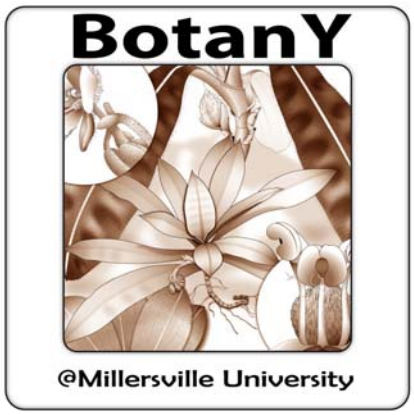
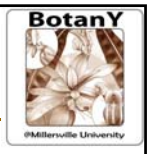
Topic 01



Introduction to Botany

Reading: Evert & Eichhorn (2013) Chapter 1

I. Plants are more important to you than you know



A. The naked truth

I. Plants are more important to you than you know

A. The naked truth
- You're wearing between 3-4 pounds of plant-based textiles now

Some Plant-based Fibers:
Cotton, Flax, Jute, Sisal, Pineapple, Rayon

1. Cotton is king

Species: *Gossypium hirsutum*

Nativity: Mexico

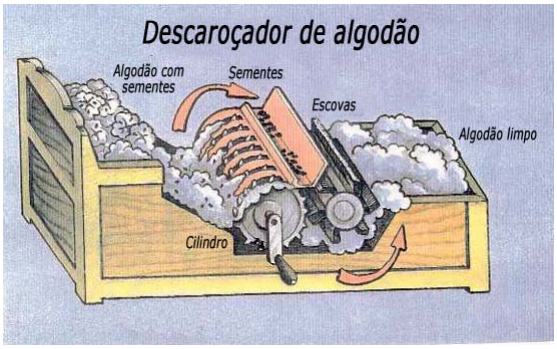
Domestication: Mexico.

Type: Seed (surface) fibers.

Leading Producers:
China (32 million bales / yr)
India (23.5 million bales)
USA (12.4 million bales)

Bale = 480 pounds

Extraction via ginning.



2. Flax was king

Flax fiber used to make linen.

Species: *Linum usitatissimum*

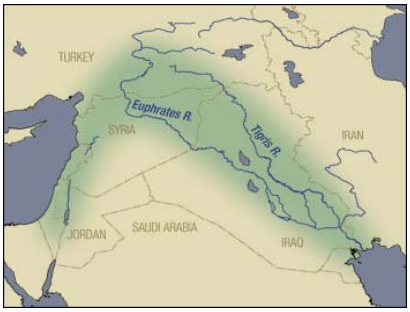
Nativity: E Mediterranean to India

Domestication: Fertile Crescent.

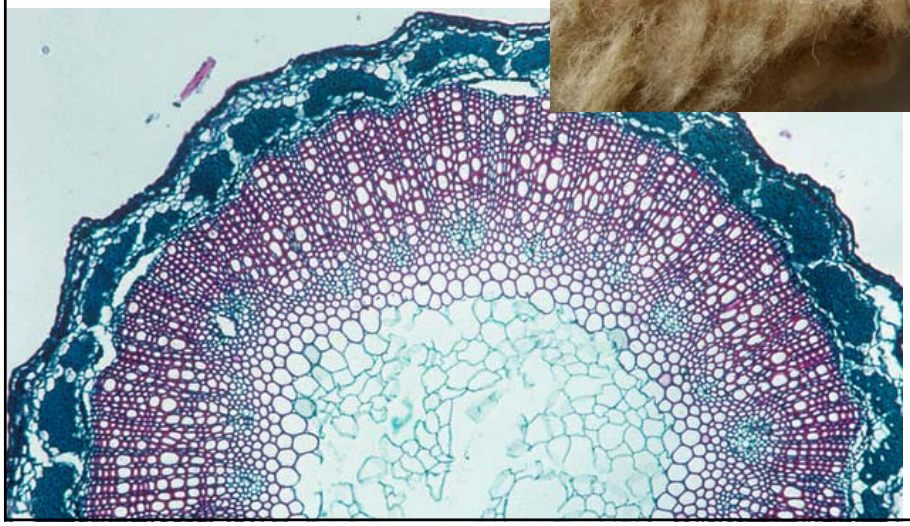
Type: Bast fibers.

