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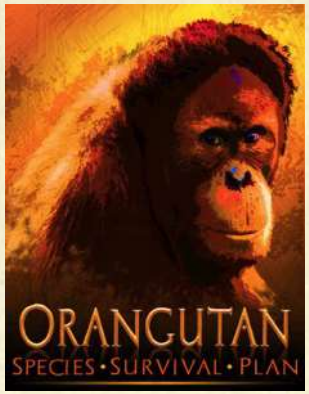
How orangutans in North America can help orangutans in Indonesia and Malaysia by just opening their mouths !



BIAZA
BRITISH & IRISH ASSOCIATION OF ZOOS & AQUARIUMS

Rehabilitant Siswi at Tanjung Puting

Photo-Jurgen Freund

EAZA
Pending

Felicity Oram

HUTAN
Kinabatangan Orang-utan Conservation Programme

JABATAN HIDUPAN LIAR SABAH

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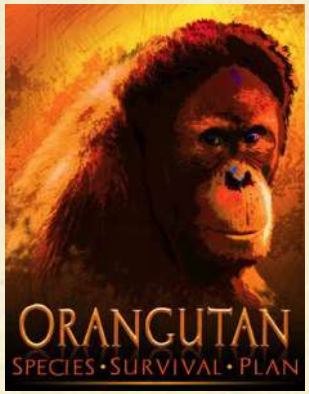
Captive Orangutan Teeth Emergence Compilation Project



Rehabilitant Siswi at Tantung Putting

Photo-Jurgen Freund

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Tatyana Humle PhD
DICE -University of Kent - Academic Advisor

Yenny Saraswati Jaya DVM - SOCP

Marc Ancrenaz DVM – Hutan KOCP

Isabelle Lackman PhD Hutan KOCP

Wild habituated
Ramadan
DOB unknown
KOCP study site
25 Feb 2013
Photo Hussein

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YOU

YOUR Orangutans

YOUR ZOO

Tengku Sumatran flanged male
DOB 3 July 1986
Photo 12 Sep 2013 Angie Selzer
Fort Wayne Children's Zoo

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Orang Juga

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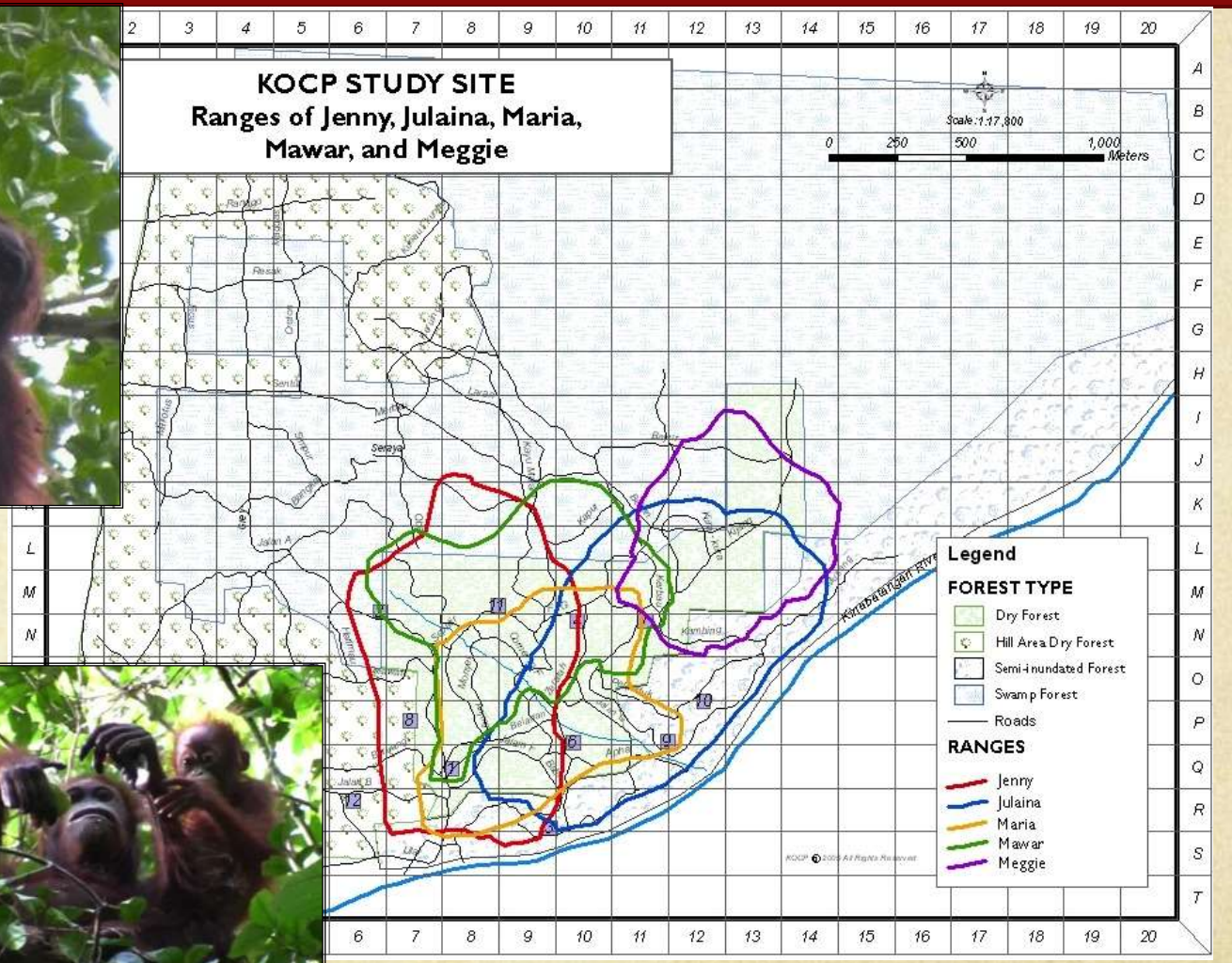
Wild

