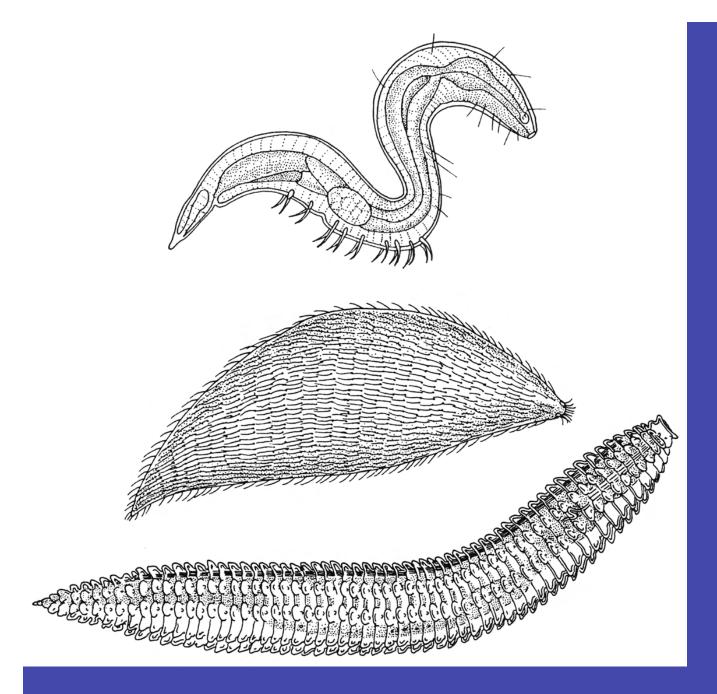
All Organisms: Total Species 1,390,900





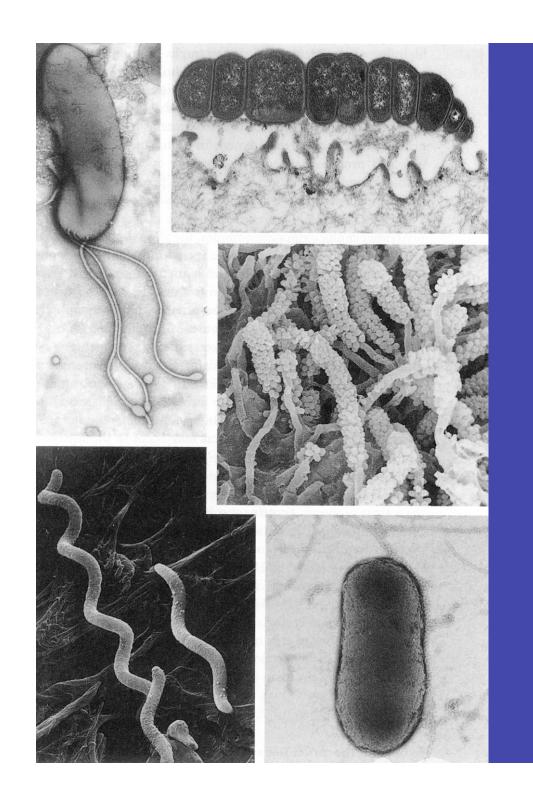
The Species-Scape

(from Quentin Wheeler, based on data from E. O. Wilson)



Three species of nematodes (roundworms), specialized variously for a free-living or parasitic existence.

(from Richard C.
Brusca and
Gary J. Brusca,
Invertebrates,
Sunderland, MA:
Sinauer Associates,
Inc., 1990, p. 350)



A medley of bacteria. The spiral species at bottom left is a freeliving aquatic species. The rest are inhabitants of various parts of the human alimentary tract; at bottom right is Escherichia coli, common in polluted water and a key species in molecular biology research.

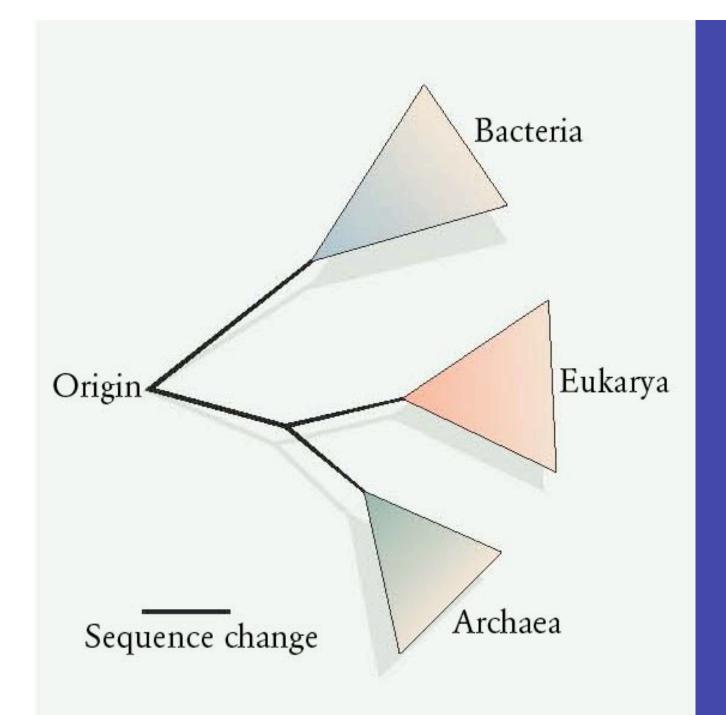
(from Paul Singleton, Bacteria in Biology, Biotechnology and Medicine, 6th ed., Hoboken, NJ: John Wiley & Sons, 2004, p. 12)

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Viruses: Gene weavers of life

(from Garry Hamilton, Nature 441, 683, 2006) Dr. E. O. Wilson, Canopy benefit lecture, 2009



Comparisons of ribosomal RNA sequences reveal a three-domains tree of life, rendering the term 'prokaryote' obsolete

(from Norman R. Pace, *Nature* 441, 289, 2006)

