

Ecology Of Rainforest Biomes



Rainforests



Biodiversity Of Rainforests

Over 50% of the Earth's species live in tropical forests.

Tropical forests contain 70% of the world's vascular plants, 30% of all bird species and 90% of all invertebrates.

90% of all primates are found only in tropical forest regions of Latin America, Africa and Asia.

In Brazil's Atlantic Rainforest, 70% of its plants and most of its 20 primate species are endemic.

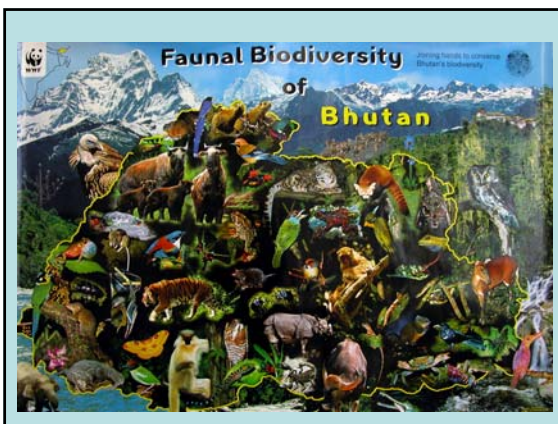
780 tree species have been found in a 25 acre plot of Malaysian rainforest-- more than the total number of tree species native to the US and Canada.

Biodiversity (cont'd)

Ecuador's tropical forests contain over 15,000 plant species. There are 13,000 plant species in all of Europe.



Madagascar is 2% of Africa's land mass but has 10,000 species of plants -80% are endemic.



A Person Could Walk A Mile In Any Direction In The Heart Of An Intact Rainforest And Never Encounter The Same Tree Species Twice.

Rainforest Factoid: 43 ant species were found on one tree in Peru -- the same number as in the entire British Isles

The Biodiversity Index Is High In Rainforests Because They Have A Relatively Constant Environment All Year Round, Just Like Tropical Lakes And Coral Reefs

What Good Is The Rainforest?

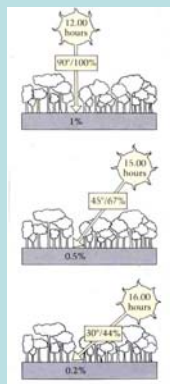
Some medicines extracted from tropical forest plants:

1. *Curare (muscle relaxant used in surgery)*
2. *Diosgenin (birth control pills, arthritis, asthma)*
3. *Ouabain (heart medication)*
4. *Quinine (malaria, pneumonia,*
5. *Emetine (bronchitis, dysentery)*
6. *Vincristine/Vinblastine (Hodgkin's disease, leukemia)*

The Reason We Know Anything At All About The Rainforest Is Because...



The Rainforests Of The World Have Been Described As The “Lungs” Of The Earth



Australia's Rainforests

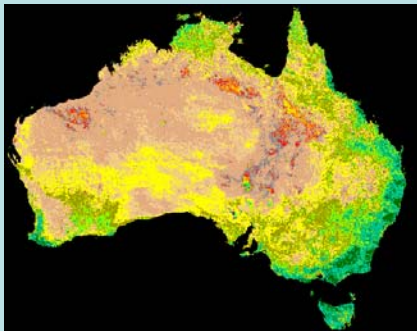
More than 1000 species of plants;

At least 4000 species of insects;

160 species of reptiles;

128 bird species;

*Nearly 90 species of mammals; and
47 species of frogs.*



Australia's Rainforests



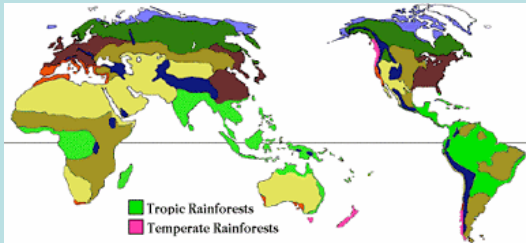
Lamington National Park



<http://lamington.nrs.m.uq.edu.au/mainmenu.html>



World Distribution Of Rainforest Types



Net Primary Production (NPP) of the Major Biome Types Based on Biomass Harvests^a.

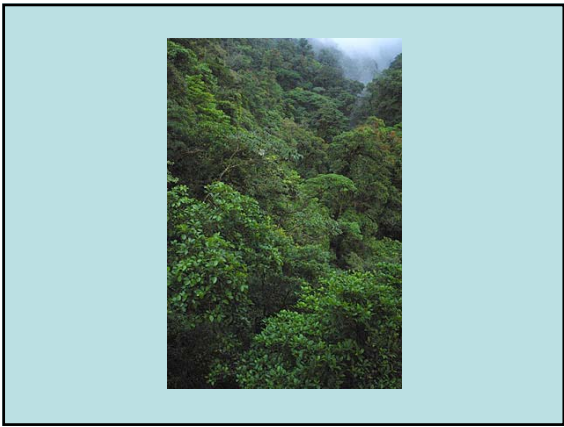
Biome	Aboveground NPP (g m ⁻² yr ⁻¹)	Belowground NPP (g m ⁻² yr ⁻¹)	Total NPP (g m ⁻² yr ⁻¹)	% of total
Tropical forests	1,400	1,100	2,500	0.44
Temperate forests	950	600	1,550	0.39
Boreal forests	230	150	380	0.39
Mediterranean shrublands	500	500	1,000	0.50
Tropical savannas and grasslands	540	540	1,080	0.50
Temperate grasslands	250	500	750	0.67
Deserts	150	100	250	0.40
Arctic tundra	80	100	180	0.57
Crops	530	80	610	0.13

^a Data from Saugier et al. (2001). NPP is expressed in units of dry mass. NPP estimated from harvests excludes NPP that is not available to harvest, due to consumption by herbivores, root exudation, transfer to mycorrhizae, and volatile emissions.