Habituated



Continuous and ongoing since 1998

Developmental milestones wild orangutans

van Noordwijk & van Schaik (2005) van and Adrichem et.al. (2006)
***P.abelii* van Noordwijk et al (2009) ,*P. p. morio* Oram (2013) in prep**

Locomotor Competence	Nutritional Competence	Weaning	Ranging Independence
Begins **2 - 3 years**	Begins **3 years**	**7 - 8 years**	Begins **8 - 11 years**
• Moving independently • except when crossing between trees	• Independent foraging for nutritional purposes than mother	• No longer share mother's night nest • Usually marked by mother's next pregnancy	• Progressive less association with mother and Sex Males leave sooner Females stay nearby But individual variation

A lot happens developmentally between 3 – 12 yrs..!

Reintroduction Process

SOCP / FZS JAMBI

Confiscation/evacuation

Quarantine

Nursery

Socialization

Adaptation

Release

Quarantine center, Medan SOCP

Reintroduction station SOCP – Aceh FZS - Jambi

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Reciprocal field worker exchange

Dr Winny, Roni, Aripin and Deeka

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May 2011 –
October 2012

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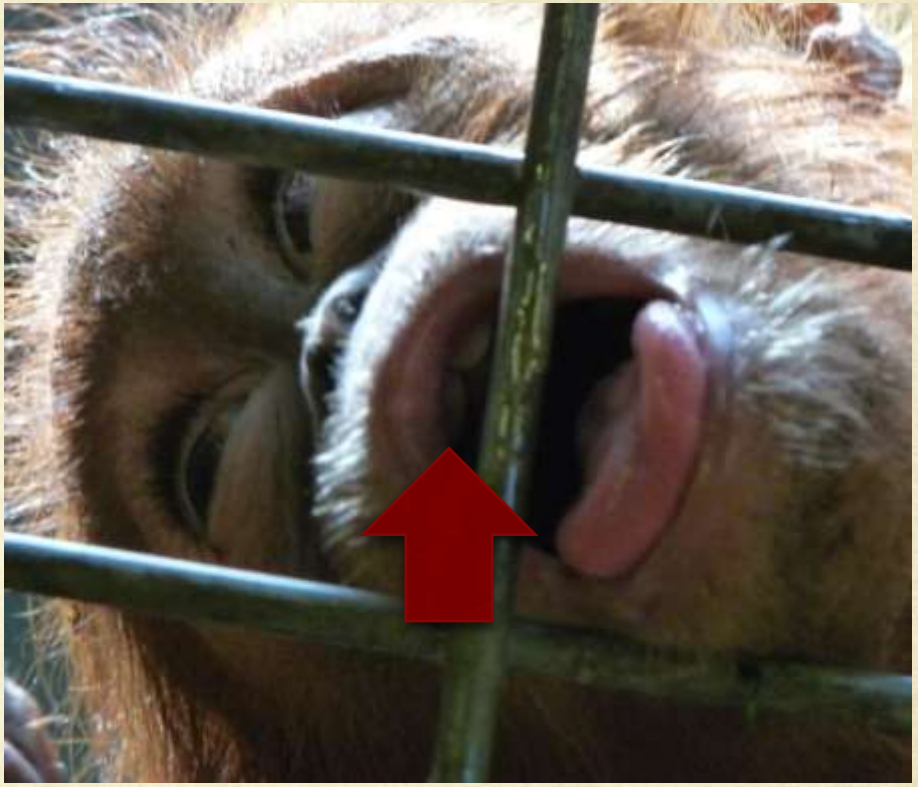
Challenge for rehabilitation