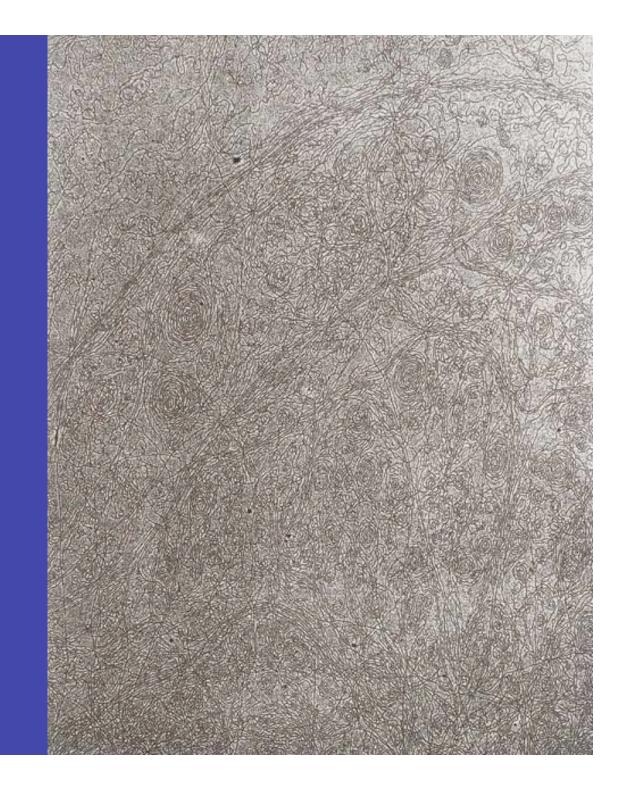
GABITITATCCCTICCATGACCCACAAGITAACACTITEGGATATTICTGATGACTCCAA AAATTATCTTGATAAAGCAGCAATTACTACTGCTGCTTCTTACCGATTAAATCGAAGTCGAC TGCTGGCGGAAATGACAAATTCCACCTATCCTTCCGCGCCTCCACAGACCTTACTT COGACCTITCCCCATCARCTARCOTTCTG1CAAAAACTGACGCGTTGGATGAGGAAAA TGGCTFANTATGC: TGGCACGTTGGTC NAGGACTGGTT TAGATNTGAGTCACATTTTGTT CATGGTAGAGATTGTCTTCTTGACATTTTAAAGAGCGTGGATTACTATCTGAGTCCGAT GCYGYTCAACCACTAATAGGTAAGAAATCATGAGTCAAGTTACTGAACAATCCGTACGTT TCCABACCGCTTTGGCCTCTATTAAGCTCATTCAGGCTTCTGCCGTTTTGGATTTAACCG AAGATGATT#CGATTT#CTGACGAGTAACAAAGT#TGGATTGCTACTGAGCGGCTCT#CGTG *TYCAAACGSCCTGTCJCAICATGGAAGSCCCIGANTTTACGGAAACATTAITAATGGG TGGASGGTGCGGTTAAAGCCCCTGAATTGTTCCGGTTTACCTTGCGTGTACGCGCAAGAA ACHETGACGTTCTTACTGACGCAGAAGAAARESTGGGTGAAAAATTAGGTGGGAAGGAG TGATGTAATGTCTAAAGGTAAARAACGTCTGGCGCTCGCCCTGGTCGTCGCCAGCGGT GEORGETACTARACSCARGESTARAGESGETESTETTTSOTATGTASGTGSTCARCART TTAATTGCAGGGGCTTEGGCCCCTTACTTGAGGATAAATTATGTCTAATATTCAAACTGG COCCONCCTATOCCCCATONCCTTTGCCATCTTGGCTTGCTTGETGGTCAGATTGGTCG TOTTATTACCATTYCANCTACTGCGGTTATCGCTGGCGACTCCTTCGAGATGGACGCCCT TGGEGCTETGGGTCTTTETCCATTGEGTCGTGGCCTTGCTALTGACTCTACTGTAGACAT TTTTACTTTTTATGICCCTCATCGTCACCGTTTATGGTGAACAGTGGATTAAGTTCATGAA GGATGGTGTTAATGGGACTGCTCCCCGACTGTTAACACTACTGGTTATATTGACCATGC TTATTIGANTATCTATAGAACTATTTTAAAGCGECGTGGATGCCTGACGGTACCGAGGC TARECETARTGAGET. TARTCARGATGATGCTCGTTATGGTTTGCGTTGCTGCCATGTCAA APACATTIGGACTGCTCCGCTTCCTCCTGAGACTGAGCTTCTCGCCAAATCACGACTTC TARCACATGTATTOACATTATGGGTCTGCAAGC:GCTTATGCTAAGTTGCATACTGACCA AGRACOTORTIACT TCATGCAGCOTTACCATGTTATTTCTTCATTTCONGGTANAS CTCTTATGACGETGACACCGECCTITACTISTCATGCGCTCTAATGTGTGGGCATCTGS CTATGATGITGATGGAACTGACCARACGTCGITAGGCCAGTITTCTGGTCGTGTTCAAGA GACCTATANACNITCIGIGCGGGTTICTTTGITCCTGAGCAIGGCACTATGITTACTCT TOCGET IBTTGGTTT TCEGEETACTGEGACTAAASASATTCASTACCTYAACGCYAAAGG TOCTTTEACTTATACCGATATICCTCGCCACCCTGTTTTGTATGGCAACTTGCCGCCGCG YCARATITCYAIGARCGATGTTITCEGITECTGTGATTEGTCTAAGAASTTTAAGATTCC TGAGGGTCAGIGGTATCCTTATGCGCCTTCGTATGTTTCTCCTGCTLATCACCTTCTTGA AGGETTCECATTEATTC4664ACCGCCTTCT65TCATTTGCAAGAACGGGTAETTATTEG CCACCATGAT : ATGACCACTG: TTGCAGTGCOT FCAGTTGTTGCAGTGGAATAGTCAGGT TAAATTTAATGTGACCOTTTATCGCAATCTGCCACCACTCGCGATTCAATCATGAGTTC GTGATAMANGATTGAGTGTGAGGTTATAACGZCGAAGGGGTAAAAATTTTAATTTTTGCC GC:GAGGGGTTGACCAAGGGAAGGGGGTAGGTTTTGTGCTTAGGAGTTTAATCATGTT: ERGACTTTTATTTCTCGCCATAATTCA4ACTTTTTTTCTGATAAGC19GTTGTCAGTTCT GTTAGTCGAGGTTGTTGGGC4CCTGTTTTAC-QACACCTAAAGCTACATGGTCAACGTTA TATFITGATAGTTIGACGGTGATGCTGGTAATGGTGGTTTTTTTCATTGCATTGAGATG GATACATCICICAACCCCCCAATCAGGITGTTTCTGTTGGTCCTGATATTCETTTTCAT GCCGACCCTAAATTITTIGCCIGITIGGTICSSTTTGAGTGTIGITGGGTIGGGAGTACC CICCEGACISCETATGATETTIATCETTTGAATGSTEGECAIGATGSTGGTTIATATCE GTCAAGGACTGTCTCACIATIGACGICCTTCCCCGTACGCCGGCAATAACGFTTATGIT GGTTTCATGGTTGGCGTCTACIATGACGACAAATGCCGCGGATTGGTTGCCTGAAT CAGGTTATTAAAGAGATTATTIGTCTCCACCCATTAAATGCTCAGGTCATTATTATGTTTGGT CTATTEGTGECGETATTEGTTCTGCTCTTGCTGGTGGCCCCATGTCTAAATTGTTTGGAG GEGGTCAAAAAGGGGGGTGGGGTGGGATTCAAGGTGATOTGEFTGEFACCGATAACAA:A CTGTAGGCATGGGTGATGC15GTATTAAATC16CCATTCAAGGCTCTAATGTTCCTAACC CTOAYGRGGCCGCCCTROT::TGT::TCTGGTGCTATGGCTANAGCTGGTAAAGGACTTC TIGOADGTAGGTIGGAGGGIGGCACTTGTGCCGTTTGTGATAABTTGGTTGATTTGGTTG GACTTGGTGGCAAGTCTGCCGCTGATAAAGGAAAGGATAGTCGTGATTATCTTGCTG<u>C</u>TG CATTICCIDADCITAATOCITOCOAGCOTGCTGGTGCTGCTTCCTCTGCTGGTATGG TTGACGCCGGA:TTGAGAATCAAAAGAGCTTACTAAAATGCAACTGGACAATCAGAAAG ACATTOCCONGATOCANANTGAGACTCNAAAAGAGATTGGCCATTCAGTCGGCGACTT CACGCEAGAATAEGA4AGACEACSTATATGCACAAAATGAGA:GCT.TGCTTATGAACAGA aggagyctactgctcgcgtigcgtctattatggaaaacaccaatctttccaagcaacac AGGTTTECCAGATTATCCCCCRAATGCTTACTCAAGCTCAAACGGCTGGTCAGTATTTTA CGAATGACCAAATCAAAGAAATGACTCGGAAGGTTAGTCCTCAGCTTGACTTAGTTCATC AGGAAAGGGAGAATCAGCGGTATGGCTCTTCTCATATTGCCCCTACTGCAAAGGATATTT CTAATGTCGTCACTGATTGCTCTGTTTGATATTTTCATCGTATTGATATTA CTG TTG CCGATACTTG GAACAAT TTC TG SAAAGACGG TAAASCTG ATGGTATTGGC TCTA ATTTOTCTAGGARATAAGGGTGAGGATTGACACCCTCCCANITGTATGTTTTCATGGCTC CAAATCT FGGAGGCTTT TTTATGGT FGGTTGTTATTACCCT TCTGAATGTCACGCTGATT ATTTTGACTTTGAGGGTATCGAGGGTCTTAAACCTGCTATTGAGGCTTGTGGCATTTCTA CTCTTTCTCAATCCCCAATGCTTGGCTTGCATAAGCAGATGGATAACCGCATCAAGCTCT IGGAAGATATCTGTCfTffcG:AfGCAGGCC1fGnGT;CGnTnATGGTGATATGTATG TTBACGGCCATAAGGCTGC:ICTGACGTTCG:GATGAGTTTGTATCTGTTACTGAGAAGT TAATGGATGAATTGGGACAATGCTACAATGTGCTCCCCCAACTTGATATTAATAACACTA AG FT TTGGGGGAAGC TGGCTGCTGAACGCCCTCTTAAGGATATTCGCGATGAGIATAATT accerarroration action of the terminal transfer of the contraction actions and the contraction actions are the contraction actions and the contraction actions are the contraction actions are the contraction actions and the contraction actions are the contraction action actio AATEGESTABABGETTTBETRITEACESTTTGAIGANTBERATGEGRENGBETGRYBETG AIGGITGSTYTATGGITTIFSACAGETE CACCETTGBETGABGAEGAETABABGEETTTF ATGATAATGECAATGETTTBECGTBACTATTTBETCATATTGBTECTATGETCTTTTTTTG CCGAGGGTCOCAAGGCTAATGATTCACACGCCGACTGCTATCAGIATTTTTGTGTGTGCCTG ASTATOSTACASCTAATGSCCGTCTTCATTTCCATGCGGTGCACTTTATGCGGACACTTC accontrator to to be a transfer to the contrator of the c CTACCAUTTATATGGCTGTTGGTTTCTATGTGGCTAAATACGTTAACAAAAAGTCAGATA TGGACCTIGGTGCTAAASGICTASGAGCYAAAQAAIGSAACAACTCACTAAAAACCAAGC TO:CGCTACTICCCAAGAGCIGTTCAGAA:CAGAATOAGCCGCAACFTCGGGATCAAAA AATTENIGEGEGETTEGNTAAAAATGATTGGCSTATCBAACBTGCA

