

TREES and RHYTHMS

Agri-Culture : Rhythms & Rituals,
Goetheanum on-line,
Dornach / Switzerland
Nov. 11th, 2024



Ernst Zürcher

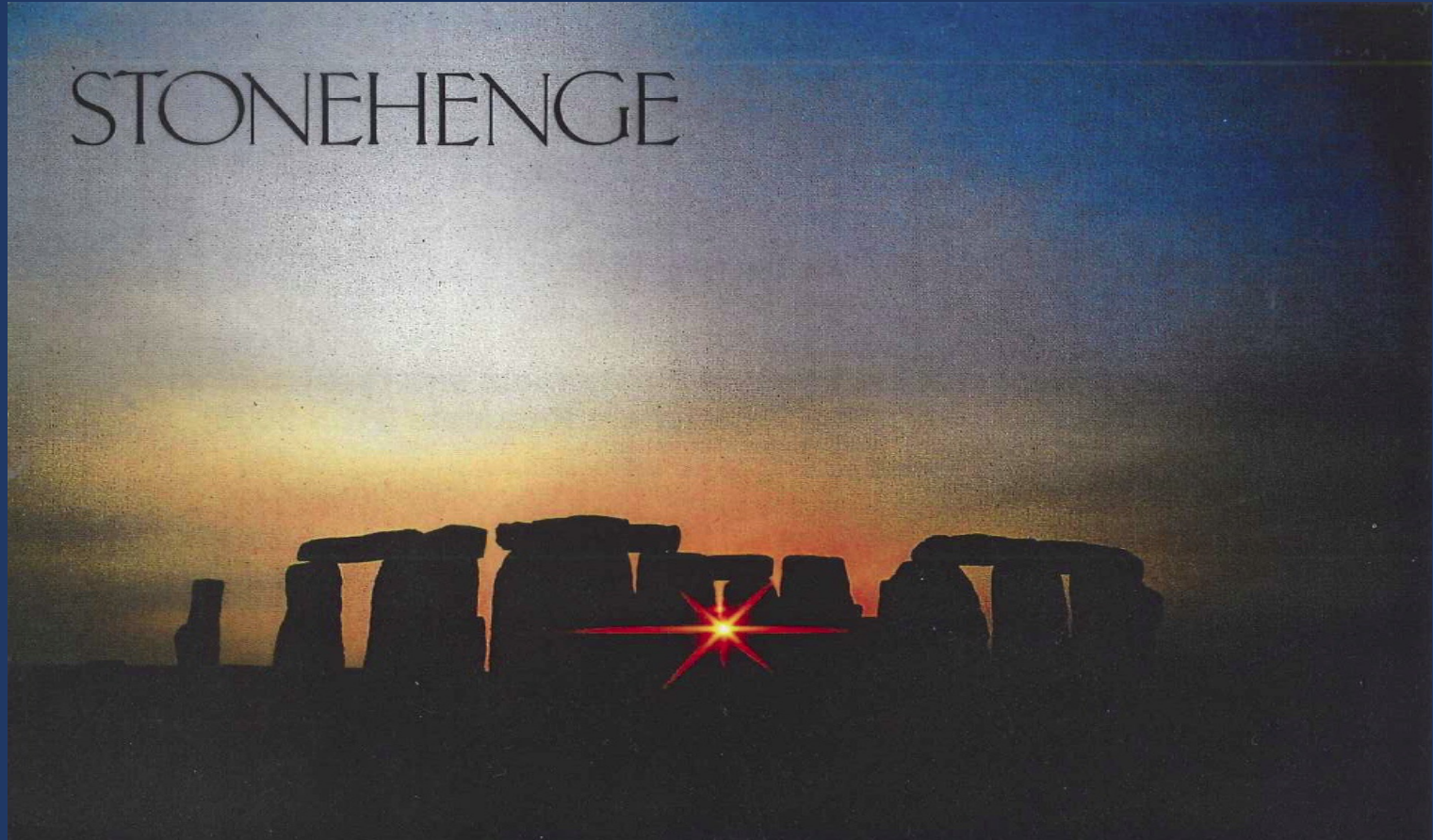
Dr. sc. nat., Forest Ing. ETHZ

Prof. em. Bern University of Applied Sciences

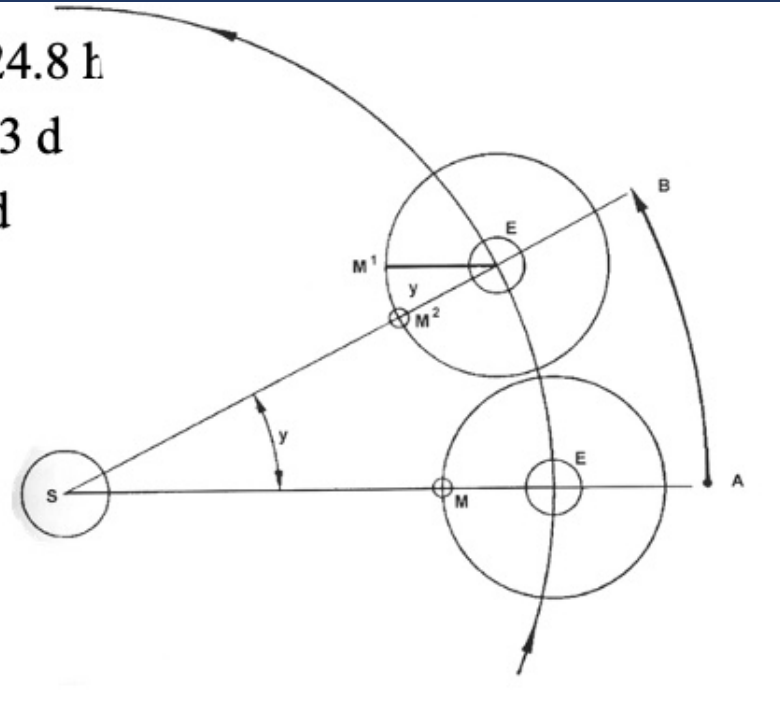
Architecture, Wood and Civil engineering