Leading Producers:
EU (122,000 tons / yr)
China (25,000 tons / yr)

(metric ton = 1000 kg;
US ton = 2000 lbs or
0.91 metric tones)



Extraction via retting.



3. Pineapple fiber

Species: *Ananas comosus*

Nativity: Brazil, Paraquay.

Domestication: South America, Central America, West Indies.

Type: Leaf fibers

Leading Producers:
Philipines (?)

Pineapple fiber

Extraction via decortication.

I. Plants are more important to you than you know

B. Biomass in the ecosystem

So, you're a Biology major and want to know how to apportion your studies amongst botany vs. zoology, mycology, and bacteriology? How about apportioning according to the proportion of Earth's total biomass that is botanical***.*** Which of the following would be closest to that figure?

a. 25% b. 50% c. 75% d. 100%

I. Plants are more important to you than you know

C. Your mass

You've probably heard that we Earthlings are carbon-based life forms, and so you rightly assume that carbon is very important. What percent of these important carbon atoms in the organic molecules of your body come from photosynthetic organisms?

a. 25% b. 50% c. 75% d. 100%

I. Plants are more important to you than you know

D. Your caloric intake

Vegans vs. Carnivores? About what percent of your caloric intake comes from photosynthetic organisms?

a. 25% b. 50% c. 75% d. 100%

I. Plants are more important to you than you know

E. Plants set the landscape, atmosphere

I. Plants are more important to you than you know

E. Plants set the landscape, atmosphere

I. Plants are more important to you than you know

E. Plants set the landscape, atmosphere

I. Plants are more important to you than you know

F. Medicines and recreational drugs

I. Plants are more important to you than you know

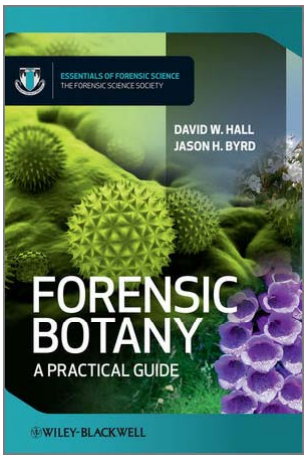
F. Medicines and recreational drugs

Table 1.3. Top five most used illicit recreational drugs in 2009, according to the United Nations Office of Drugs and Crime (2010) and ranked according to their lower-end estimate of users.

Rank	Drug	Estimated Users aged 15-64	Ultimate Source (plant, fungus, animal, or totally synthetic)	Species if Organismal Source
1.	Cannabis	128,910,000 – 190,750,000		
2.	Cocaine	15,070,000 – 19,380,000		
3.	Opiates	12,840,000 – 21,880,000		
4.	Amphetamines	13,710,000 – 52,900,000		
5.	Ecstasy	10,450,000 – 25,520,000		

I. Plants are more important to you than you know

G. Forensics



I. Plants are more important to you than you know

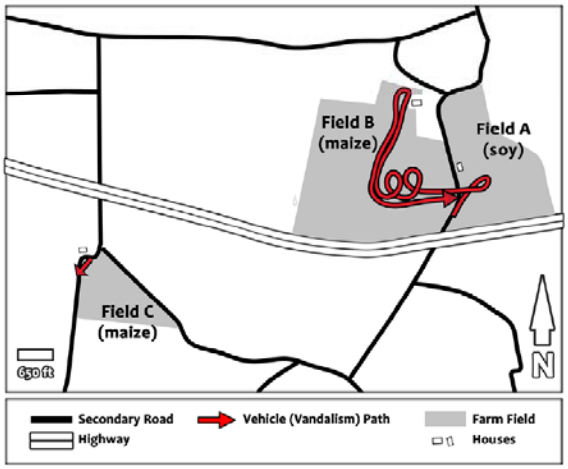


Figure 1

Map providing an overview of the crime scene and vehicular path taken by the perpetrator in a case of vehicular crop destruction in rural Pennsylvania.