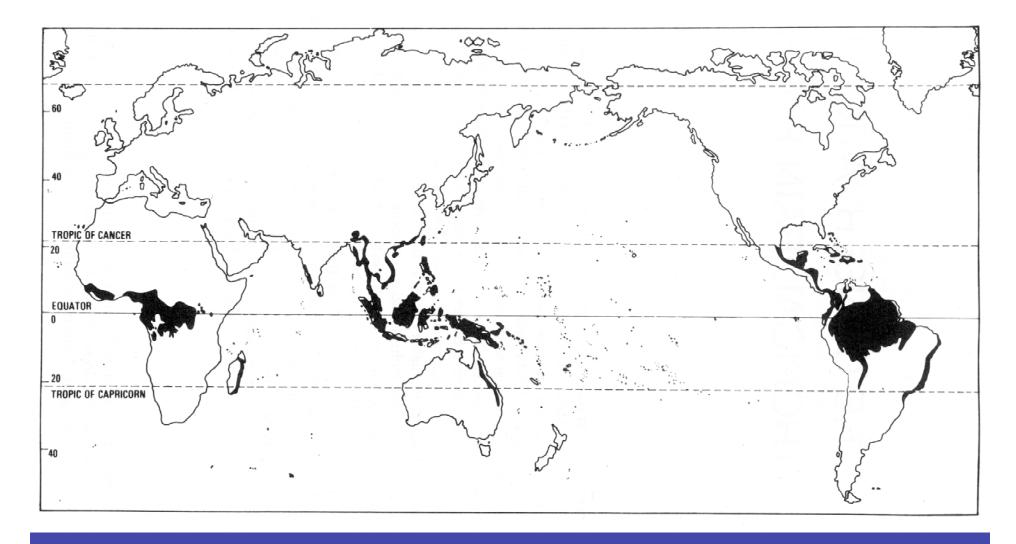
The entire hereditary information of the simple bacterial virus $\phi X174$ is contained in the single strand of DNA whose nucleotide sequence is given here.

(The sequence should be read from left to right in successive lines down the page, as if it was normal text.)

An electron micrograph of approximately two five thousandth of the DNA from a single human cell. The cell was in the interphase between cell divisions. It was treated to free the nucleus, from which most of the material other than the DNA was then extracted. The remaining DNA was spread on the surface of water and photographed at high magnification.

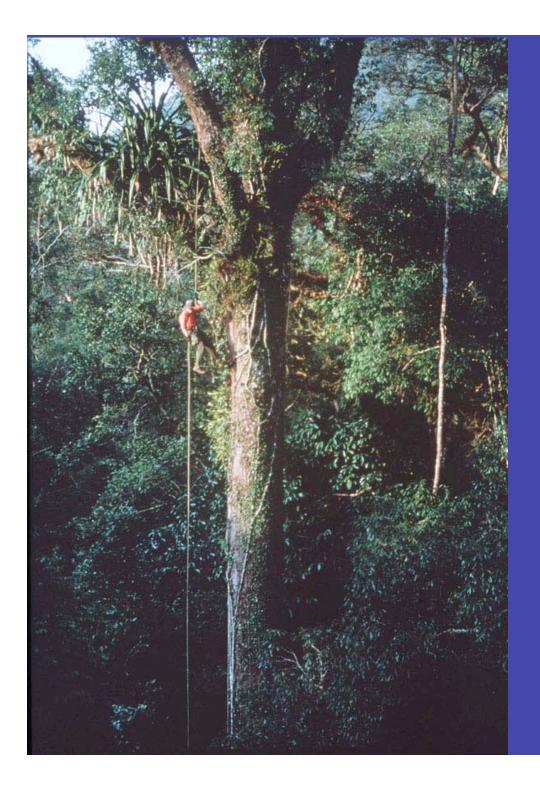
(from McCready et al., Electronmicroscopy of nuclear DNA from human cells, J. Cell Sci. 39, 53-62, 1979 in George Snell, Search for a Rational Ethic, 1988)





Tropical rainforests

(from T. C. Whitmore in M. E. Soulé and B. A. Wilcox, eds., Conservation Biology, Sinauer Associates, 1978, p. 304)

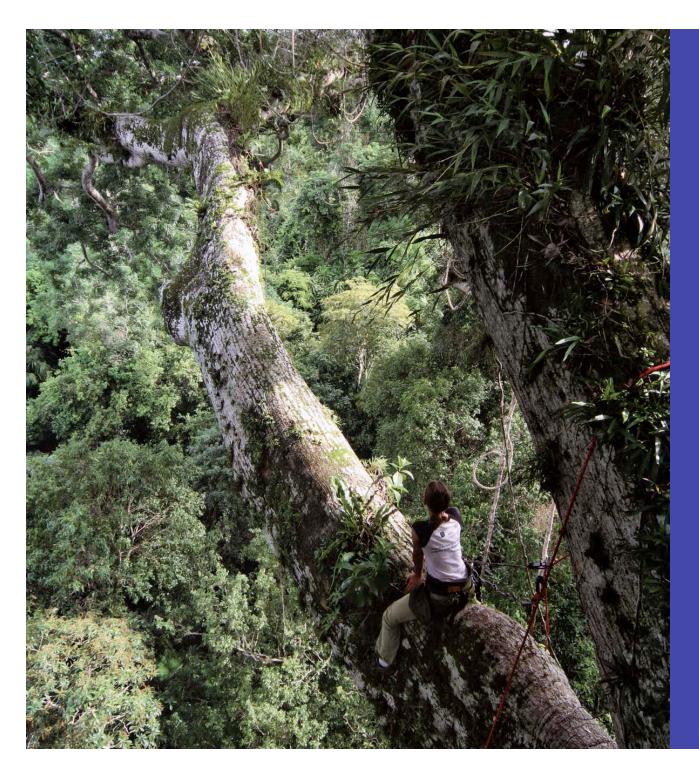


Bornean rainforest, Indonesia

(Scott Zens is in the tree;

photo by Tim Laman)

Dr. E. O. Wilson, Canopy benefit lecture, 2009

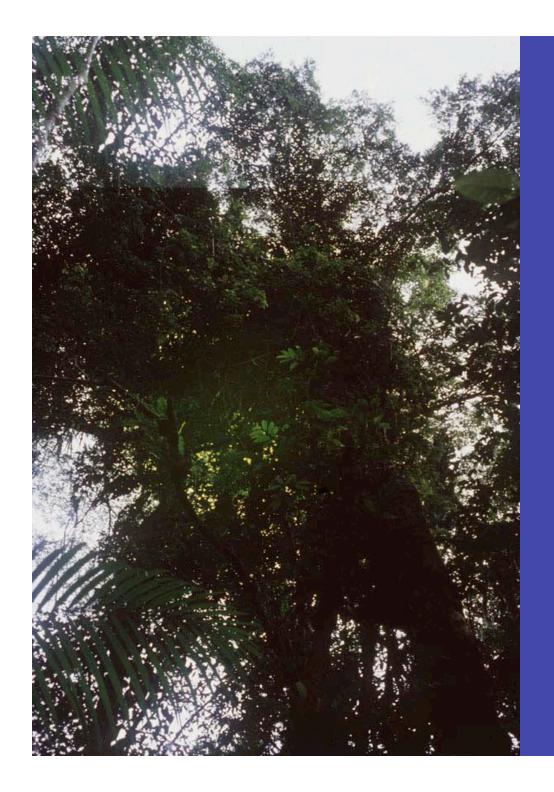


Barro Colorado Island, Panama

Chrislie Rich,
tropical biologist
exploring
the canopy

(Explorers's Journal, Winter 2006/2007, p. 9)