CH-2500 Biel / Bienne

Astronomy in the oldest buildings of mankind

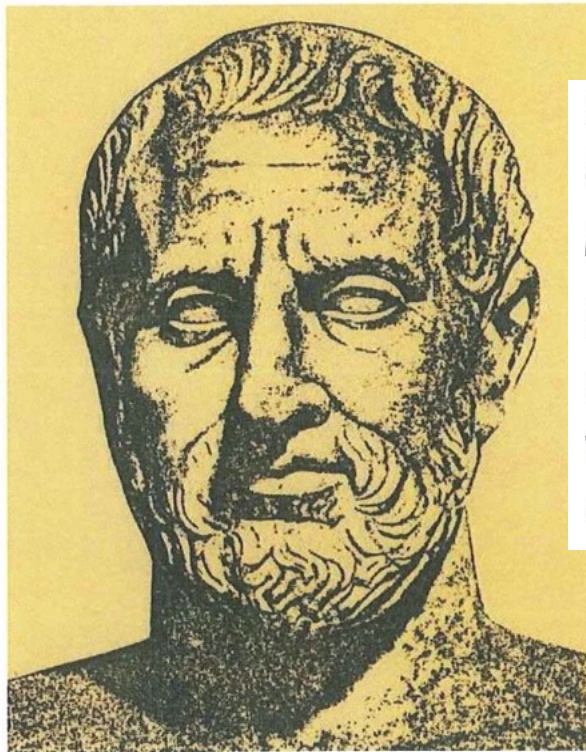


-
- A diagram illustrating the Moon's phases and its orbit around Earth. The Earth is shown at the center, with the Moon's orbit depicted as an elliptical path. Eight positions of the Moon are marked along the orbit, each corresponding to a specific phase shown in a square inset: New Moon (dark), Waxing Crescent, First Quarter (half-lit), Waxing Gibbous, Full Moon (fully lit), Waning Gibbous, Last Quarter (half-lit), and Waning Crescent. Yellow arrows on the right indicate the direction of incoming light from the Sun.



The Moon in early nature writing

Theophrastos (Eresos, Lesbos, 372 v. Chr. - Athene, 287 v. Chr.)



Il y a une saison appropriée pour la coupe des arbres et - dans cette saison - le bois est plus dur et moins sujet à la pourriture s'il est abattu au début de la lune décroissante.

Es gibt eine geeignete Jahreszeit für den Schnitt von Bäumen und - innerhalb dieser Jahreszeit - ist das Holz härter und weniger anfällig auf Fäule wenn es am Anfang des abnehmenden Mondes gefällt wird.



OLD TESTAMENT, Job38 / 31-33

«³¹Can you bind the chains of the Pleiades or loose the cords of Orion?

³² Can you lead forth the Mazzaroth (12 Zodiac constellations) in their season, or can you guide the Bear with its children?

³³ Do you know the ordinances of the heavens? Can you establish their rule on the earth?»

The caesura: Council of Braga (Portugal) in 561 / 571

Kanon 72

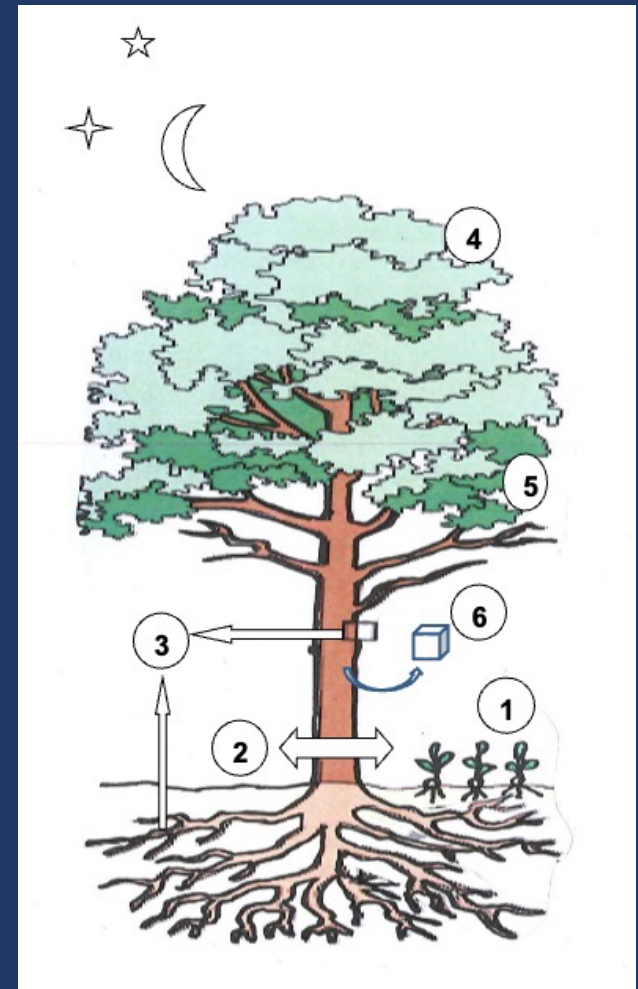
Non liceat christianis tenere traditiones gentilium et observare et colere elementa aut lunam aut stellarum cursum aut inanem signorum fallaciam pro domo facienda vel ad segetes vel arbores plantandas vel coniugia socianda,



Christians are not allowed to keep to pagan traditions and observe and put into practice the elements, or the moon, or the course of the stars, or the vain illusion of signs when building, sowing, planting trees or sealing a marriage.