I. Plants are more important to you than you know

Figure 2

The vehicle (vandalism) path in field C as it appeared on June 13, 2009, the morning after the crime was perpetrated.

I. Plants are more important to you than you know

18 Pa. Const. Stat. § 3310

§ 3310. **Agricultural crop destruction.**

(a) Offenses defined.--A person commits a felony of the second degree if he intentionally and knowingly damages any field crop, vegetable or fruit plant or tree that is grown, stored or raised for scientific or commercial purposes or for any testing or research purpose in conjunction with a public or private research facility or a university or any Federal, State or local government agency.

(b) Restitution.--Any person convicted of violating this section shall, in addition to any other penalty imposed, be sentenced to pay the owner of the damaged field crops, vegetable or fruit plants or trees restitution. Restitution shall be in an amount equal to the cost of the financial damages incurred as a result of the offense, including the following:

(1) Value of the damaged crop.
(2) Disposal of the damaged crop.
(3) Cleanup of the property.
(4) Lost revenue for the aggrieved owner of the damaged crop.

I. Plants are more important to you than you know

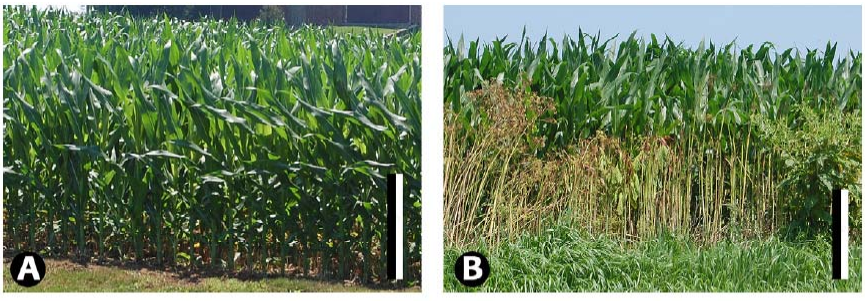


Figure 5

I. Plants are more important to you than you know

18 Pa. Const. Stat. § 3310

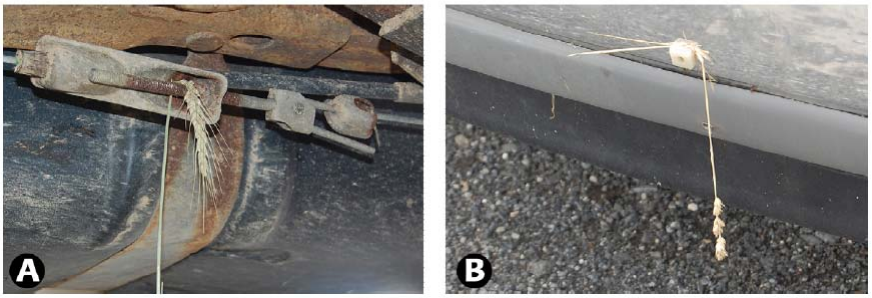


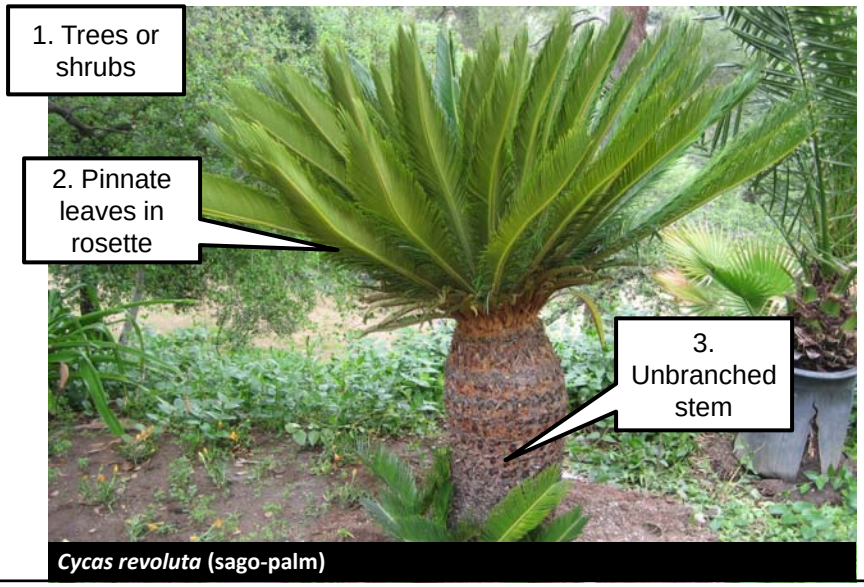
Figure 4

Many fragments or entire stems of winter wheat from field B were found lodged in the undercarriage (A) and front bumper (B) of the suspect's Dodge Ram pickup truck.

II. Cycad Stories

Cycads

A. Vegetative Morphology

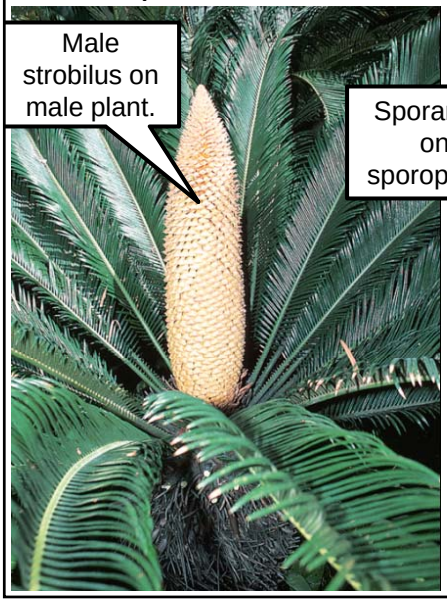


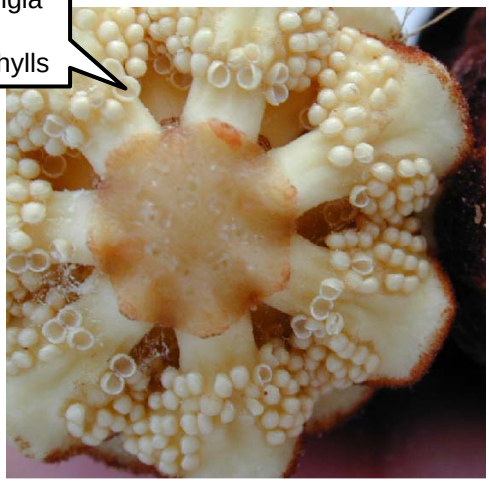
Cycas revoluta **(sago-palm)**

Cycads

B. Reproductive……1. Dioecious

a. Males w/ strobili





Cycads

B. Reproductive……

Seeds on sporophylls in *Cycas.*

Seeds on sporophylls in a strobilus in *Zamia*

Cycads

C. Economic botany

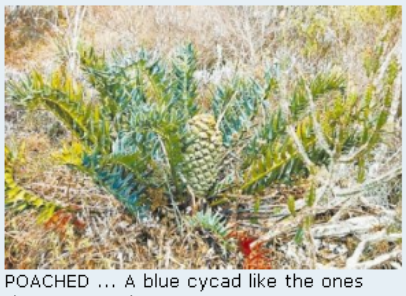
-Ornamental horticulture

Cycads

Rare cycads fetch big money on black market

Cycad thieves strike at Van Stadens Reserve

2009/06/02
Guy Rogers ENVIRONMENT & TOURISM EDITOR rogersg@avusa.co.za



POACHED ... A blue cycad like the ones that were stolen.