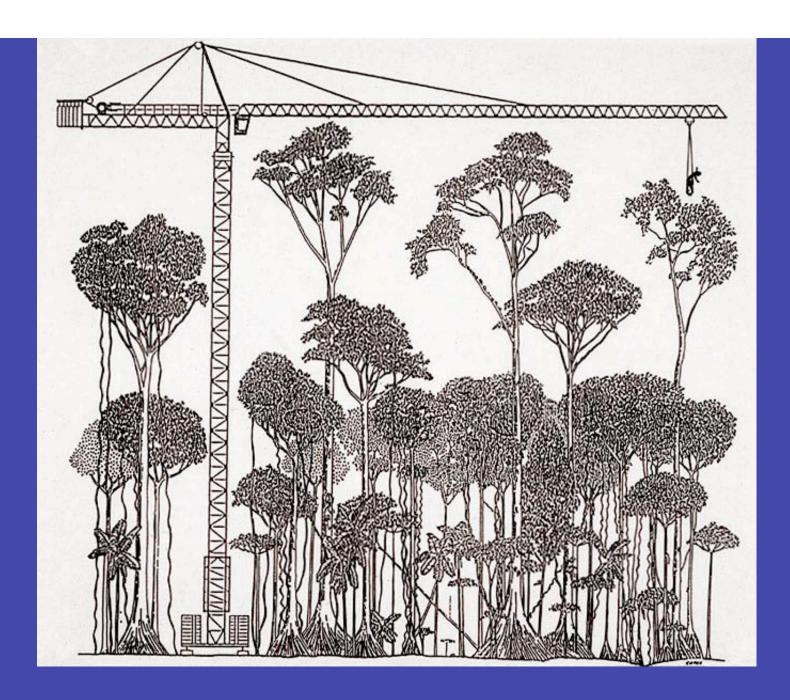
Dr. E. O. Wilson, Canopy benefit lecture, 2009



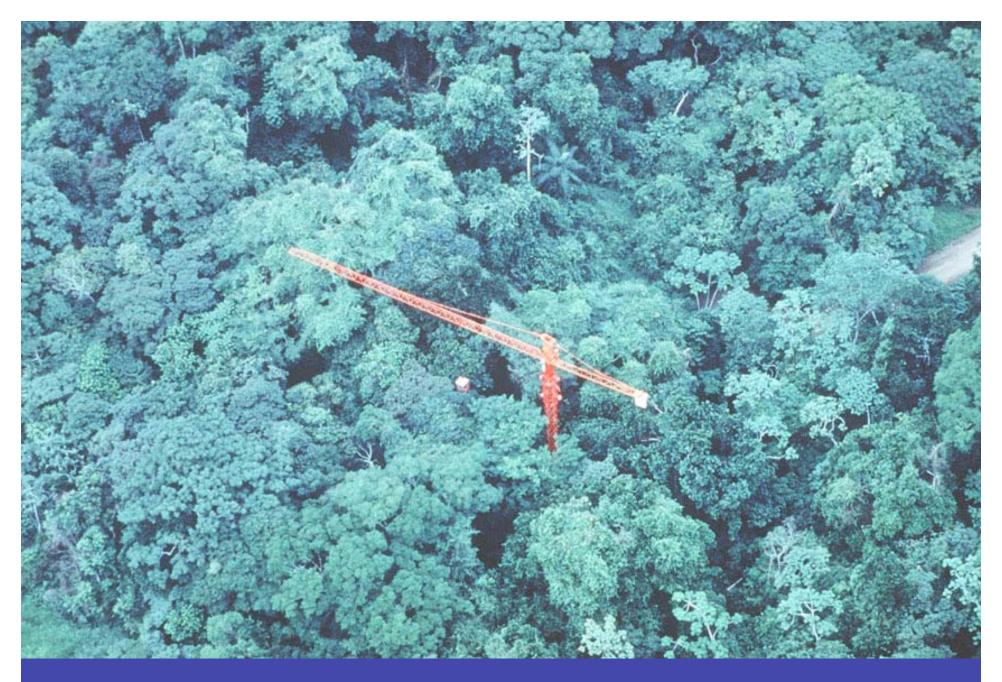
Tree canopy

Peruvian rainforest

(photo by Terry Erwin)



Canopy research crane, STRI, Panama
Dr. E. O. Wilson, Canopy benefit lecture, 2009



Crane above canopy in Panama
Dr. E. O. Wilson, Canopy benefit lecture, 2009

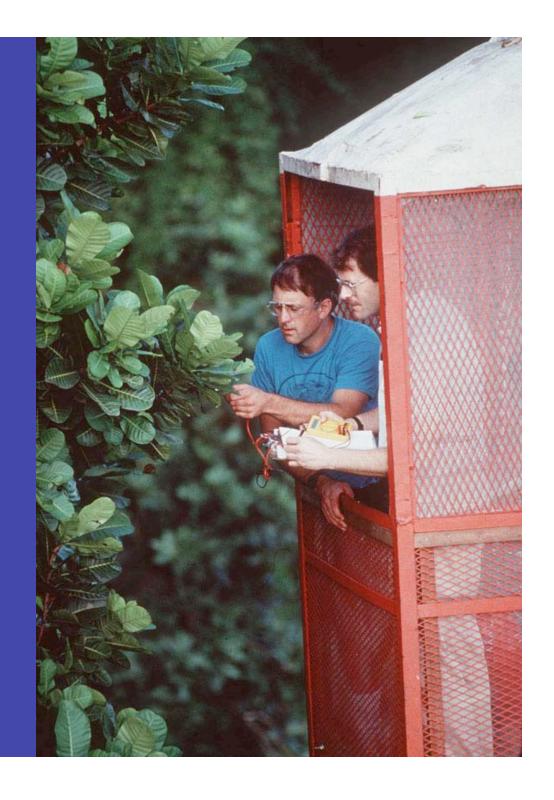


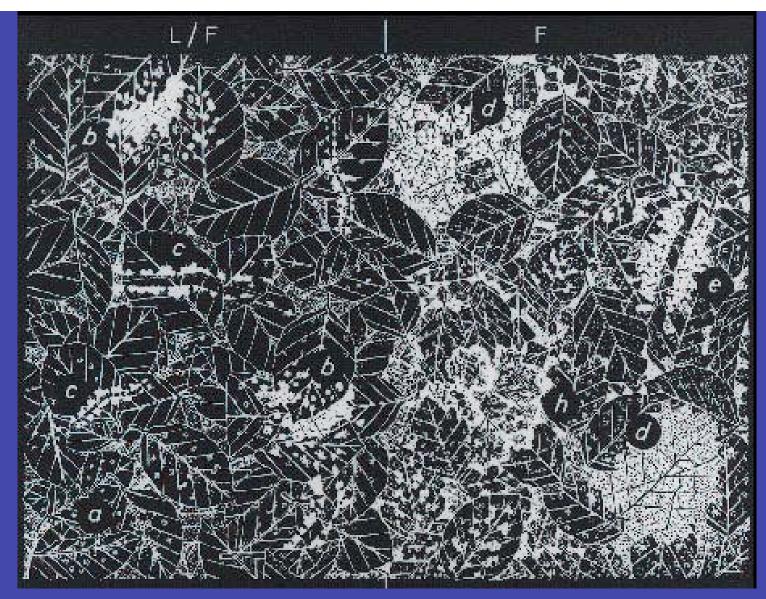
Canopy crane gondola, Panama

Close-up of canopy from gondola suspended from crane in Panama.

Geoffrey Parker (left), Alan P. Smith (right), in the fall of 1990, just a little while after the crane was installed.