and wild research

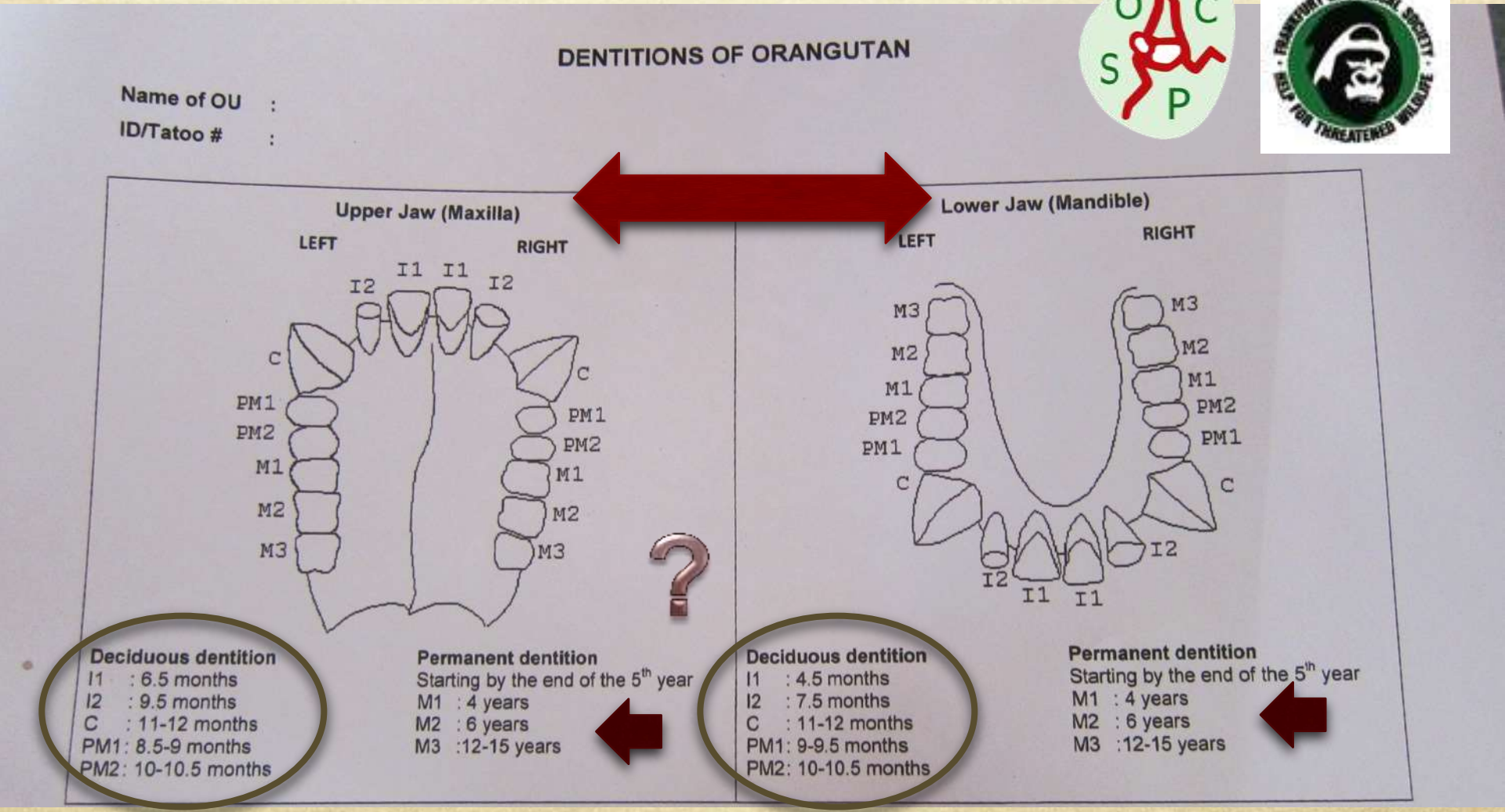
- AGE ESTIMATION
- Most have no known date of birth
- Whereas in zoos today
- Most orangutans have precise birth dates



Tuti
Female Sumatran
Chester Zoo
8 months 18 days

SOCP tooth chart – info 3-12 years scant

NO permanent incisor, canine and premolar info – and molar quite vague



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Deciduous dentition	Permanent dentition
I1 : 6.5 months	Starting by the end of the 5th year
I2 : 9.5 months	M1 : 4 years
C : 11-12 months	M2 : 6 years
PM1: 8.5-9 months	M3 :12-15 years
PM2: 10-10.5 months	

Deciduous dentition	Permanent dentition
I1 : 4.5 months	Starting by the end of the 5th year
I2 : 7.5 months	M1 : 4 years
C : 11-12 months	M2 : 6 years
PM1: 9-9.5 months	M3 :12-15 years
PM2: 10-10.5 months	

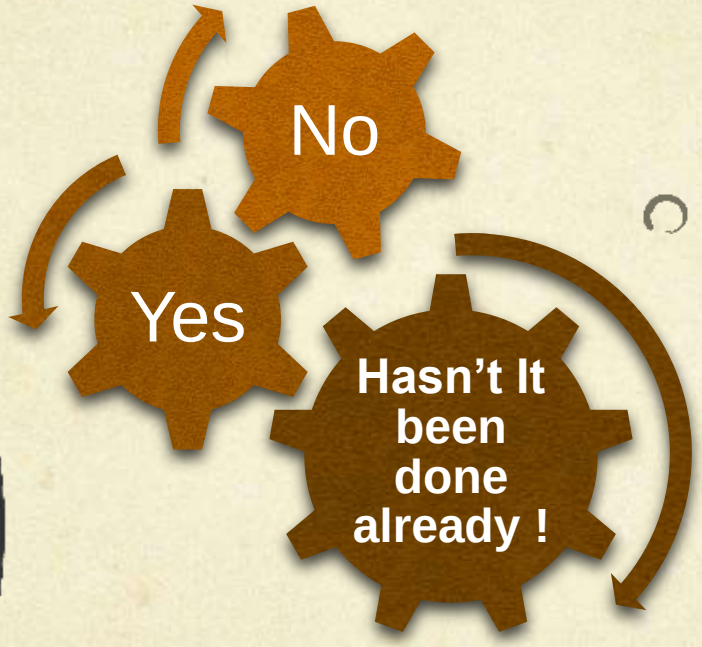
Particular challenge for OVAG vets and rehab staff –

3 – 12 years

Key age for developmental milestones therefore key ages for rehabilitation

- Permanent front teeth data could fill this gap …
- But we found very little data have actually been reported ..

Teeth emergence charts for orangutans



- Most data from **museum specimens – no known age of birth.**
- Most comprehensive captive study to date was published in **1983** (Fooden & Izor) **before two species designation**.
- What is available is **very incomplete - extremely small sample size**.

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Zoos today don't need age estimation.

Most have known DOB now.

If not dental procedure easily overlooked in immobilizations

Assumed all great apes teeth emergence similar

Assumed captive growth accelerated

So not relevant

Hand raised esp.

Why hasn't it been done already ?