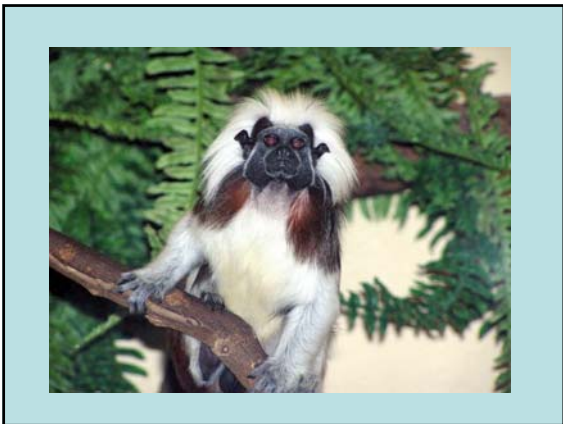
Images Of The Rainforest

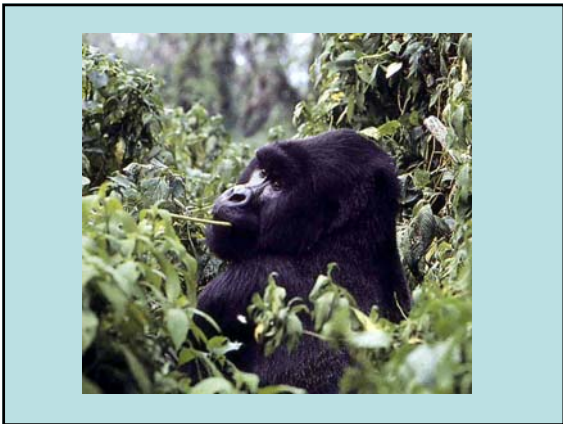
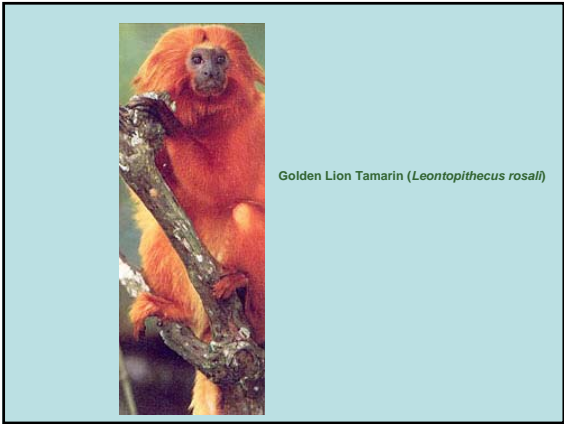


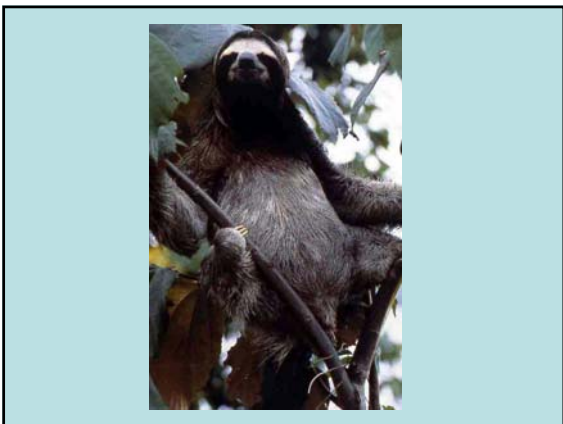
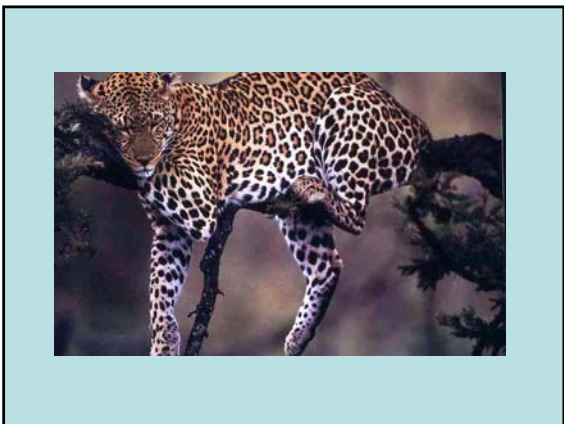
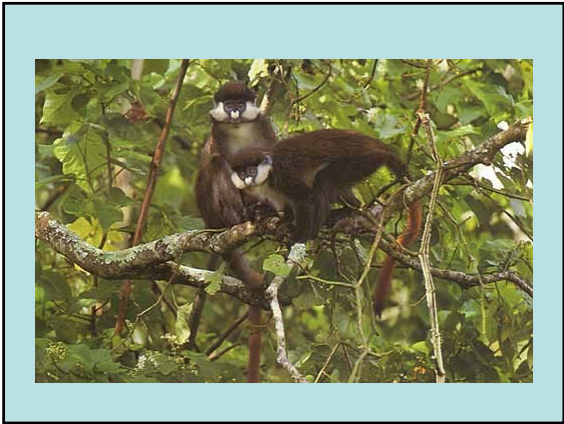
© Deep Green Photography 2008

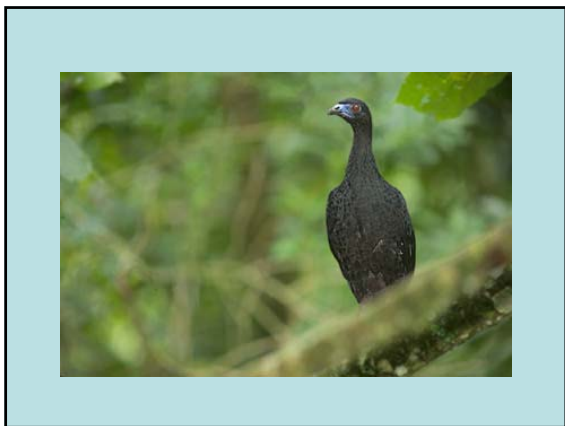
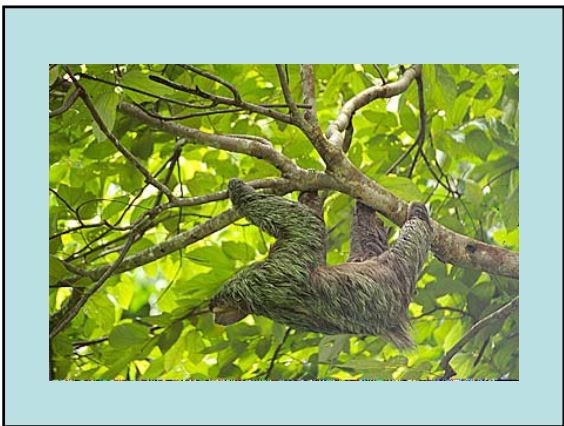