Research fields in chronobiology of trees

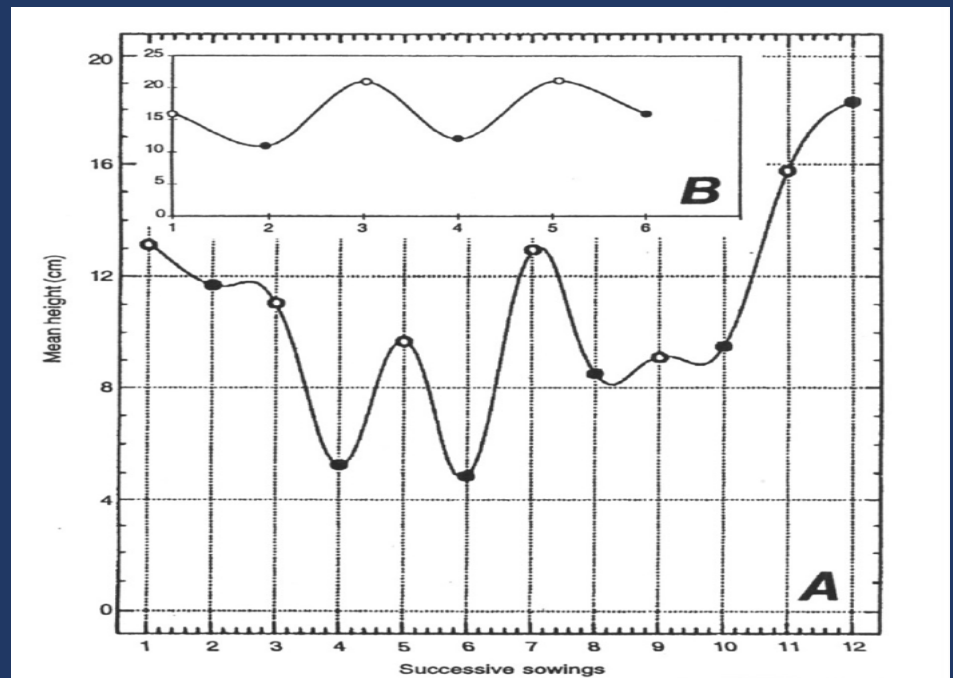
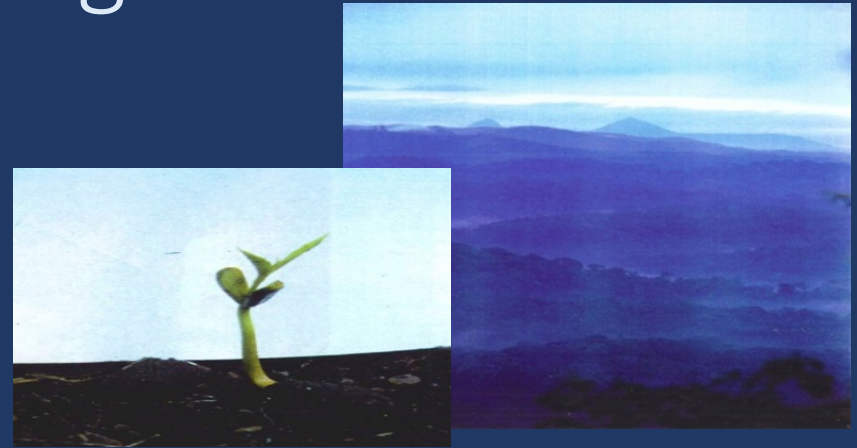
1. Germination and initial growth
2. Stem diameter fluctuations
3. Bio-electric potential variations
4. Pulsation of buds
5. (The Golden Section in Space and Time)
6. Tree felling date and wood properties