CONSERVATION authorities are hoping that sharp-eyed members of the public might be able to help with a weekend incident in which seven rare, protected cycads were seized from the Van Stadens Wildflower Reserve.

Reserve manager Wesley Berrington said yesterday that he was off the reserve on Sunday and returned to find the seven blue cycads (Encephalartos horridus), which are endemic to the Uitenhage area, gone.

"They were growing in our work area around our store rooms. They were just dug up. One was left behind, which seems to indicate that the thieves were disturbed."

Cycads

Rare cycads fetch big money on black market

Thieves target rare, valuable plants

Sunday, December 12, 2004 Posted: 6:12 PM EST (2312 GMT)Sunday, December 12, 2004 Posted: 2312 GMT (0712 HKT)

COSTA MESA, California (AP) -- The thieves struck at night and knew just what they were after.

In minutes, they ripped two plants from the lavish landscaping at a home in this Los Angeles suburb, then fled when the homeowner woke up and turned on a porch light.

Total haul: $3,500.

The thieves were after cycads, palmlike plants so prized that a rare specimen can fetch $20,000 or more on the international black market. Some species have been around since the time of the dinosaurs but are now close to extinction.

story.cycads.ap.jpg
Horticulturist Jason Kubrock says cycads are "the hot, trendy plant right now."

> "In the black market, some species of cycads are like a fine piece of art -- like a Picasso."
> *-- Nannette Zapata, Fairchild Tropical Botanic Garden spokeswoman*

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Cycads

Research on DNA technology to help prosecute.

news24
Breaking News. First.

The Southern African Larger Telescope has brought more than astronomy to the depressed town of Sutherland. See it in pictures.

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South Africa | World | Africa | Entertainment | Science & Technology

Barcode bars cycad smugglers

2010-01-11 16:07

Johannesburg - Scientists at the University of Johannesburg have started a DNA bar-coding project to stop the smuggling of endangered cycad species in the country.

Botany masters student Philip Rousseau started the project with the aim of creating a barcode library for the African Encephalartos species in an attempt to control collectors in America and the Far East who are prepared to pay up to R71 000 for a large specimen of a rare species, university spokesperson Herman Esterhuizen said in a statement.

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Cycads

D. Biogeography & Conservation

-Pantropical (rainforest to deserts)

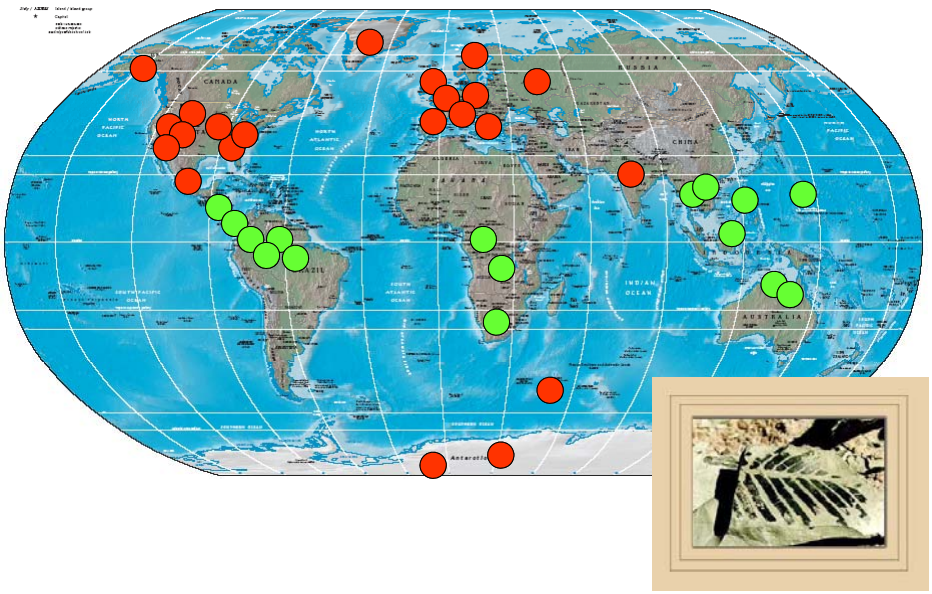
-Long fossil history (<200 my)

-ca. 240 extant (surviving) species

-threatened by poaching & black market

Cycad Distribution

neontological paleontological



Fossil Cycads

Int. J. Plant Sci. 164(6):1007–1020. 2003.