Info recorded but not centrally so not readily accessible

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Despite more rapid weight gain and skeletal growth, teeth emergence is less affected by environmental conditions in macaques and chimpanzees

(Swindler 2002, Smith et al 2010)

Orangutan dental emergence is significantly slower than chimpanzees and more closely parallels humans (Kelley & Schwartz 2010)

Victoria
Female Bornean
Blackpool Zoo UK
DOB July 1984
Photo taken 18 Sep 2013
28 years

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RELAVANCE !

Data deficient
New evidence teeth emergence independent of environment
Known date of birth individuals exist in sufficient numbers
Orangutan teeth emergence later than chimpanzee/gorilla so great apes can't just be summed together

Aurora At Houston Zoo

Li_1 - left lower deciduous central incisor

First tooth !

Date photo ? ?? Around 4.5 months ???

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Captive orangutans

Updated life history baselines benefits captive husbandry

Opportunity for zoo OUs to serve their more elusive fellows in practical way

Rehabilitant OUs

Better age estimation = improved husbandry and rehabilitation outcomes

Evidence for law enforcement

Wild OUs

Better age estimation =

better understanding of life history = improved management and conservation wild populations

Evidence for law enforcement

Some orangutan teeth facts

- Orangutans like humans have 2 sets of teeth.
- 20 deciduous teeth (baby) followed by 32 permanent teeth (adult) same as humans.
- The deciduous teeth are incisors, canines and premolars only.
- These are replaced by permanent incisors, canines and premolars.
- Adults have 3 (but maybe some have 4 molars). The molars are permanent but emerge behind (distal) the deciduous premolars while these baby teeth are still in place.
- There are some labeling inconsistencies between human dentists , veterinarians , primatologists, physical and evolutionary anthropologists that add to confusion on teeth ids….this is why photographs are really helpful !

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Malatus
Female *Pongo Pygmaeus morio*
DOB 18 June 2005
Photo 25 April 2013
7 years 10 months 7 days

Deciduous exfoliation (loss)
and
Permanent emergence
overlap

It's NOT
THAT EASY or
straightforward to
figure out once you
have some teeth

Dental Formula orangutans

- Deciduous (baby teeth)

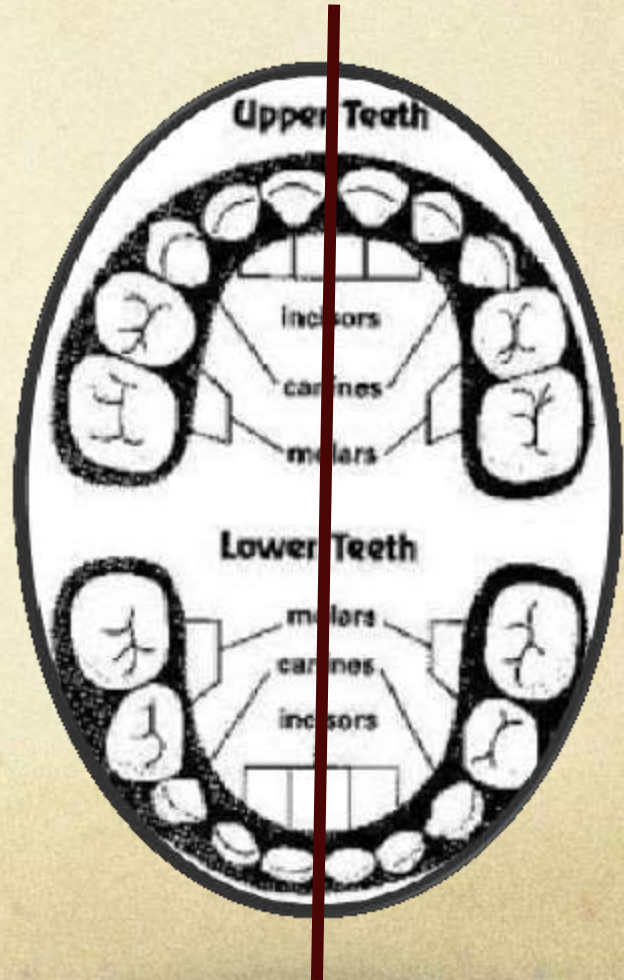
$i^2 - c^1 - p^2 / i_2 - c_1 - p_2 \times 2 = 20$

small letters = deciduous

superscript = upper - subscript = lower

X 2 = each side of midline

Human baby teeth diagram



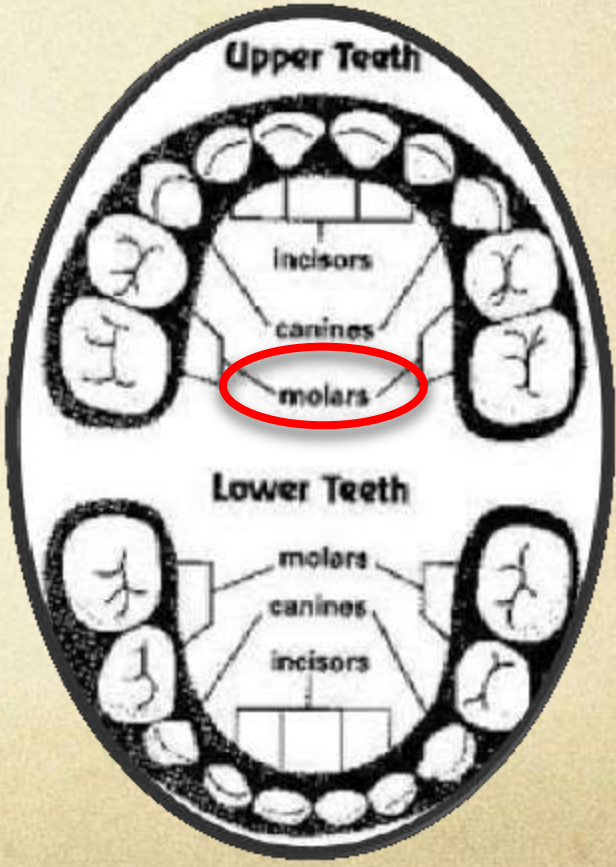
Dental Formula orangutans

- Deciduous (baby teeth)

$$i^2 - c^1 - p^2 \,/\, i_2 - c_1 - p_2 \times 2 = 20$$

NOTE : Human dentists call **deciduous premolars - deciduous molars even though they are actually premolars**