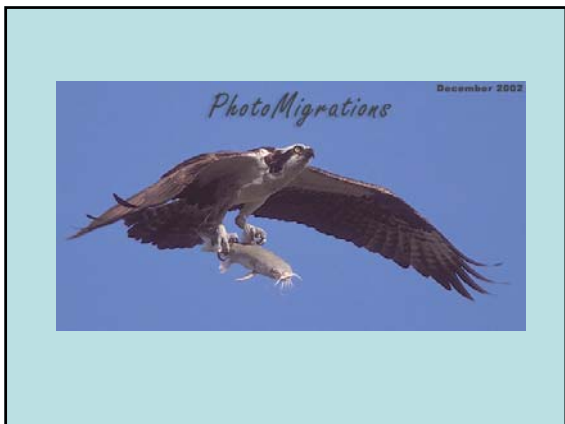
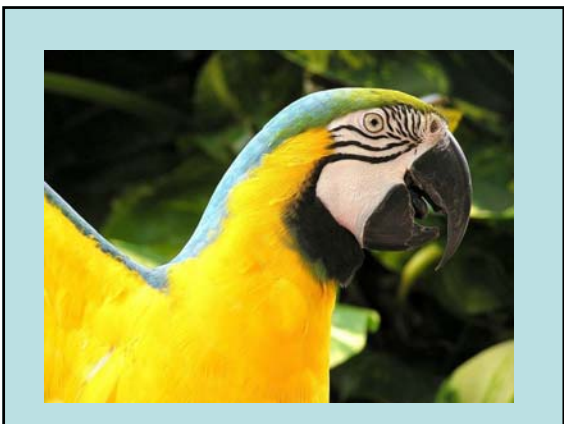
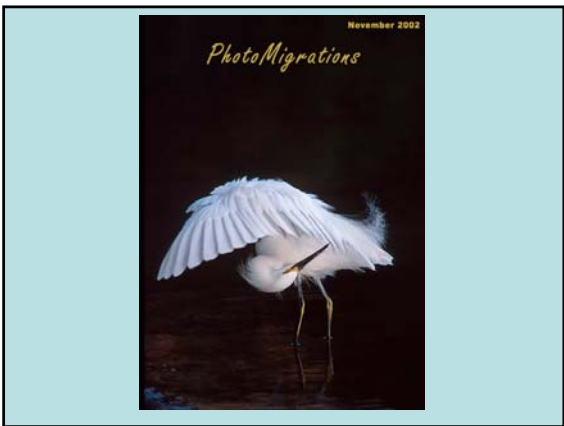
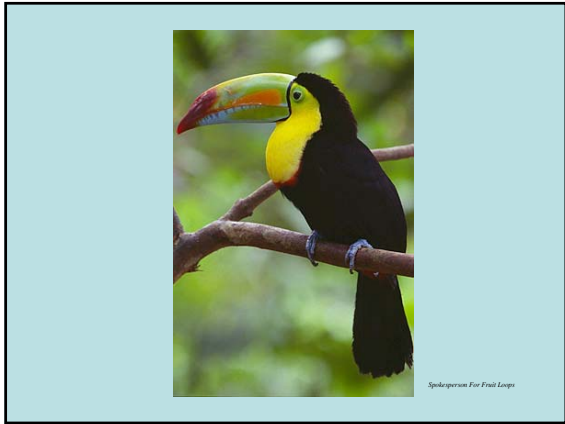
Peoples Of The Rainforests

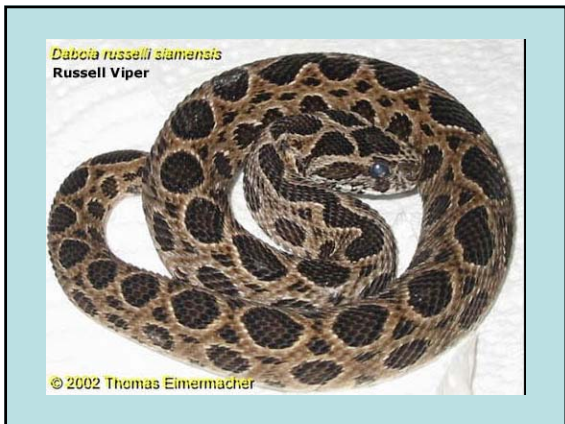
A collage of four images related to rainforest peoples. At the top right is a close-up of a man's face. Below it is a silhouette of a person standing on a tree branch. To the left of the silhouette is a woman's face with a large white feather in her hair. At the bottom left is a person holding a spear. The text "Peoples Of The Rainforests" is written in a cursive font at the top left of the collage.