Photo: Carl Hansen, STRI

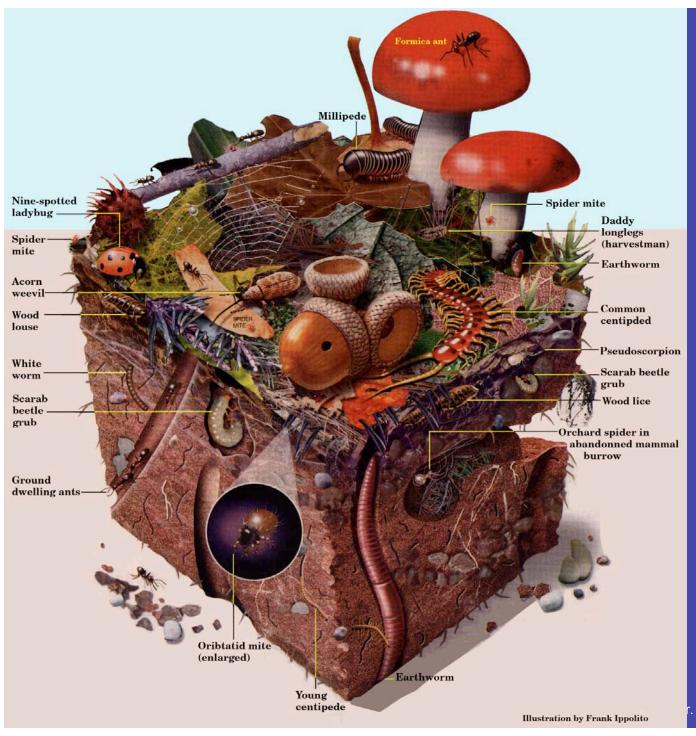




Leaf litter seen from above

German temperate forest (from G. Eisenbeis and W. Wichard,

An Atlas on the Biology of Soil Arthropods, 1987)
Dr. E. O. Wilson, Canopy benefit lecture, 2009

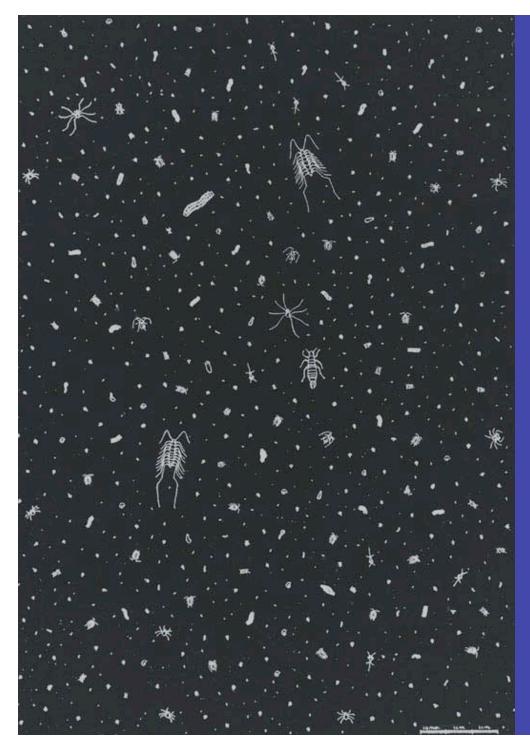


Soil from
Central
Park,
New York
City

Illustration by Frank Ippolito

(from The New York Times, Tuesday, 24 Sept. 2002)

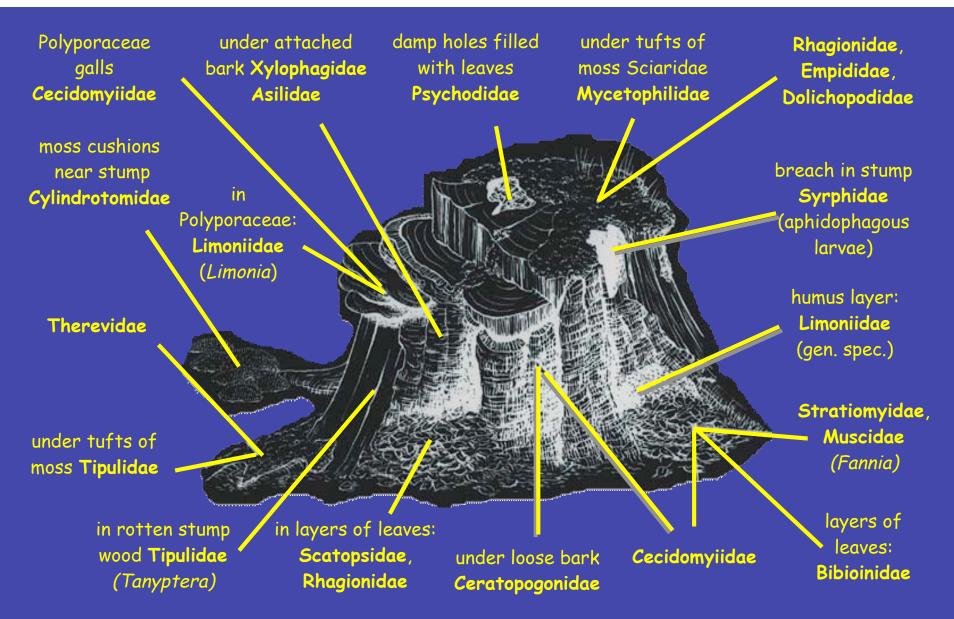
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Barro Colorado Island (BCI)

Diagram of average population on one-tenth of a square meter, based on small quadrats

(from E. C. Williams, Bulletin of the Chicago Academy of Sciences 6, 107, 1941)



Habitats of dipteran larvae in a 6-8 year-old beech stump

(after Brauns, 1954; from G. Eisenbeis and W. Wichard,

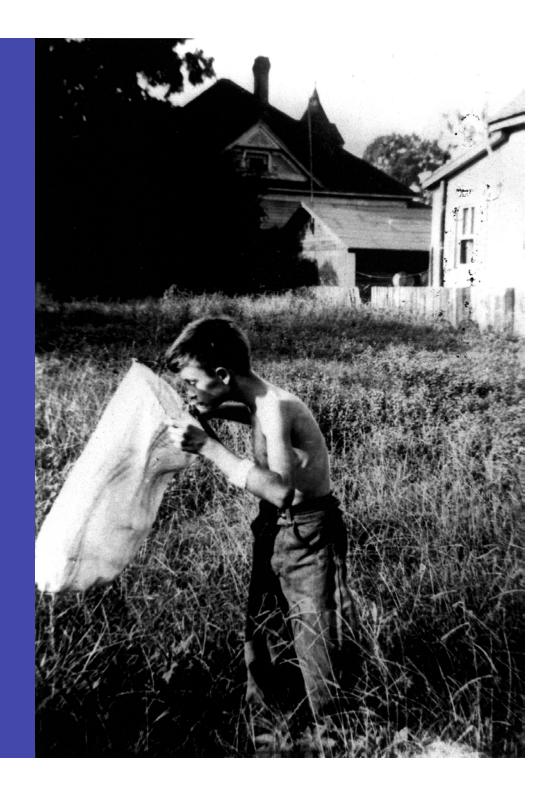
An Atlas on the Biology of Soil Arthropods, 49.8%), Canopy benefit lecture, 2009