Human

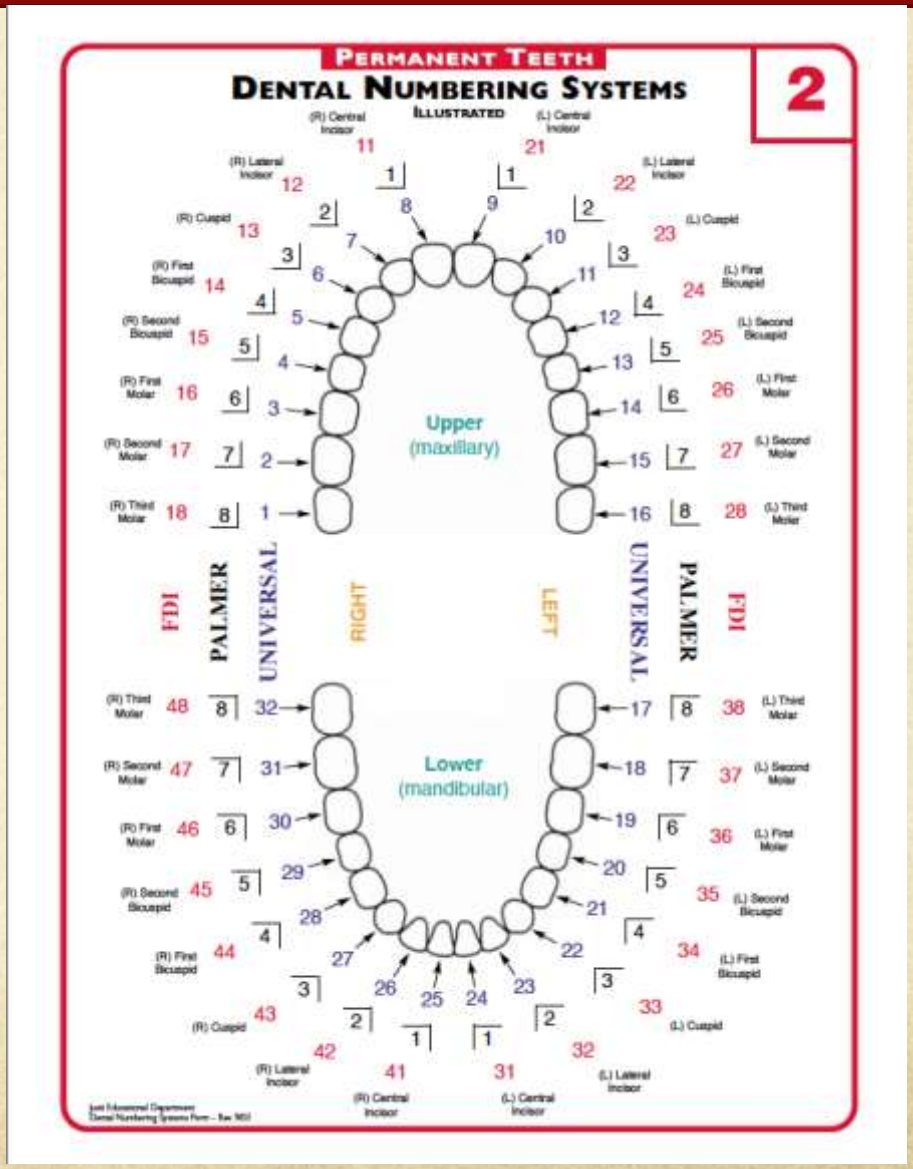


human dentistry
3 main different
numbering systems !!!

cuspid = canine
bicuspid = premolar

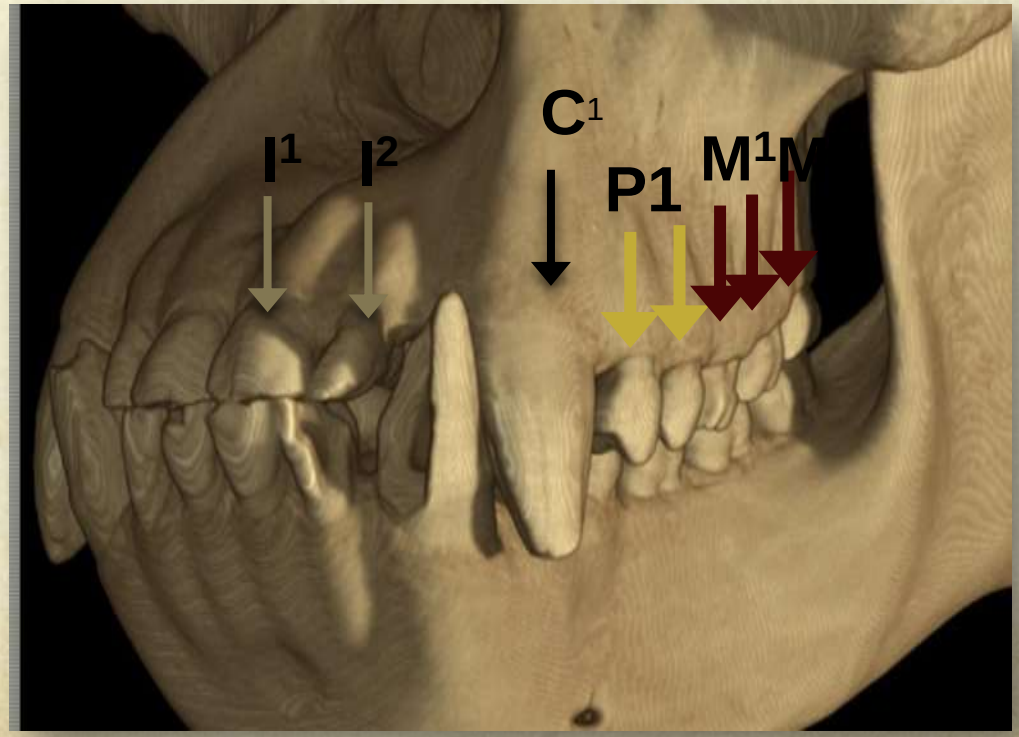
MORE HUMAN dentist /physical anthropologist terms !