(C) Greg Calvert

Hog-nosed Viper

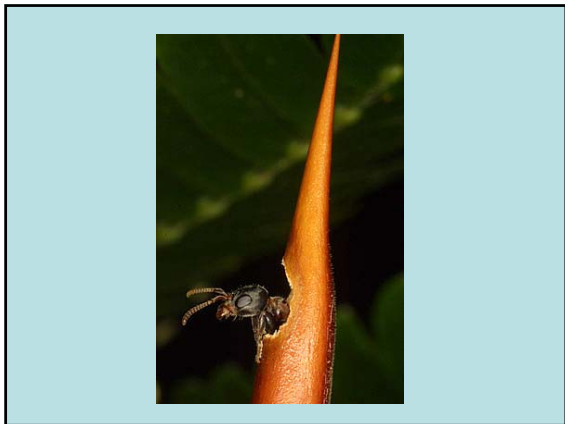
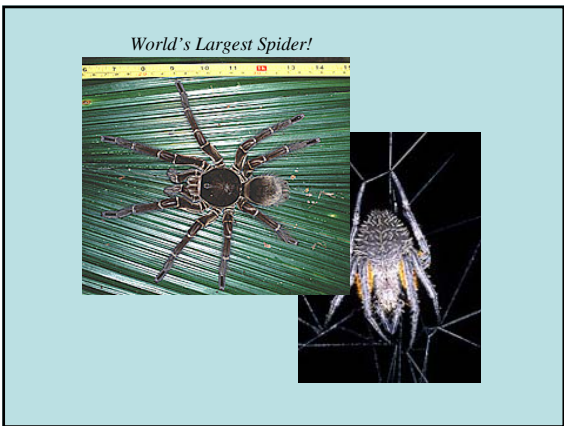


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www.garycook.co.uk



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World's Largest Flower

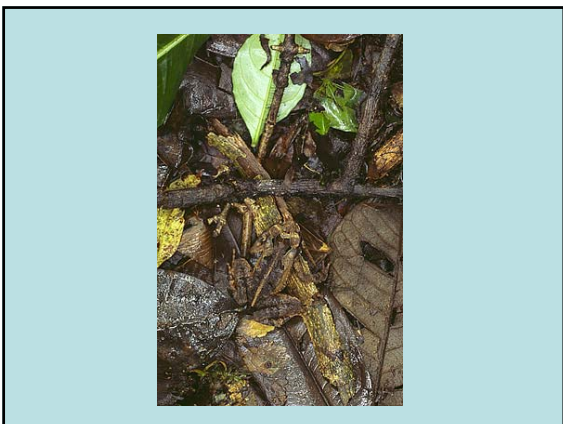
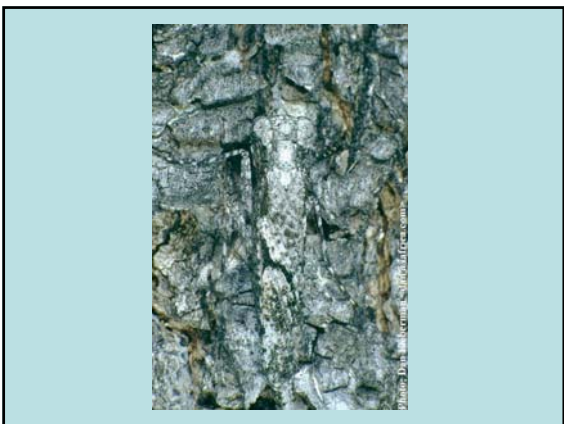


Rafflesia arnoldii



Heliconia sp.





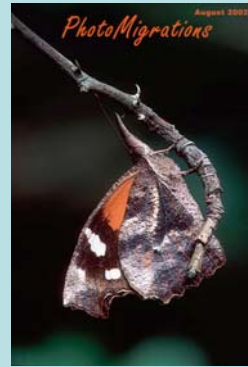
A Spider Posing As An Ant!



Another Spider Posing As An Ant!!



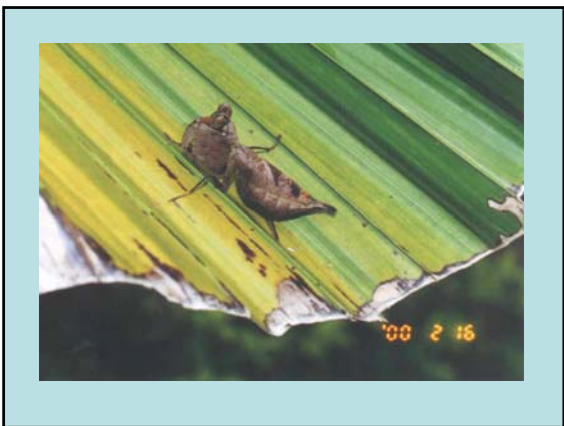
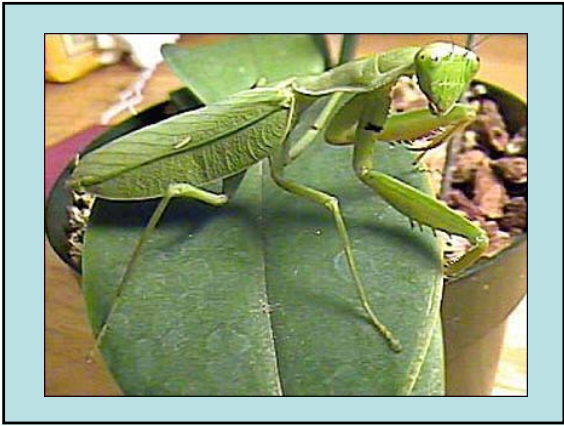
by F. Tomasinelli





There Are Approximately 1,800 Different Species of The Praying Mantis
Here are some of them