1058-5893/2003/16406-0016$15.00

GYMNOSPERMS FROM THE MIDDLE TRIASSIC OF ANTARCTICA: THE FIRST STRUCTURALLY PRESERVED CYCAD POLLEN CONE

Sharon D. Klavins,* Edith L. Taylor,* Michael Krings,† and Thomas N. Taylor*

*Department of Ecology and Evolutionary Biology and Natural History Museum and Biodi
Lawrence, Kansas 66045-7534, U.S.A.; and †Bayerische Staatssammlung für Paläon
Paläontologie, Richard-Wagner-Strasse 10, 80333 Munic

The first permineralized cycad pollen cone is described from the lower
cone is characterized by helically arranged, wedge-shaped microsporophyll
projections extending from the rhomboid distal face. The vascular cylinde
traces to each microsporophyll. Three vascular bundles enter the base of
produce at least five vascular strands in the sporophyll lamina. Pollen sac
the lateral margins on the abaxial surface of the microsporophyll. Each
pollen sacs that are fused for approximately half their length and display l
are sessile and attached to a vascularized, receptacle-like pad of tissue tha
microsporophyll. Pollen is ovoid, psilate, and monosulcate. Although th
Cycadales are obvious, the complement of characters in the fossil is unique a
to an extant family. Features of the cone are evaluated against reproductiv

Keywords: Cycadales, *Delemaya*, gymnosperms, microsporophylls, pollen

Introduction

that this approach
solving relationsh

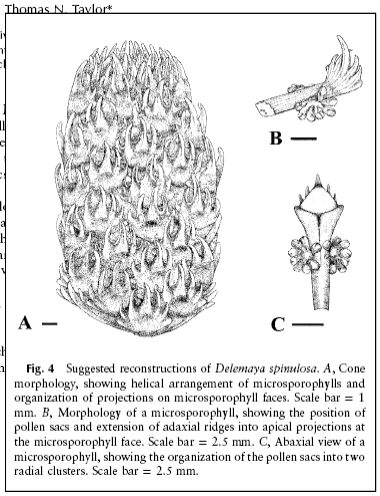


Fig. 4 Suggested reconstructions of *Delemaya spinulosa*. *A*, Cone morphology, showing helical arrangement of microsporophylls and organization of projections on microsporophyll faces. Scale bar = 1 mm. *B*, Morphology of a microsporophyll, showing the position of pollen sacs and extension of adaxial ridges into apical projections at the microsporophyll face. Scale bar = 2.5 mm. *C*, Abaxial view of a microsporophyll, showing the organization of the pollen sacs into two radial clusters. Scale bar = 2.5 mm.