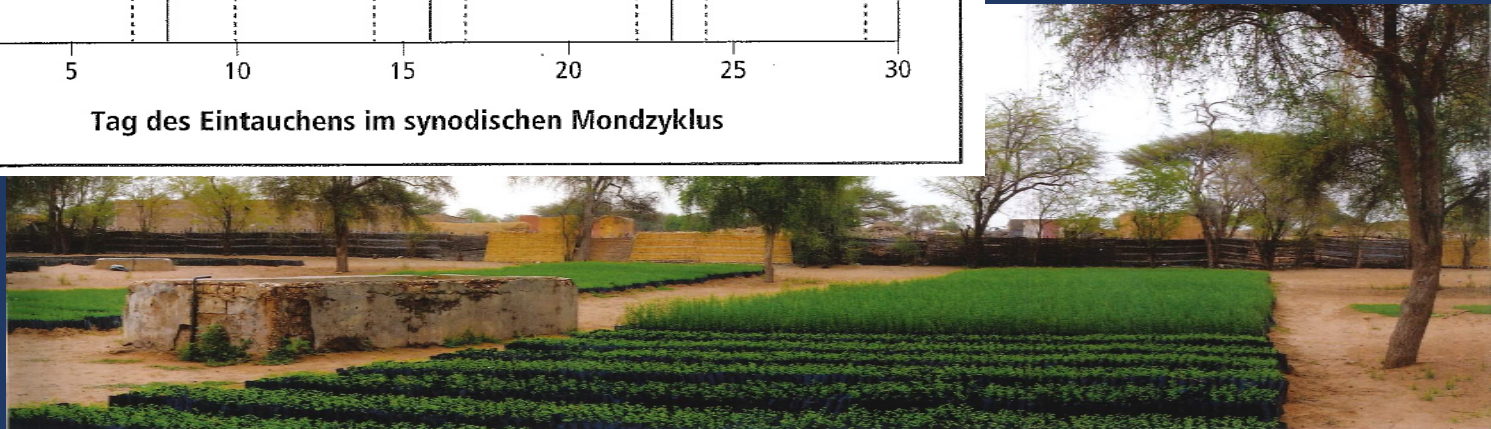
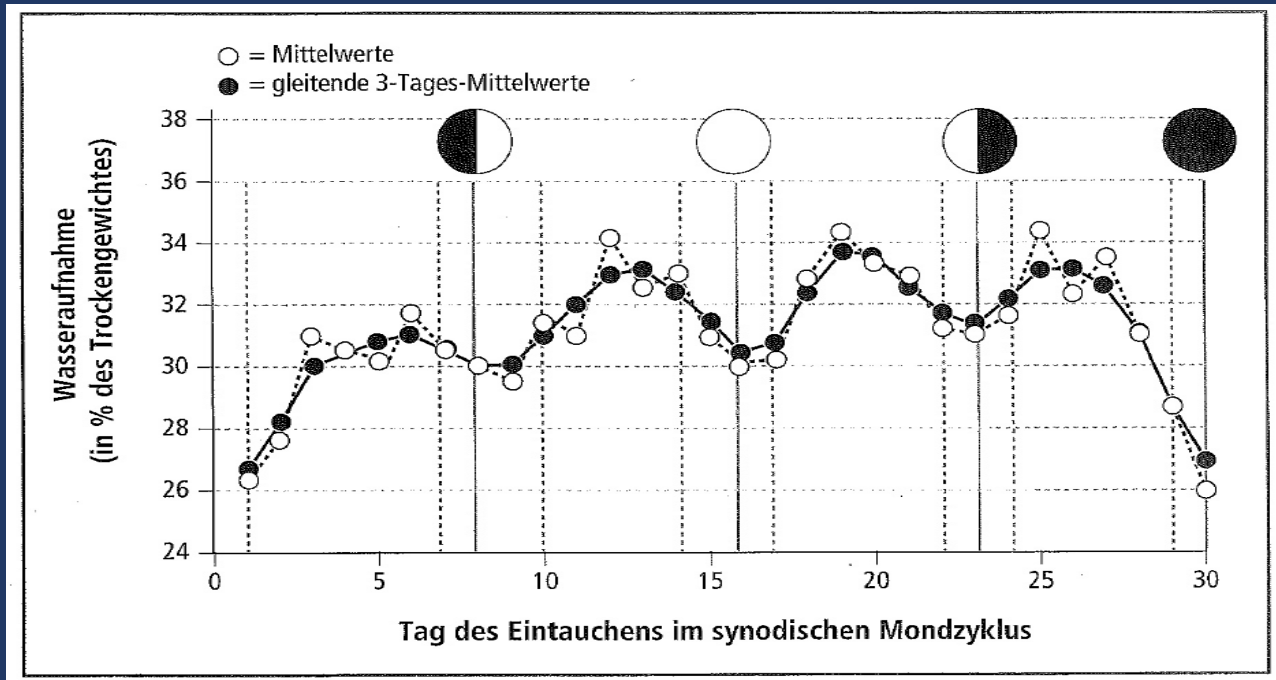
Germination and initial growth

A tree nursery situated in the tropics, in Rwanda, offered interesting conditions for experiments on the germination and initial growth of woody species according to the moon influence, since temperatures and day-lengths were less variable than in higher latitudes. In addition, the dry seasons could be compensated by watering. The work occurred over 3 years: preliminary trial, main trial with 12 sowings of 4 repetitions of 50 seeds, then control and complementary trial. The sowings of the main trial were carried out 2 days before the full moon, alternating with sowings 2 days before the new moon, as suggested by Kolisko's work.

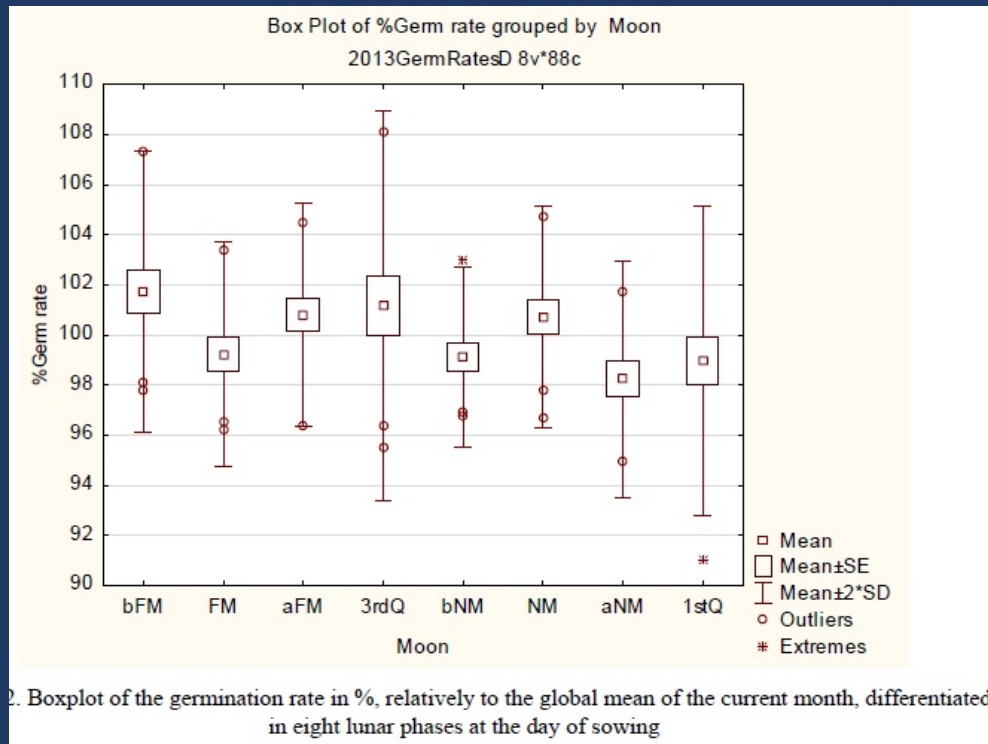
For African musizi (*Maesopsis eminii*, Rhamnaceae), a species found from Liberia to Kenya, the speed and rate of germination, as well as the mean and maximum values of growth in the first months, vary in a clearly rhythmic manner, with higher values for sowings just before the full moon (A: Zürcher 1992). Similar trials with dryland species confirmed the phenomenon (B: Bagnoud 1995).