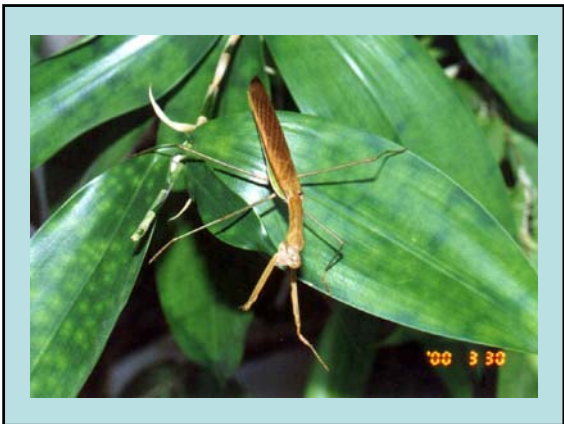
Miomantis gastrica - male



Miomantis sp. (South Africa) - female



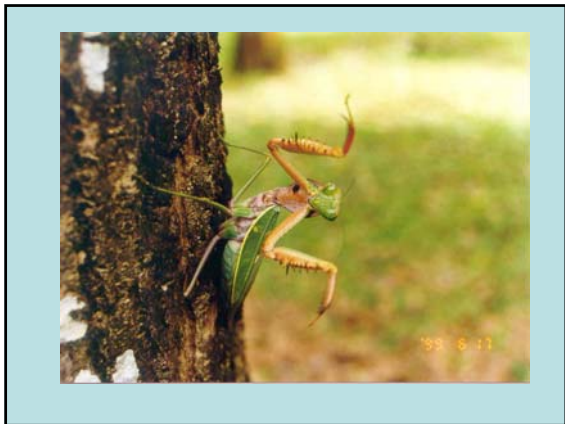
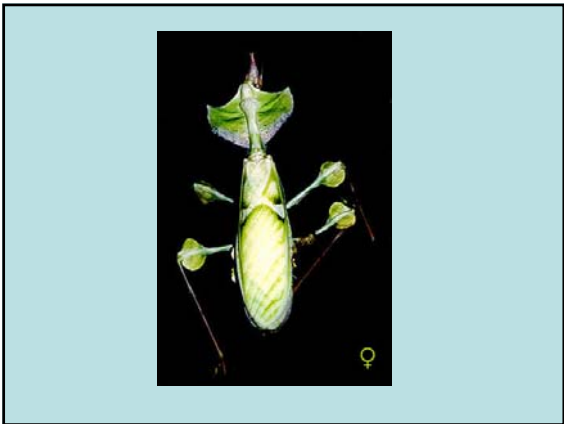


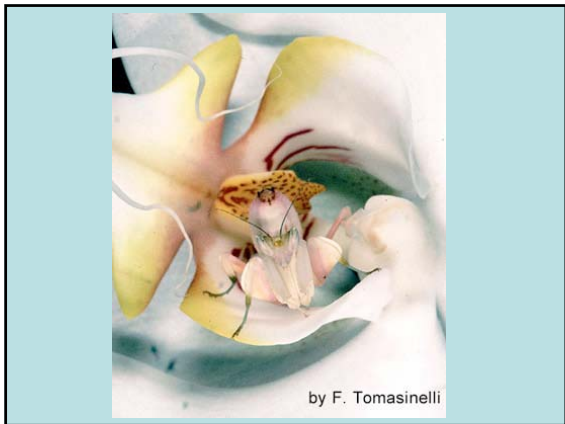


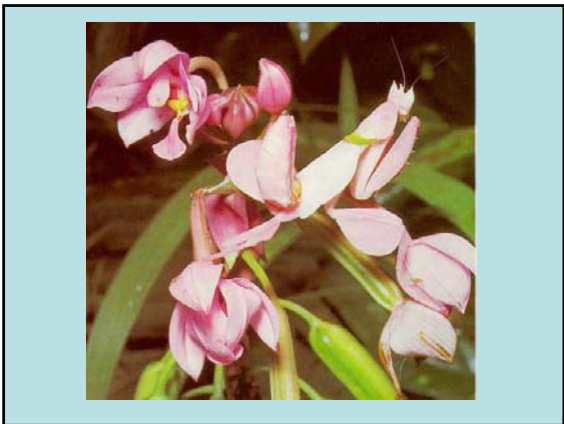
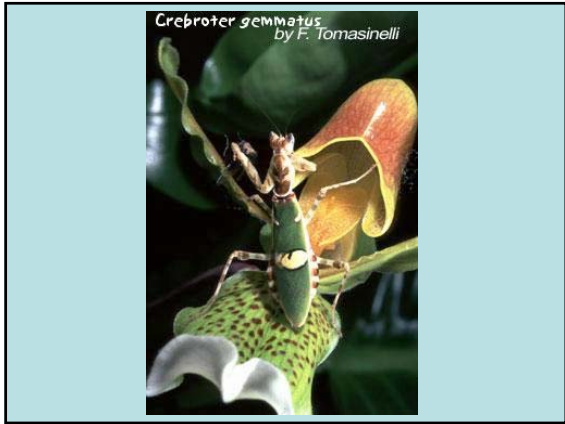


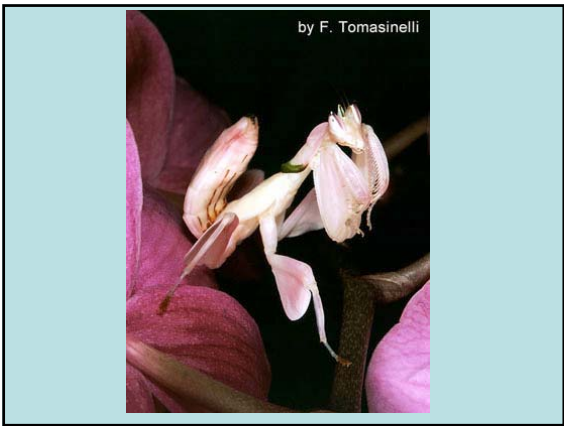




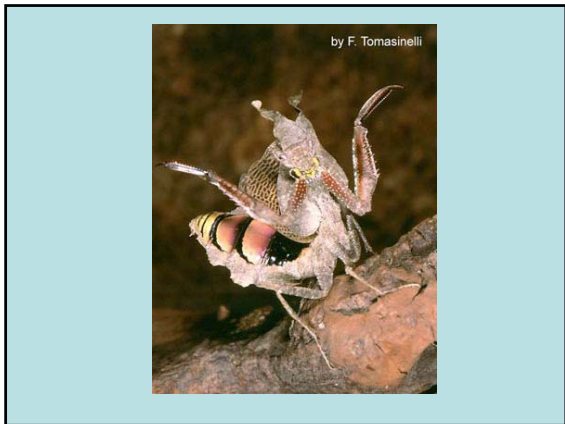
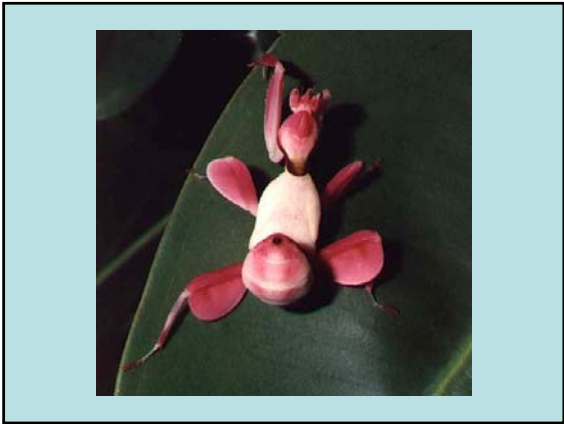