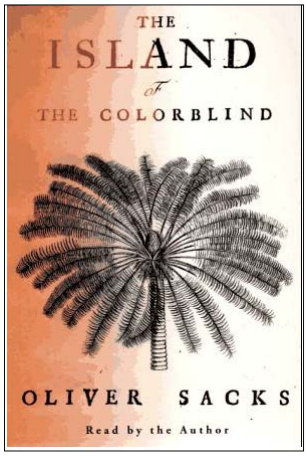
Cycads

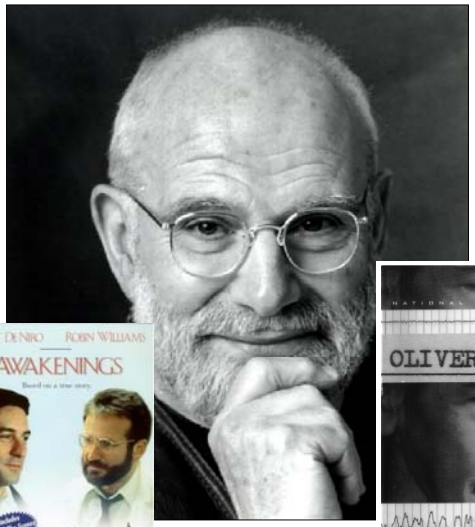
E. Cycads & Guam Dementia

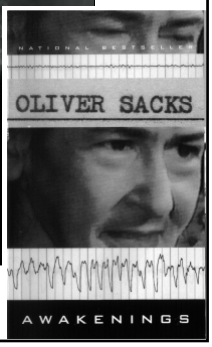
US territory 1898-1941, 1944-present.
Japanese 1941-1944

Cycads

E. Cycads & Guam Dementia







Chamorro = indigenous people of Guam

*Extremely healthy by historical accounts.

*20th century brought lytico-bodig, leading cause of death in 40's, 50's, 60's.

Lytico-Bodig (sometimes called Guam dementia).

Demographics: Chamorro men; usu. strikes 25-40 yrs.

Symptoms:

Lytico = progressive paralysis that resembles ALS (amyotrophic lateral sclerosis);

Bodig = parkinsons-like shakes with Alzheimers-like dementia.

Prognosis: premature death.

NIH investigates from 1940-1990's:

They Explore:

1. Genetics (including sex-linked)

NIH investigates from 1940-1990's:

They Explore:

1. Genetics (including sex-linked)
2. Cycad pollen (BMAA discovered in 1950's)

NIH investigates from 1940-1990's:

They Explore:

1. Genetics (including sex-linked)
2. Cycad pollen (BMAA)
3. Cycads as food ("fadang" flat bread; BMAA)

NIH gives up in the 1990's.

Enter botanist Paul Cox, Oliver Sacks, flying foxes, & a new angle on the cycad hypothesis.

Then, Insitute of Ethnobotany, NTBG, Hawaii.

Now, Institute for Ethnomedicine in Jackson Hole, Wyoming.

-Bats eat the seeds.
-Bioaccumulate BMAA 400x in fatty tissues (apparently unaffected).

But, what's the connection to lydigo-bodig?

-Bats eat the seeds.
-Bioaccumulate BMAA 400x in fatty tissues (apparently unaffected).

But, what's the connection to lydigo-bodig?

1. Why primarily in men?

2. Why could it be passed to men from other tribes only through marriage?

3. Why did it arise during 20th century, then peak in 40-60's?

Neurology 2002;58:956-959

Medical Hypothesis

Cycad neurotoxins, consumption of flying foxes, and ALS-PDC disease in Guam

Paul Alan Cox, PhD and Oliver W. Sacks, MD

From the Institute for Ethnobotany (Dr. Cox), National Tropical Botanical Garden, Kalaheo, HI; and Department of Neurology (Dr. Sacks), Albert Einstein College of Medicine, Bronx, NY.

Address correspondence and reprint requests to Dr. Paul Alan Cox, Institute for Ethnobotany, National Tropical Botanical Garden, 3530 Papalina Road, Kalaheo, Kauai, HI 96741.

The Chamorro people of Guam have been afflicted with a complex of neurodegenerative diseases (now known as ALS-PDC) with similarities to ALS, AD, and PD at a far higher rate than other populations throughout the world. Chamorro consumption of flying foxes may have generated sufficiently high cumulative doses of plant neurotoxins to result in ALS-PDC neuropathologies, since the flying foxes forage on neurotoxic cycad seeds.

1. Why primarily in men?

2. Why could it be passed to men from other islands only through marriage?

3. Why did it arise during 20th century, then peak in 40-60's?