Synodic moon rhythms in water absorption by seeds: periodicity of lunar weeks (7.4 d)



A germination test with Spruce in 1938
(with 80'000 seeds) re-analyzed: → Moon
influence **actually** significant !



Lunar Rhythmicities in the Biology of Trees, Especially in the Germination of European Spruce (*Picea abies* Karst.): A New Statistical Analysis of Previously Published Data.
Ernst Zürcher & Rodolphe Schlaepfer (Journal of Plant Studies 2014)

Stem diameter fluctuations and gravimetric tides (E.Zürcher, M.-G.Cantiani, F.Sorbetti-Guerri, D.Michel 1998) – with *Picea abies* etc.

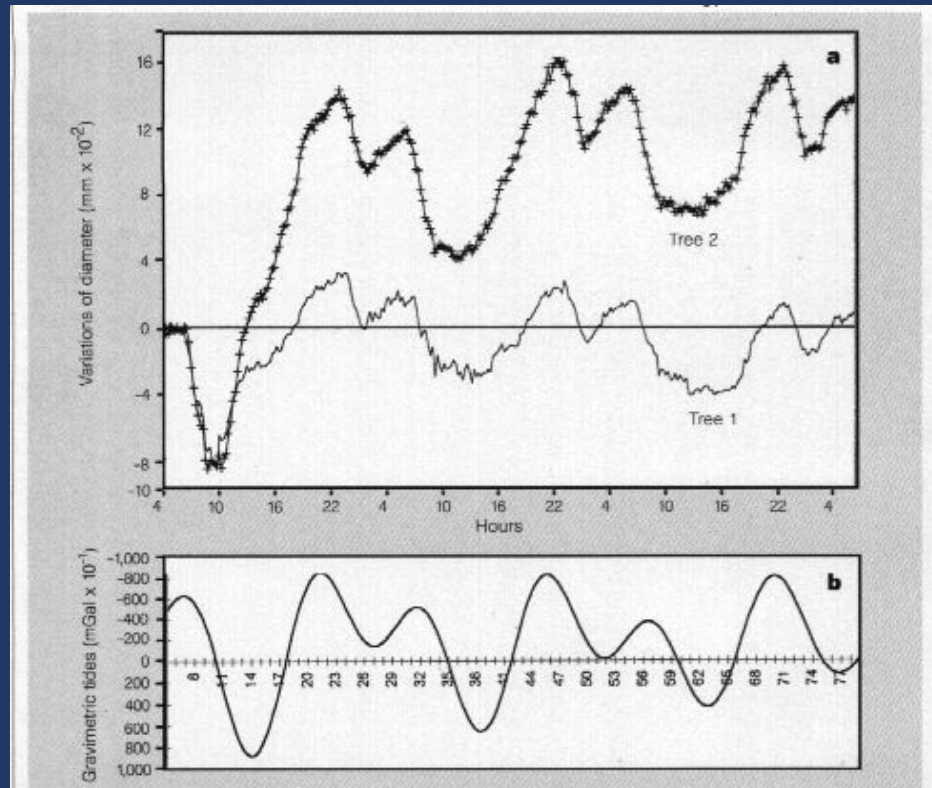
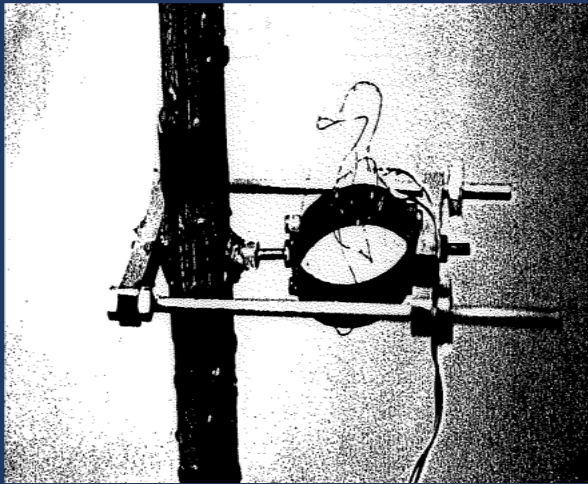
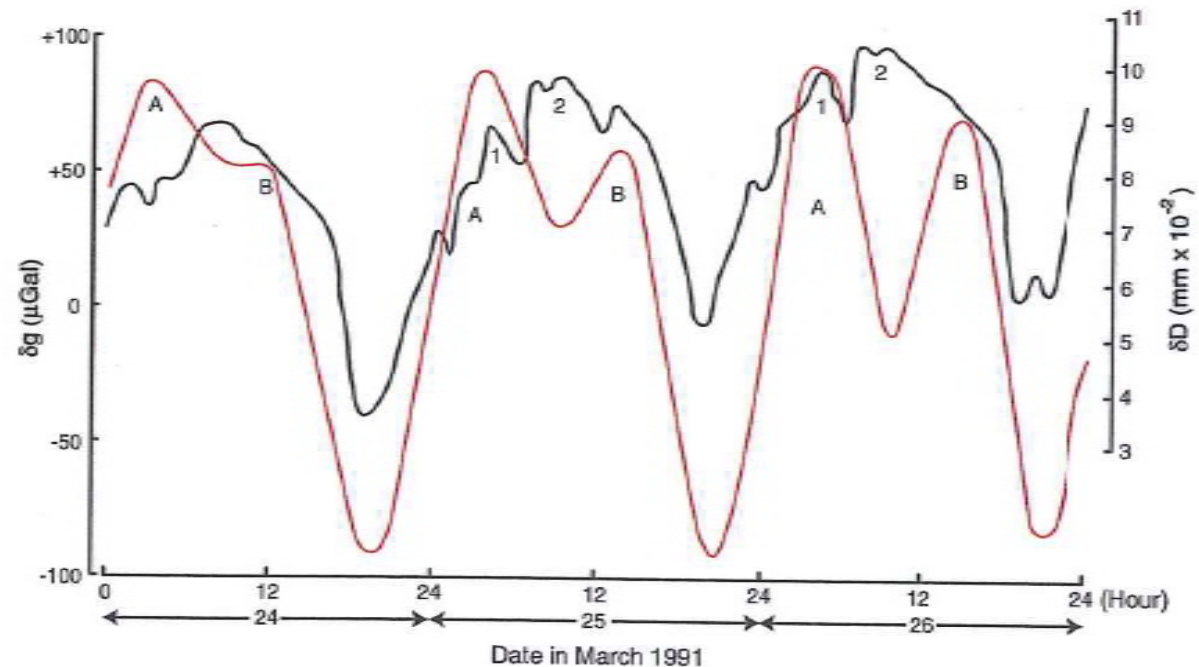