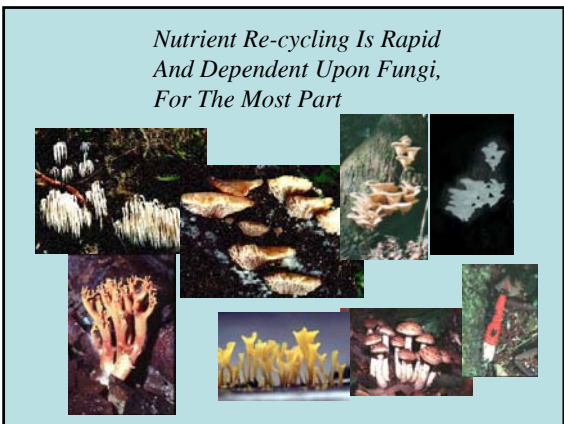
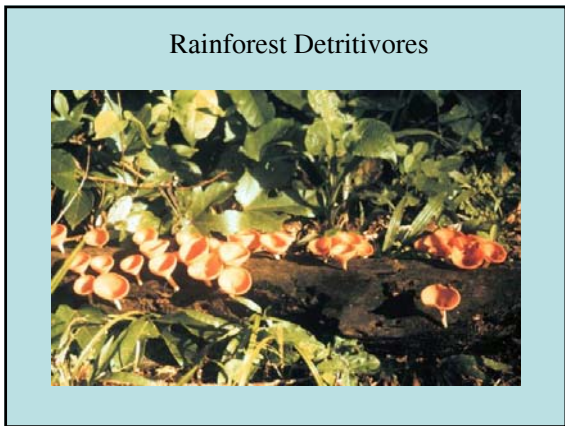












Trees Struggle For Dominance Of The Canopy



Rainforest Soils

1. Warm soil and water surplus combines to promote decomposition of rock to great depths.
2. Laterite soil; red, little litter, low nutrients; silica leached out; Al and Fe left behind; iron oxides give red color, pH 4.5-5.5.
3. Temperature and rainfall allow rapid decomposition of litter; therefore no organics soil incapable of holding nutrient base cations; therefore infertile and nutrient limiting; nutrients all tied up in biomass.
4. Severe nutrient limitation necessitates rapid re-cycling of leaf litter.

Rainforest Soil Types

Three general classifications of soils throughout humid tropics

1. Ultisols
2. Oxisols
3. Alfisols

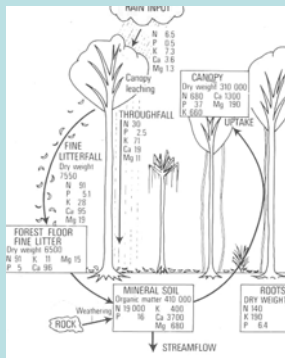
- Comprise ~71% of land surface in humid tropics worldwide
- Only ~15% of moist tropical forests moderately fertile (in young soils of recent origin)

Mineral Cycling on Oligotrophic Soils

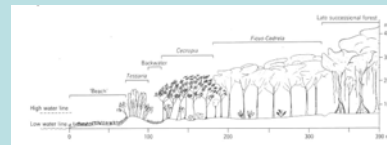
- Up to 26% of roots on the surface
- Root mats several cm thick can develop
- Root mat & mycorrhizae directly absorb available minerals
- 99.9% of Ca & P absorbed into root mat in Amazon
- Presence of buttresses may allow roots to spread widely at surface, where they reclaim minerals

Rainforest Trees Have Shallow Root Systems

Buttresses are a feature of many trees in all tropical rainforests. They are woody flanged extensions that radiate outwards from the lower part of the tree trunk and often reach large proportions, sometimes up to 10 meters in height.



Succession In A Tropical Rainforest



*Pollination Of Rainforest Trees
Is Solely Dependent Upon Animals*

Ants

Beetles

Birds

Mammals

Bats: Partners in Pollination



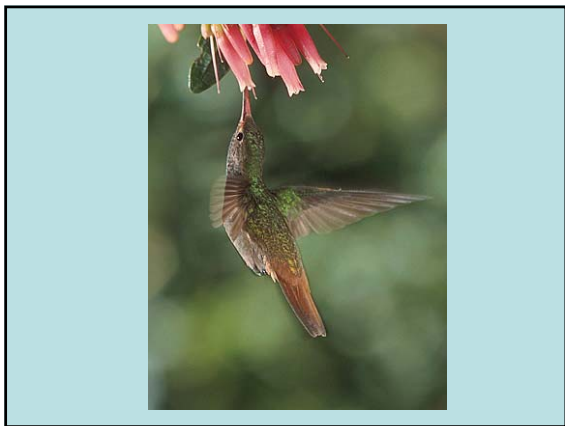
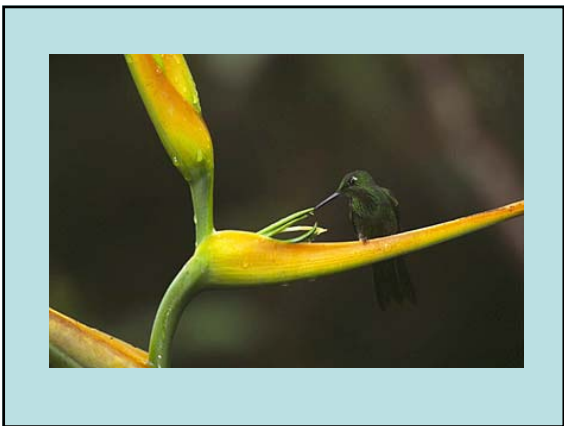
*Many Species Of Rainforest Plants
And Animals Are So Inter-dependent,
That Eliminating One Also Eliminates
The Other*