Ed Wilson,

13-years-old

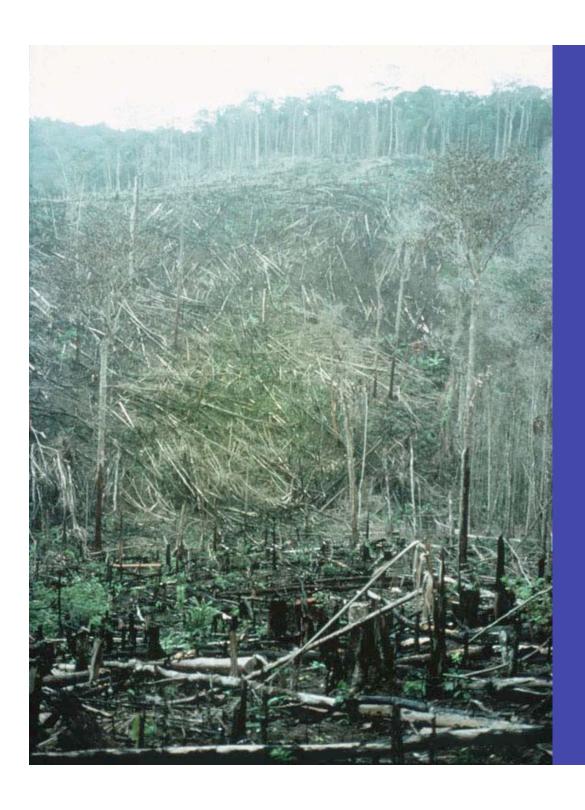
in

Alabama

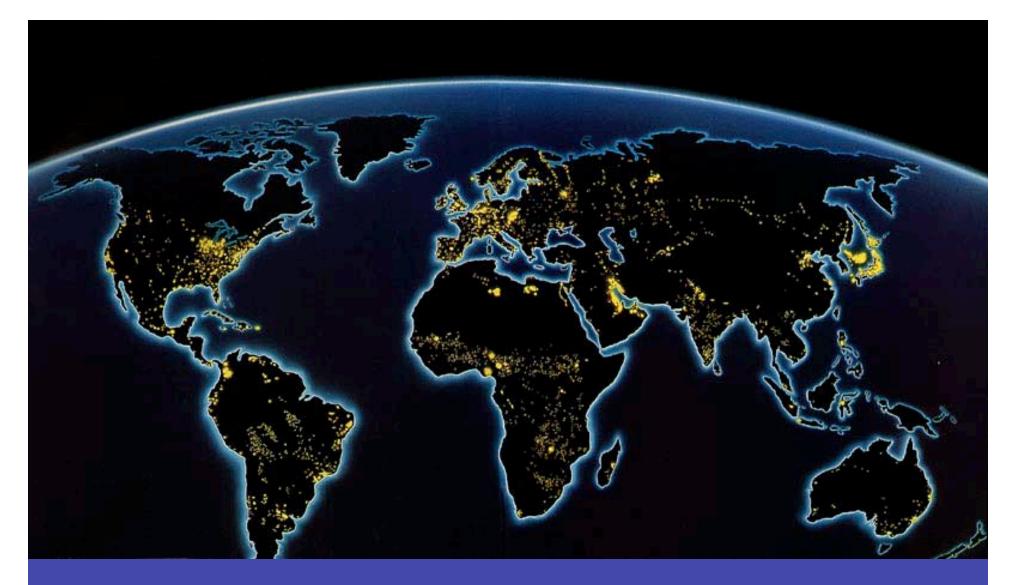




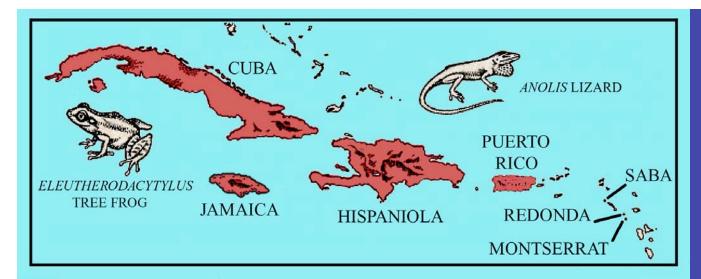
Ed Wilson looking for ants, San José, Costa Rica Dr. E. O. Wilson, Canopy benefit lecture, 2009

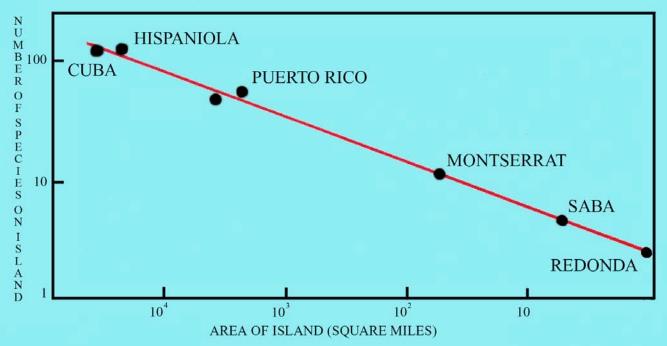


Slash and burn in a Brazilian forest



Points of light reflect the impact of human beings on the earth, as seen at night by satellite

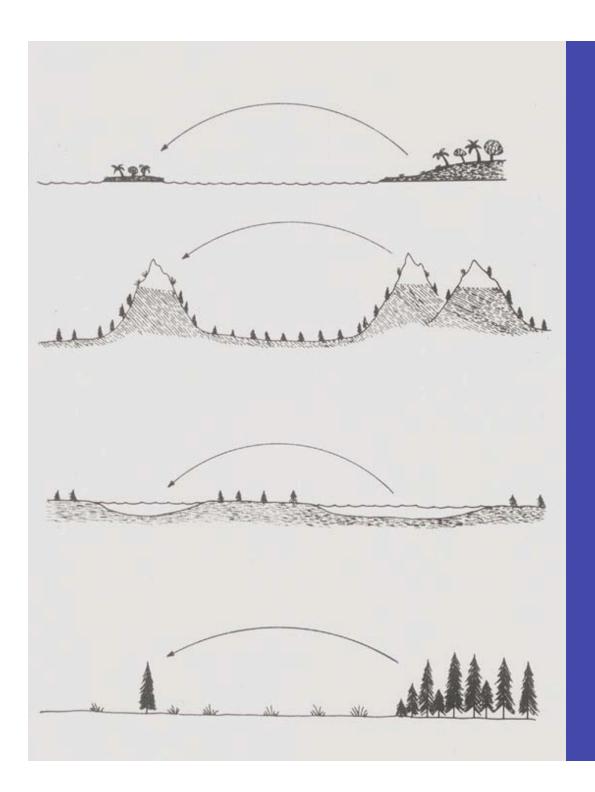




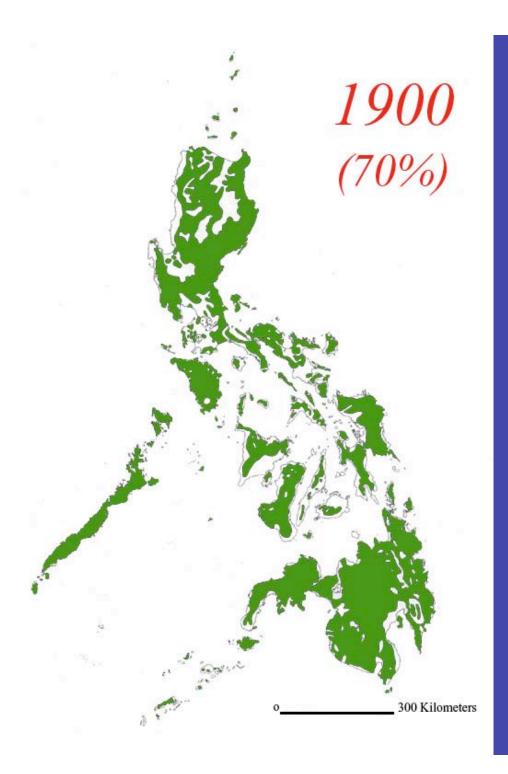
The number of species on an island corresponds to its size. As a general rule, when the area of an island decreases to one tenth, the number of species on it drops to onehalf.

(from E. O. Wilson, Sci.

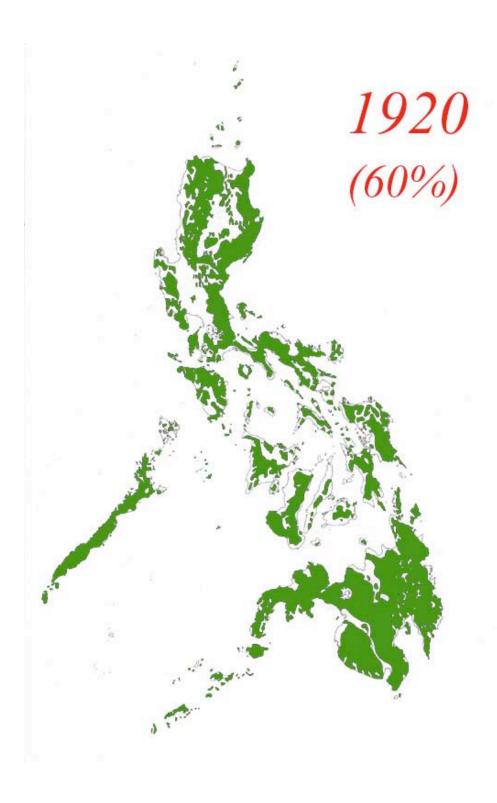
Amer., Sept. 1989)
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"Real" and habitat islands



The Philippines



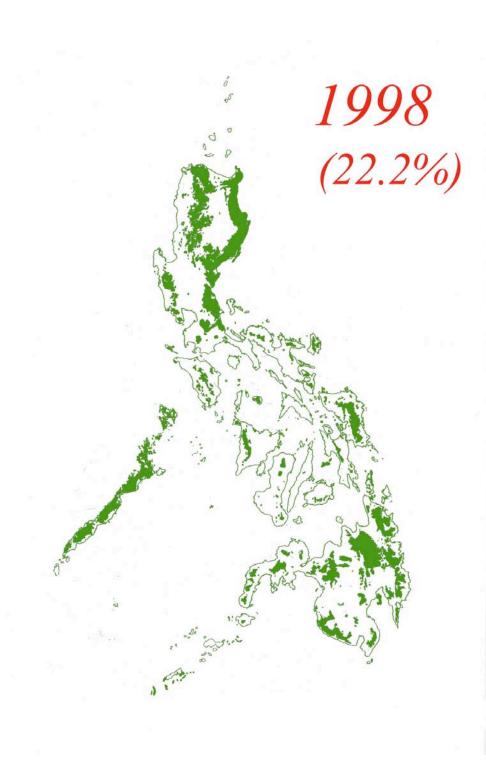
The Philippines

1970 (34%)

The Philippines

1987 (23.7%)

The Philippines



The Philippines



Darwin's forest

Depletion of the forest area in São Paulo State, Brazil

Between 1500 and 1845, the area of forest covering the state changed only from 82% (20,450 km²) to 80%.