Source : americantooth.com



Permanent (adult teeth)

$$\frac{I^2 - C^1 - P^2 - M^3 \;/\; I_2 - C_1 - P_2 - M_3 \times 2}{32} =$$



Deciduous (baby teeth)

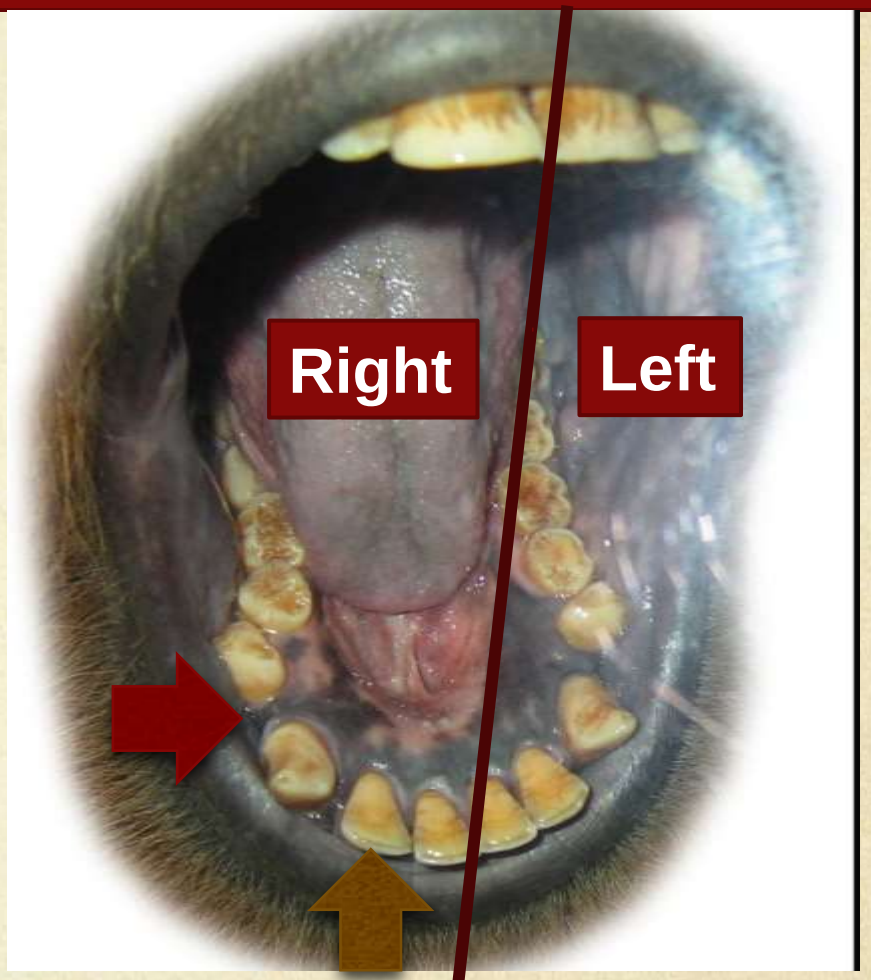
$i^2 - c^1 - p^2 / i_2 - c_1 - p_2 \times 2$

Permanent (adult teeth)

$I^2 - C^1 - P^2 - M^3 / I_2 - C_1 - P_2 - M_3 \times 2$

R I_2 - Right lower permanent incisor

Note space for upper canine between lower canine and first premolar



Caroline Stuttgart Zoo
Taken 29 October 2008
By Camern_hf Dlickr

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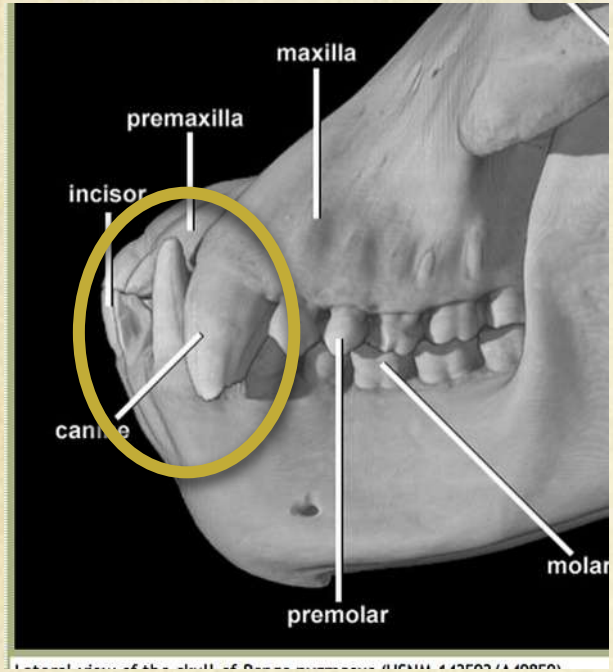