COSTA RICA
19 - 26 OCTOBER 2002



Photographs by DAVID J. LHOSTE





Fruit/seed dispersal

Fleshy fruits the rule: correlation with dioecy

Bats: green and yellow fruits
frugivorous birds: arillate seeds

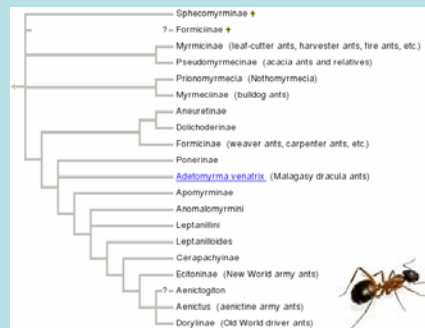
Larger mammals (monkeys)

Wind dispersal (5-10%)

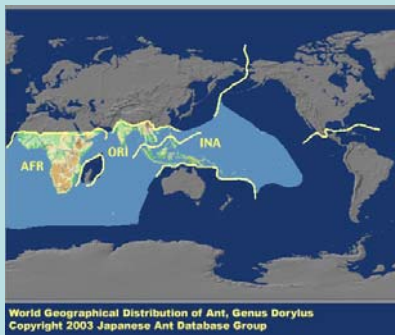
Water dispersal (1-2%)



Ant Taxonomy



Driver Ant Distribution*



* The most feared animal on earth!





Leaf Cutter Ants


Rainforest Factoid: 43 ant species were found on one tree in Peru -- the same number as in the entire British Isles

Leaf-cutting ants (subfamily Formicidae; tribus Attinii) certainly are amazing creatures. Unlike most other ant species (whose diets normally consist entirely or partly, of preyed or scavenged arthropod material,) leafcutter ants can be considered vegetarians. This because the *Attinii* use freshly cut plant material as the main substrate on which to grow protein rich fungi. Because of this unique habit, these ants are commonly referred to as "Leaf-Cutting ants or Parasol Ants"




Photo from: *The Ants* Holldobler and Wilson

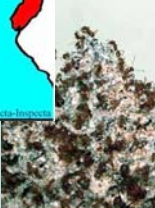
Distribution Of Leaf Cutting Ants




Distribution of *Attini* spp.



Queen With Workers

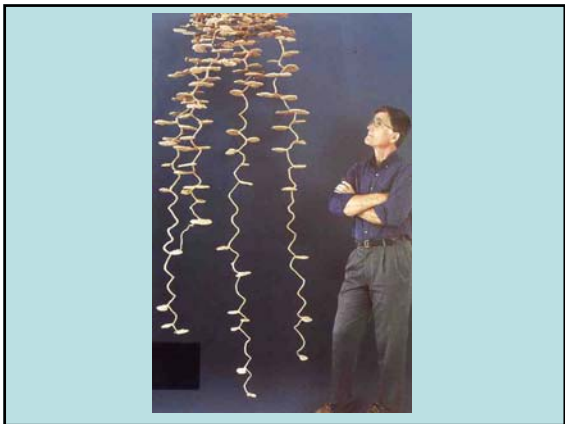
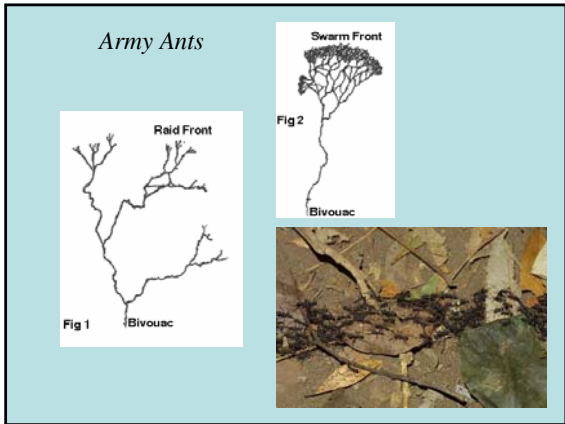
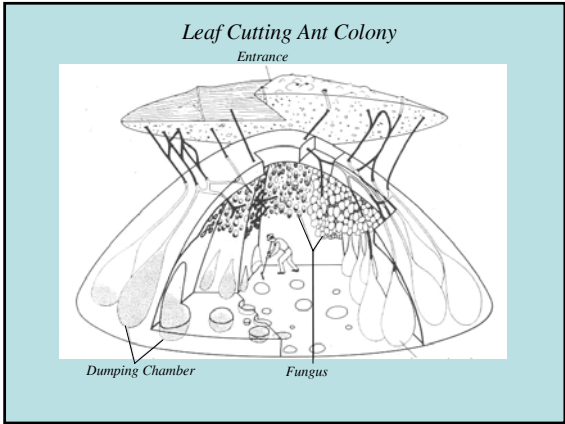


Harvest Of Fungus



Worker At Work





Frogs And Magainins

Biochim Biophys Acta. 1998 Nov 10;1376(3):391-400. [Related Articles, Links](#)

Magainins as paradigm for the mode of action of pore forming polypeptides.
Matsuzaki K.
 Graduate School of Pharmaceutical Sciences, Kyoto University, Sakyo-ku, Kyoto 606-8501, Japan. katsumim@pharm.kyoto-u.ac.jp

Magainins are a class of antimicrobial peptides discovered in the skin of *Xenopus laevis*. The peptides kill bacteria by permeabilizing the cell membranes without exhibiting significant toxicity against mammalian cells, and are a promising candidate for a new antibiotic of therapeutic value. The main target of the peptides are considered to be the lipid matrix of the membranes. This review summarizes studies on magainin-lipid interactions in comparison with other pore forming peptides. The selective toxicity can be at least partly explained by preferential interactions of magainins with anionic phospholipids abundant in bacterial membranes. A novel mode of action is discussed in detail, i.e., the formation of a dynamic peptide-lipid supramolecular pore, which allows the mutually coupled transbilayer transport of ions, lipids, and peptides per se.