Figure 1 Reversible diameter variations in spruce and gravimetric tides. **a**, Two independent young spruce trees under conditions of constant darkness and controlled temperature show simultaneous reversible diameter variations, which are strongly correlated (synchronous) with **b**, the gravimetric curve calculated for the same place (Florence, Italy) and period (17–20 July 1988).

Confirmation: P.W. Barlow, M. Mikulecky et J. Strestik, Protoplasma 2010

Fig. 9 Time series of δD (black line) recorded from a stem of *Juglans regia* during March 1991 and the contemporaneous variations of δg (red line)



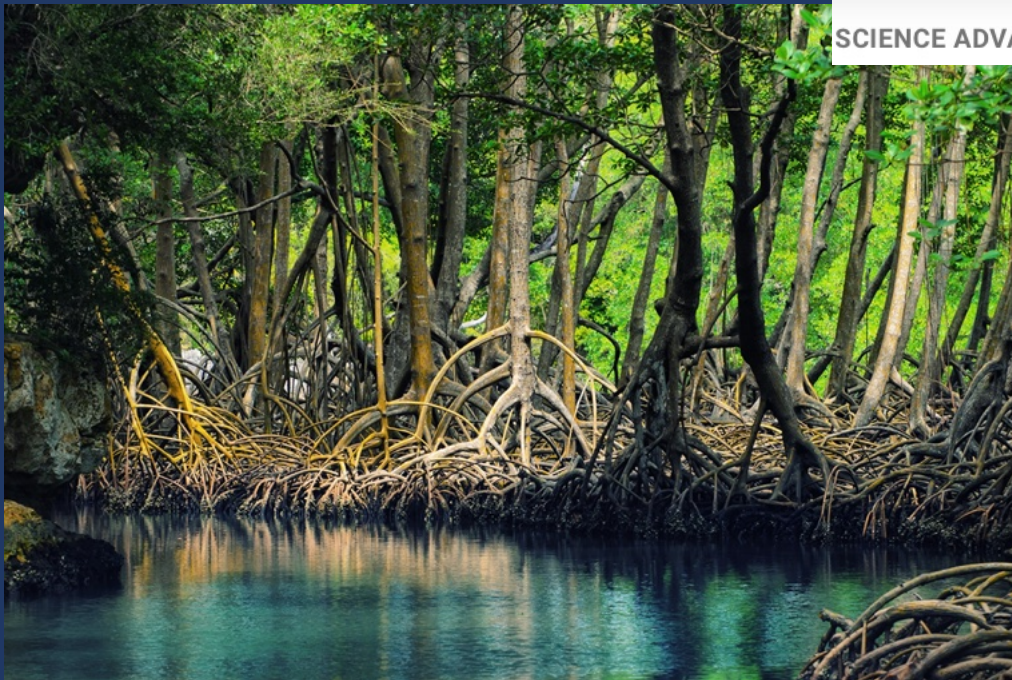
Mangroves fluctuate with the lunar Saros cycle 18.6 y. (Saintilan et al., SCIENCE ADVANCES 14 Sep 2022 Vol 8, Issue 37