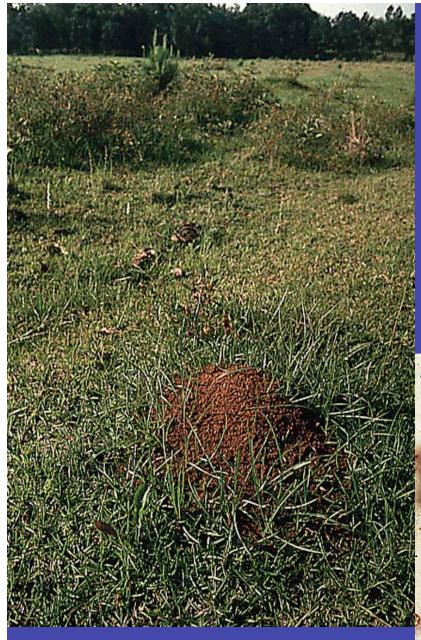
Today less than 10% of São Paulo State is covered by forest.

(adapted from Oedekoven, 1980; in T. Lovejoy, 1985)



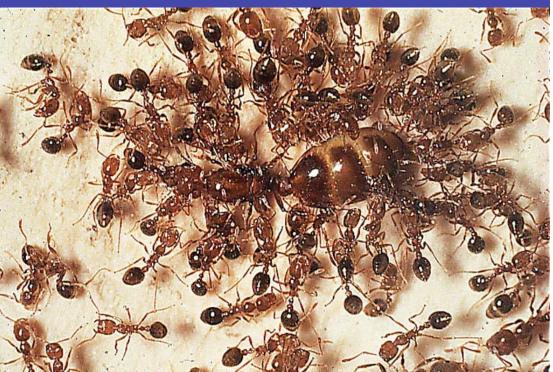
The Panamanian golden frog, Atelopus zeteki, is nearly extinct in the wild as a combined result of habitat change, illegal collecting, and fungal disease; the species is currently secure in captivity (from Joseph R. Mendelson III et al., Science 313, 48, 2006)

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Imported Fire Ants

(photographs by Walter Tschinkel)





Brown tree snake

The brown tree snake has eaten into extinction virtually all of Guam's native bird life.

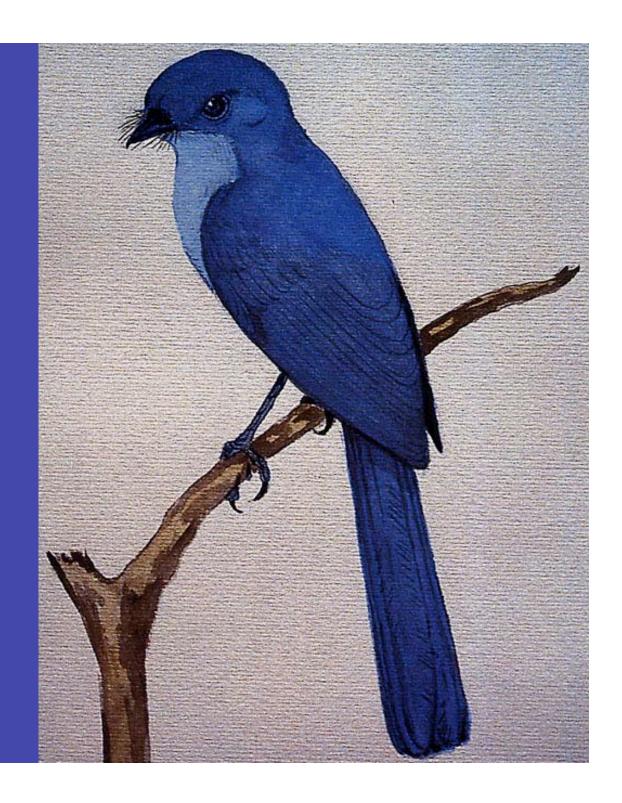
(Source:

America's Least Wanted,

The Nature Conservancy, 1996)

Cerulean paradiseflycatcher of Sangihe Island, Sulawesi, Indonesia

Painting by
Stephen V. Nash
(from
Conservation Biology,
1(1), cover, 1987)

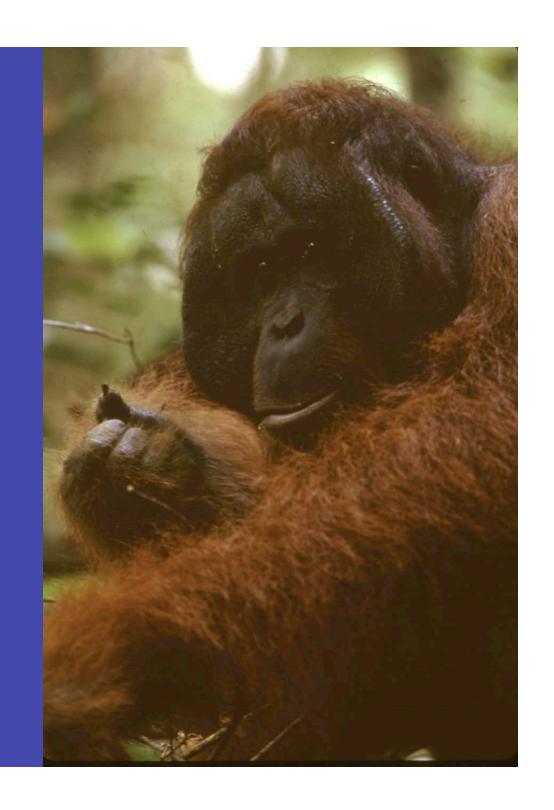


Wild adult male orangutan

Gunnung Palung National Park

Borneo, Indonesia

(photo by Tim Laman)