ON upper jaw the space for lower canine to fit is between lateral incisor I^2 and canine –

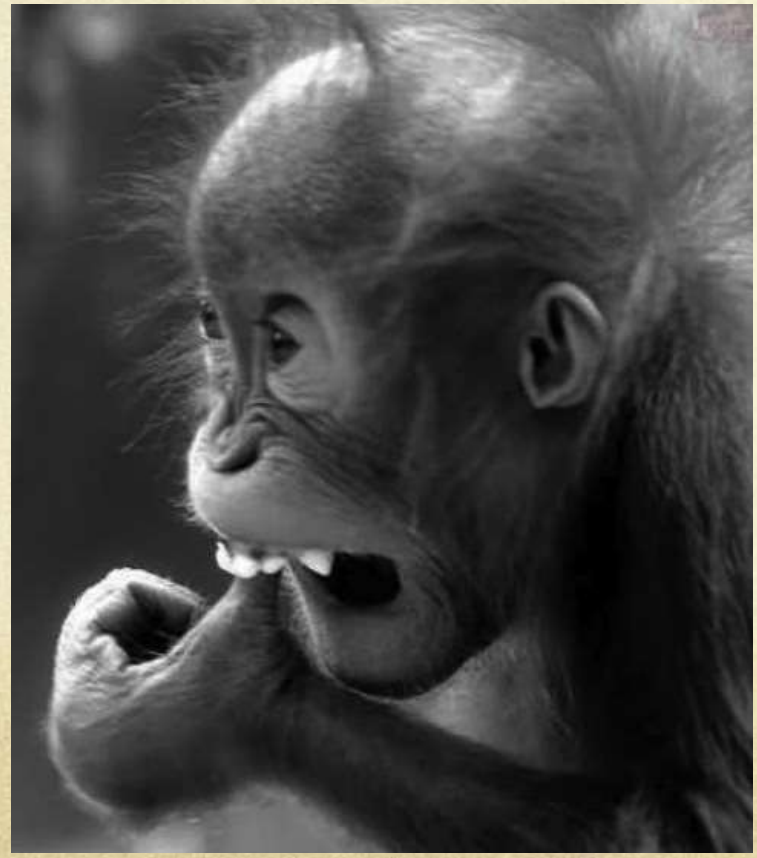
On lower jaw the space for upper canine to fit is between Lower canine and first premolar

This is helpful to remember when looking at individulas that are losing baby teeth and getting adult teeth

Deciduous (baby teeth)

$i^2 - c^1 - p^2 / i_2 - c_1 - p_2 \times 2 = 20$

2-3 years lots of space in mouth



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Iznee
Female *Pongo pygmaeus*
4 years 2 months

4 years on all spaces seem to disappear as molars come in behind deciduous pre-molars

It's NOT

THAT EASY or straightforward once you have some teeth

Kirana
Female *Pongo abelii*
4 years 5 months

Then you get all sorts of spaces so taking a series once a month really helpful on 4-10 year olds
and females and males likely different ?

Theo Allofs - Biosphoto
Tanjung Puting

So how old is Miriam ?

Is she under 4 or over 4 ??

Is she missing (exfoliation) her right upper canine ???

Answer

Not sure from this view

More open mouth to see premolars and/or molars would be better …

While there is a space clearly visible on her upper right

It may well be the space for her lower canine

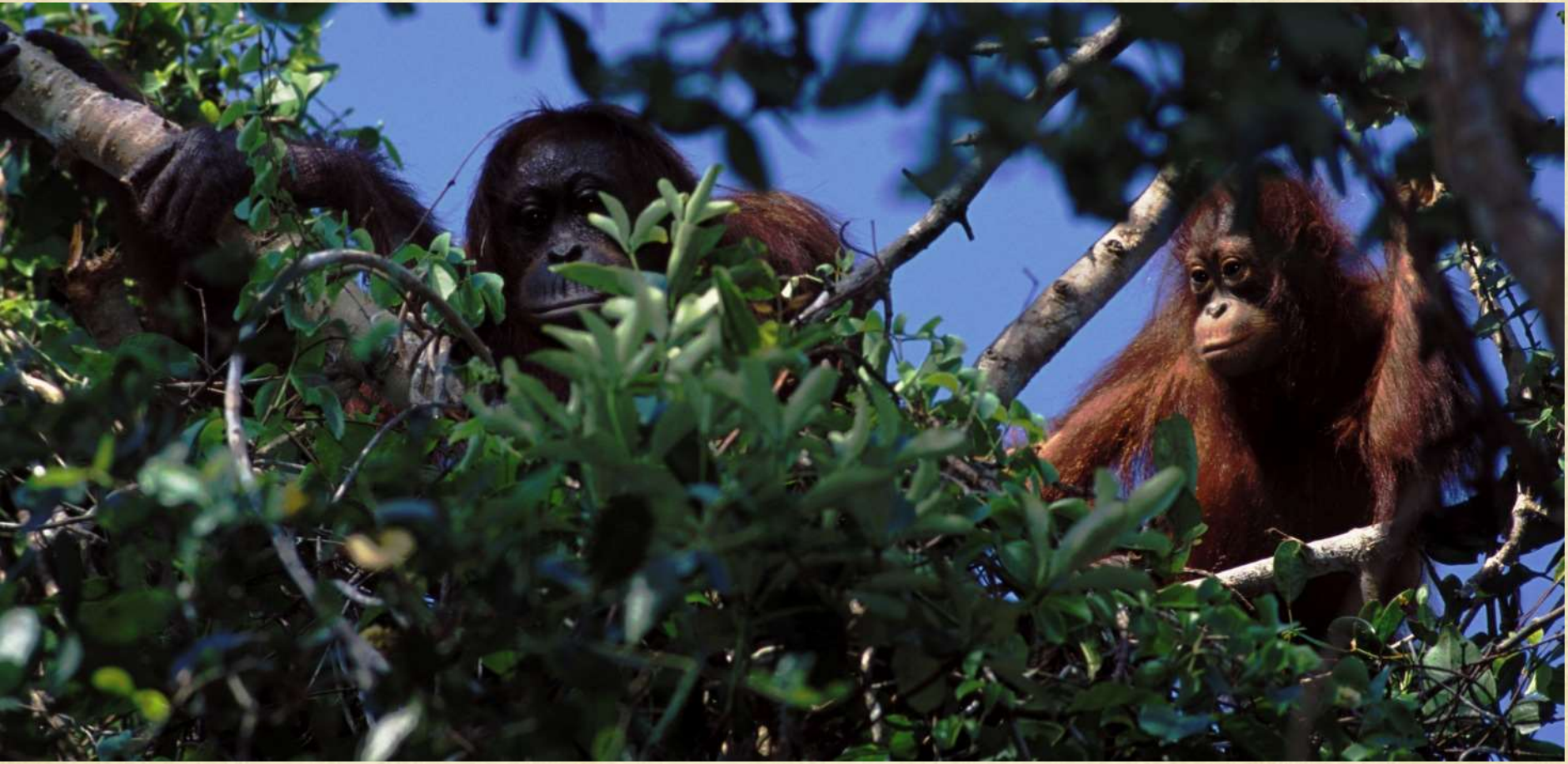
In this view we see what certainly appear like deciduous incisors nicely