The lunar nodal cycle controls mangrove canopy cover on the Australian continent

NEIL SAINTILAN , LEO LYMBURNER , LI WEN , IVAN D. HAIGH , [...], AND RICHARD LUCAS 

ScienceAdvances

SCIENCE ADVANCES > VOL. 8, NO. 37 > THE LUNAR NODAL CYCLE C



Lunisolar rhythms and Quantum physics: J. Fisahn, P. Barlow, G. Dorda 2018

A proposal to explain how the circatidal rhythm of the *Arabidopsis thaliana* root elongation rate could be mediated by the lunisolar gravitational force: a quantum physical approach FREE

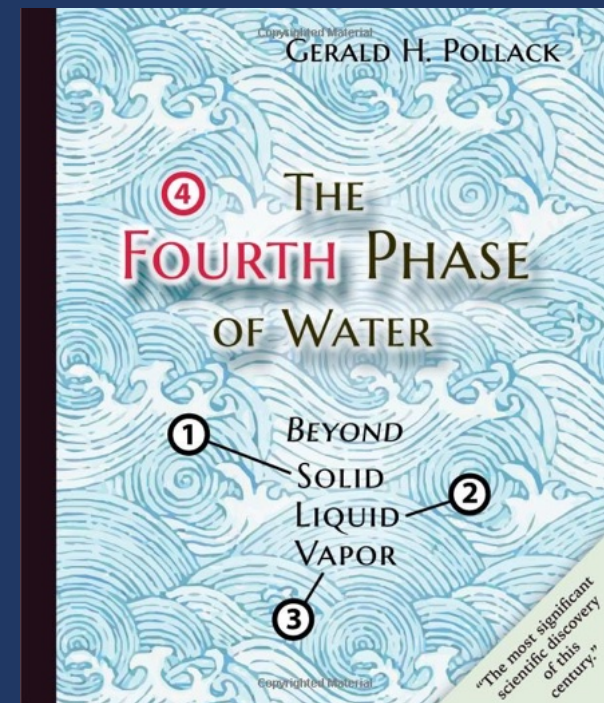
Joachim Fisahn ✉, Peter Barlow, Gerhard Dorda

ANNALS OF
BOTANY
Nonprofit since 1887



Annals of Botany, Volume 122, Issue 5, 5 October 2018, Pages 725–733, <https://doi.org/10.1093/aob/mcx143>

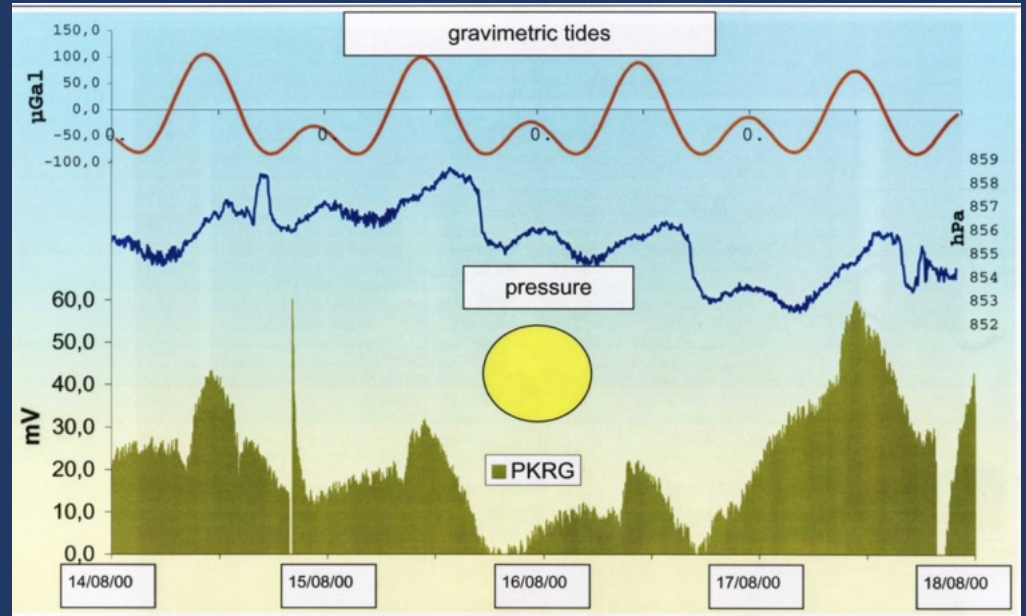
The present study aims at a physiological/physical model to describe the interaction of weak gravitational fields with cellular water dynamics that mediate rhythmic root growth profiles.



Bio-electric potential variations in phase with tides

This last lunar phenomenon (tides in trees) has recently been elegantly confirmed and had new light thrown on it, following on from Burr's work from 1944 to 1972. Holzknecht (2003) presents an extremely sensitive device to measure bio-electric potentials of standing trees, applied to spruce (*Picea abies*) and Swiss stone pine (*Pinus cembra*). It enables the detection of rhythms in phase with gravimetric daily tides and with the synodic lunar monthly cycle, during the trees' rest period in the winter. On the other hand, the ordinary 24 hour period predominates while the trees are growing.

Another interesting phenomenon visible on the shown graph, is that during calm weather periods, the atmospheric pressure (blue curve) also fluctuates in phase with the gravimetric tides (red curve).