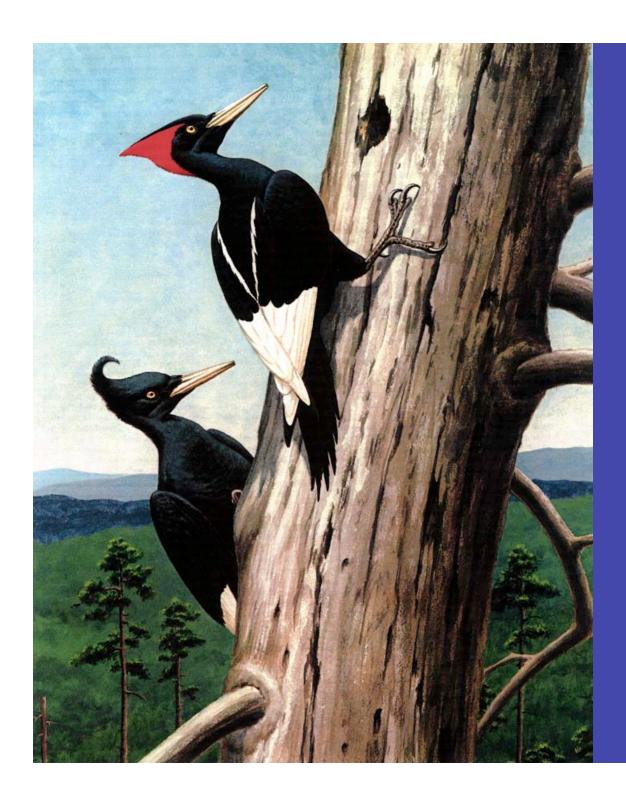


Ivory-billed

woodpecker

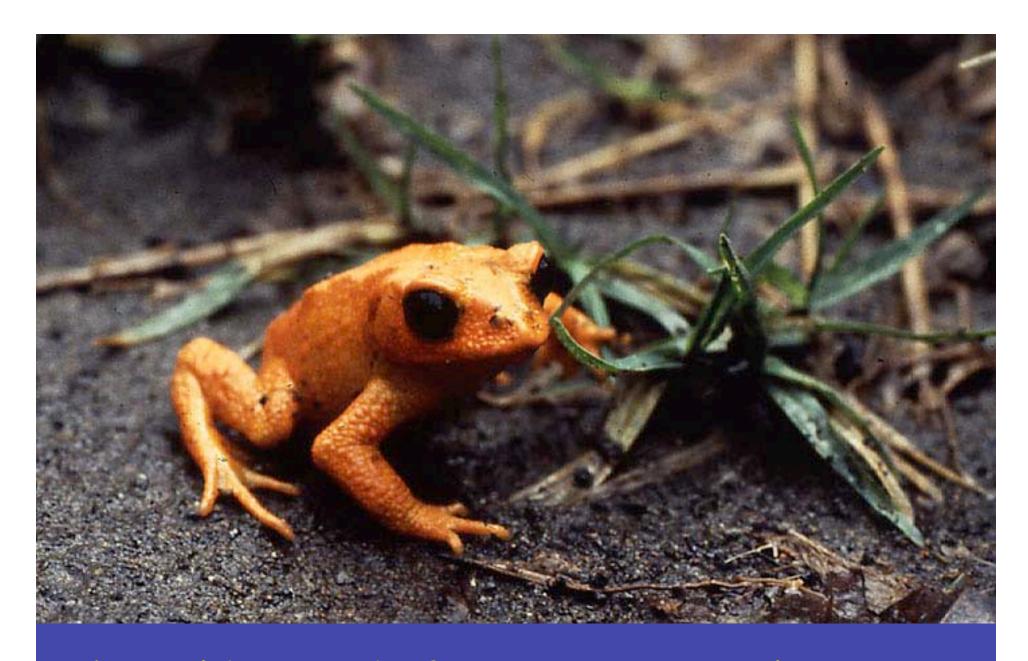
North America

Extinct



Imperial

woodpecker



The golden toad of Costa Rica: newly extinct

Oahu tree snail

Achatinella spp.

Honolulu, Hawaii

(from Middleton and Littschwager, Witness, 1994)



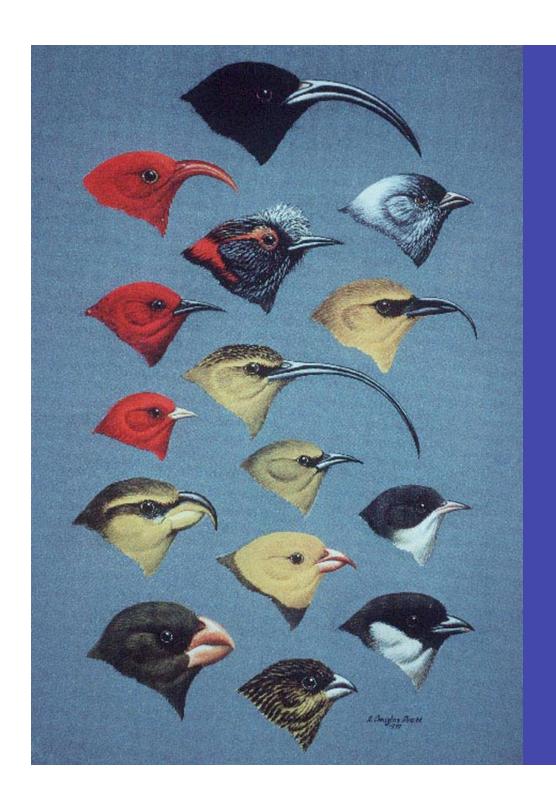
Ahinahina

Argyroxiphium sandwicense ssp. sandwicense

Hawaii, Hawaii

(from Middleton and Littschwager, Witness, 1994)



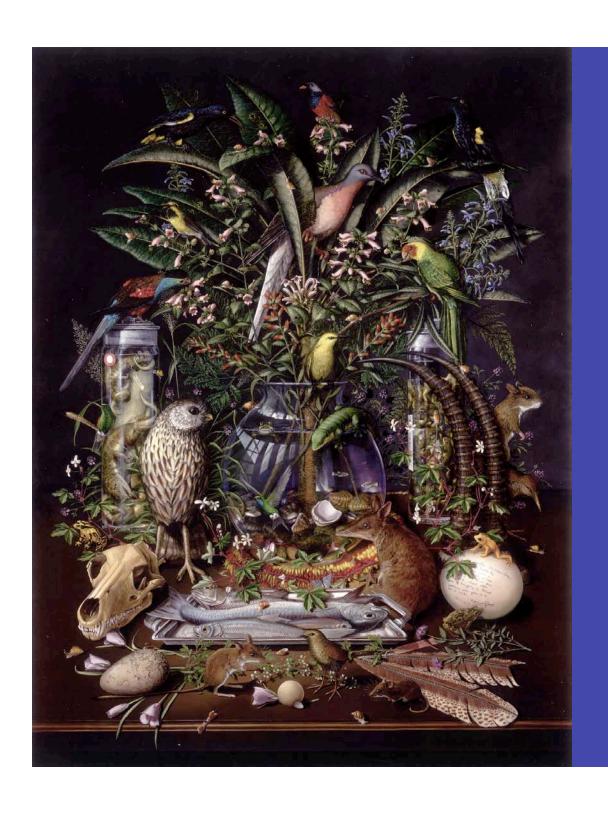


Drepanididae

Hawaiian

honeycreepers

(from J. M. Scott et al., *BioScience*, April 1988)

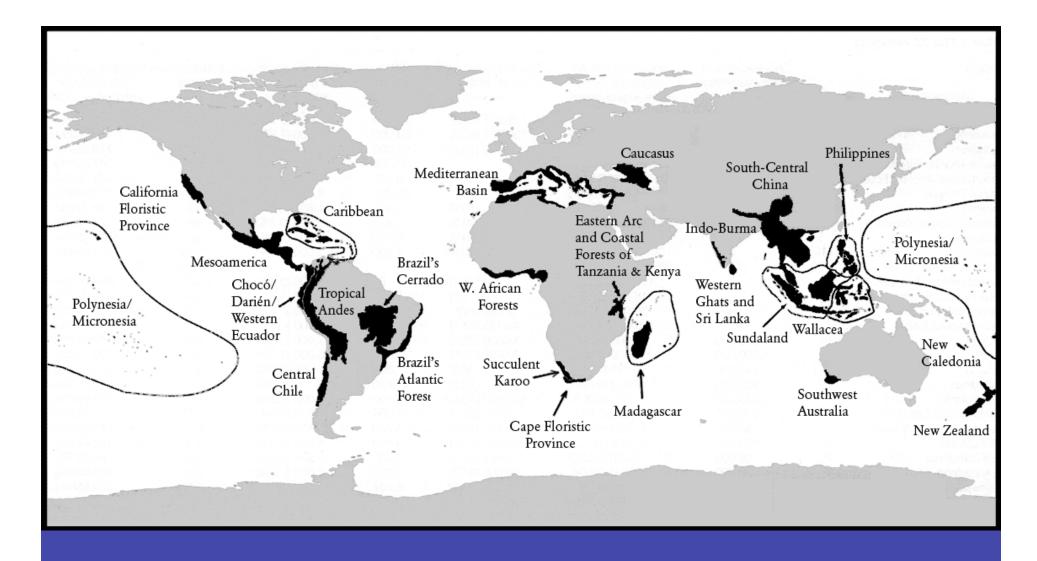


Species gone from Earth

Painting by

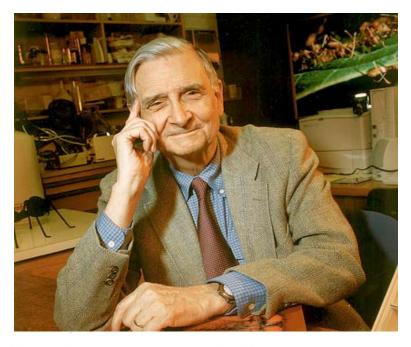
Isabella Kirkland

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Biodiversity hotspots for conservation priorities

(from Norman Myers et al., Nature 403, 853, 2000)





Biodiversity and Our Future Healing Mother Earth

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