Miriam – FZS Jambi release site October 2012

Deciduous

wild orangutans do not even begin to travel more than about 50 m from their mother until 7- 8 years old

A lot to learn!!!…..



Etin about 5-6 years old watching his mother Jenny making a nest

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Data requested from you and your orangutans

- **known DOB ≤15 year olds**
  - **Need larger sample size**
  - **5 months – 2 years**
    - **Confirm and extend current deciduous data**
    - **Sumatran/Bornean /hybrid same or different**
  - **New data permanent emergence**
  - **. 4- 12 year olds**
    - **permanent incisors, canines, premolars**
    - **Timing and sequencing**
    - **Better age estimation at critical developmental stages**
    - **Sex /species differences ?**
- **From ≥ 15 all Adults**
  - **3 or 4 molars presence/absence**
  - **Normal variation /species /subspecies difference ?**

Utara Female Pongo abelii
9 years 3 months

What we need

- Initial presence / absence by opportunistic or as part of routine open mouth training especially 1-15 year olds
- From this we will target important representative individuals for follow ups --- Because it isn't as straight forward as it might seem to id teeth PHOTOS ARE REALLY HELPFUL.
- Notation and full documentation with photos as a part of all pre-ship exams …

Sentul

Uuna

Jari telunguk kiri tidak buka

Felicity

Sangat besar, gigi yang dipakai - janggut panjang
Malu tetapi tenang di seluruh kakitangan
sangat pandai - berjalan-jalan di atas tanah

What we need to know

- House name
- Zoo of residence
- DOB
- Species
- Isis # , or other ID #s
- Sex
- Hand or maternally raised or or surrogate OU or mixed (details)
- Date of observation and specifics - Photos are especially helpful !
- trainer contact for follow up if possible

Coding system for emergence

- 0 = tooth absent
- 1 = tooth present
- 2 = tooth fully emerged
- 3 = tooth actively growing but not fully emerged
- 4 = tooth budding or just broken the skin
- 5 = tooth missing (exfoliated) was there but now missing

Coding system for infant care

- 1 = wholly mother raised
- 2 = wholly hand raised – removed from dam within 24 hours of birth
- OTHER – please supply details
  - 3 = removed from dam within 24 hours of birth and successfully introduced and raised by surrogate orangutan female within one month
  - 4 – combination - e.g. maternal care 10 days removed for insufficient nursing at 20 days hand raised 3 months then reintroduced to dam - fed by bottle x intervals (list) by dam presenting infant to mesh.

Coding system for species

- 1 = Bornean – *Pongo pygmaeus*
- 2 = Sumatran – *Pongo abelii*
- 3 = hybrid

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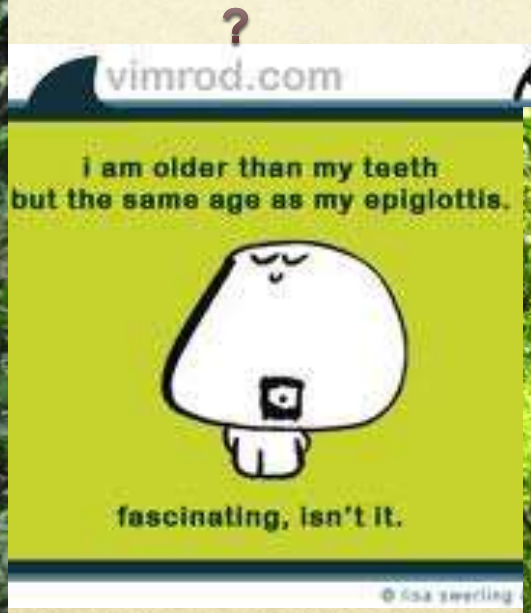
opticon@earthlink.net

Thank you

Questions ?….



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