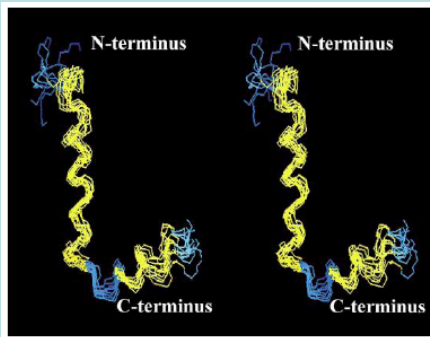
Natural Peptides With Anti-microbial Activity

Defensins
Cecropins
Magainins

Structure Of Magainins



3-D Structure Of Magainin

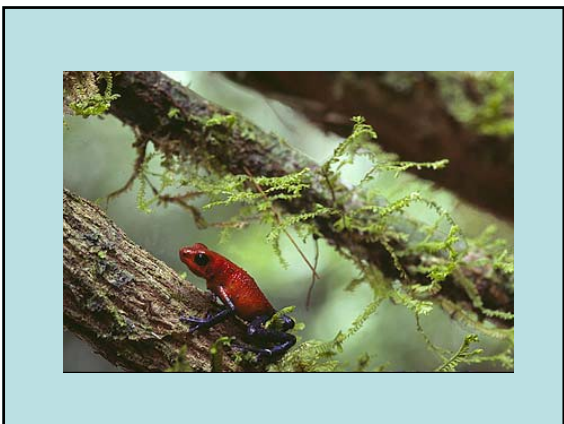
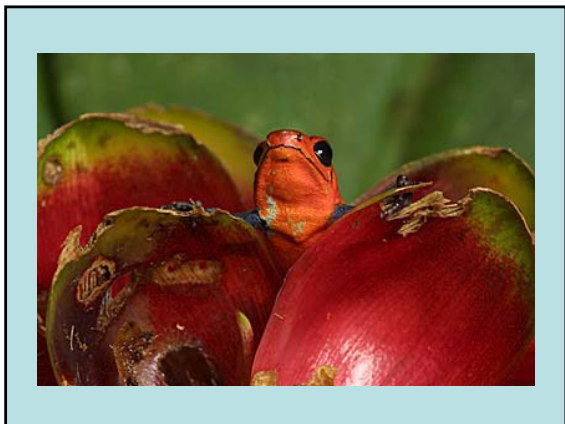
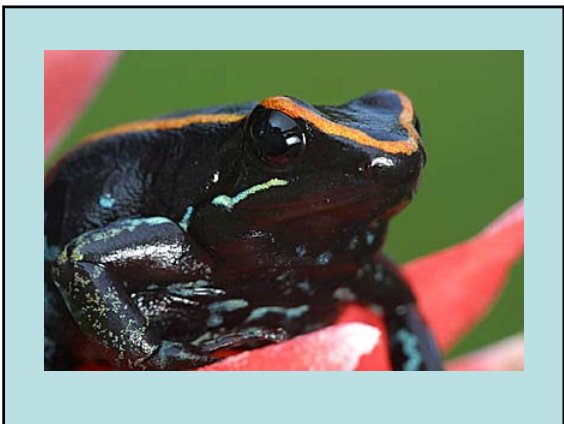


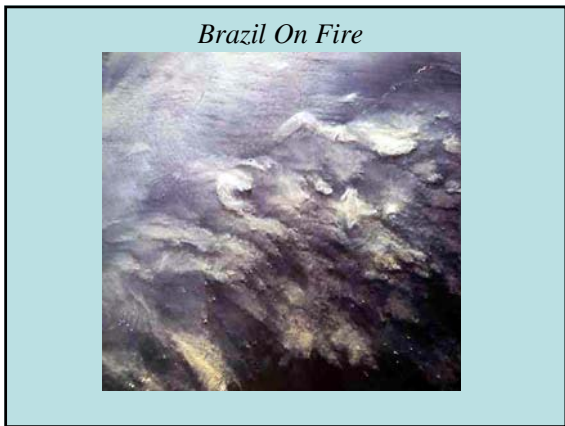
There Are Approximately 4,000 Species of Frogs



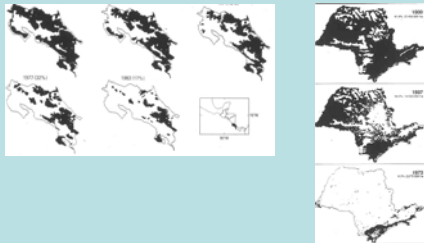
Sometimes Its Easy Being Green!







Encroachment Due To Human Activity (Farming, Mining, Dam building) Is Highly Destructive To The Rainforest.



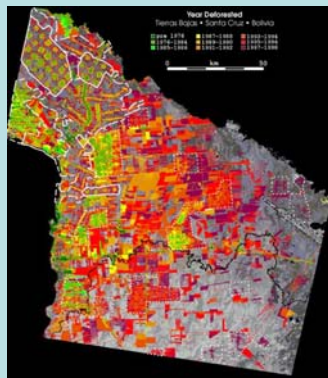
Bolivian De-forestation



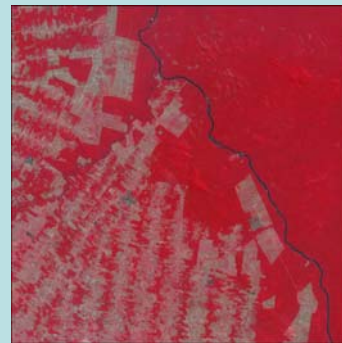
July 1975

July 1992

August 2000



De-forestation In Brazil



Brazil



Come To E.O. Wilson's talk:
Saving The Last Life and Why Its Worth It