To this topic: see Electrophysiology of Plants (Volkov 2012)

Bio-electric potential variations of Black Poplar in phase with tides, daily & monthly (P.W. Barlow, 2012)

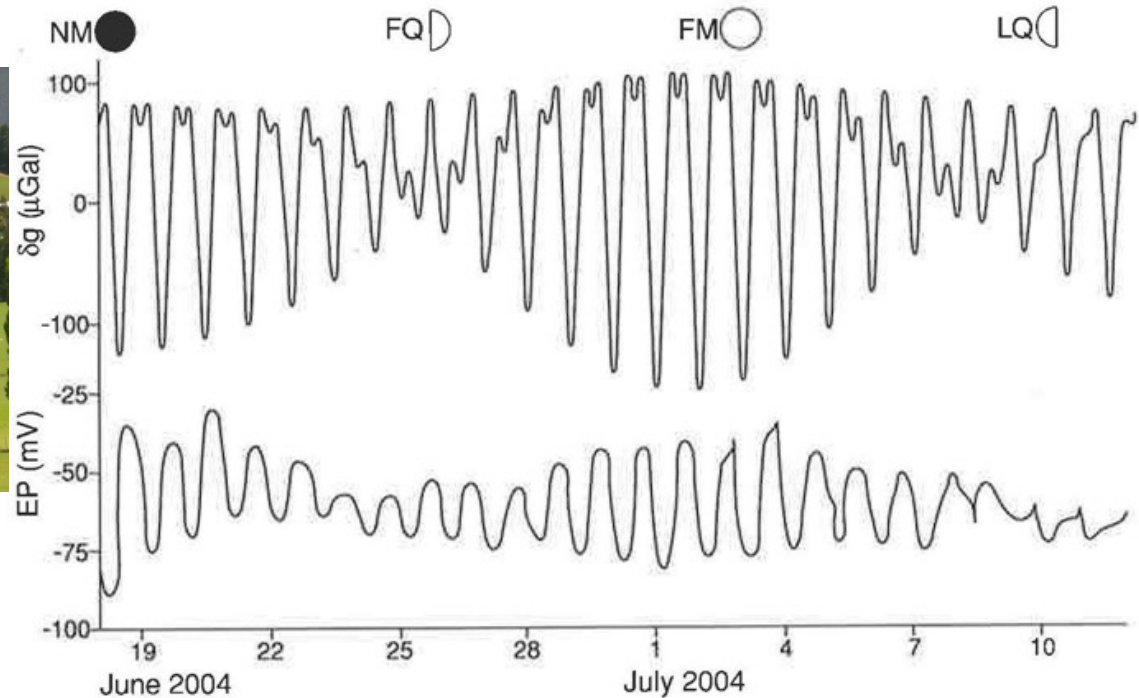
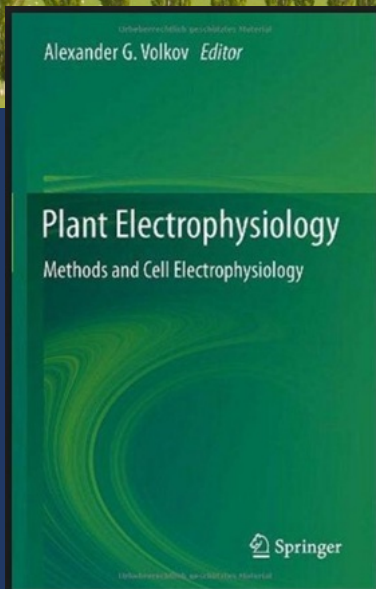
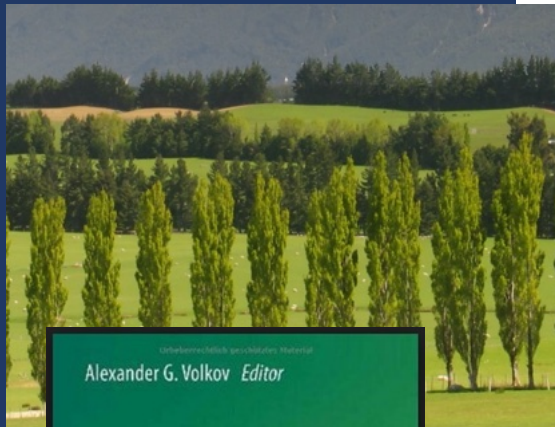


Fig. 10.8 Profiles of electrical potential (*EP*, lower panel) recorded in a tree of *Populus nigra* and of the corresponding lunisolar-derived gravimetric tidal profile (δg , upper panel) during 25 days of June–July 2004. Dates of new moon (*NM*), full moon (*FM*) and first and last quarter (*FQ*, *LQ*) are indicated. New moon occurs on 18 June. Data for *EP* are redrawn from Fig. 11 of Gibert et al. (2006)

Pulsation of buds and planetary alignments

Lunar rhythms in the shape of organs, analogous to those of the trunk diameters described above, had already been discovered by Edwards (1982), thanks to a meticulous series of photographic observations of tree buds. With the help of a shape factor developed in projective geometry, each bud, whether it be spherical, elliptical or ovoid, can be characterized by a unique parameter Lambda. This shape, therefore lambda, not only changes radically at budbreak, but varies subtly around the characteristic value through the bud's existence, from formation to budbreak.

The phenomenon consists of a rhythmical elongation and relaxation of the buds through the winter, as though there was breathing or a subtle heartbeat, already hinting at tiny movements of opening and closing. Edwards also indicates that this fluctuation in shape is synchronized for some species with the position of the moon relative to the sun (synodic rhythm) but for others with the alignment of the moon with certain planets (e.g. Saturn for beech *Fagus sylvatica*, Mars for oak *Quercus sp.*).

from the Egg-Shape to the Vortex

[Lawrence Edwards]

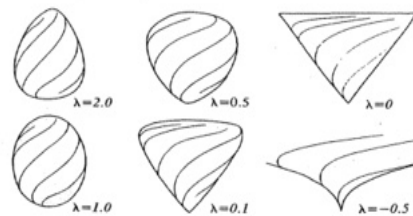


Abb. 62 Der einfache Prozeß der Verkleinerung von λ bedeutet für die Knospe, daß sie eine «Öffnungs»-Geste durchläuft.

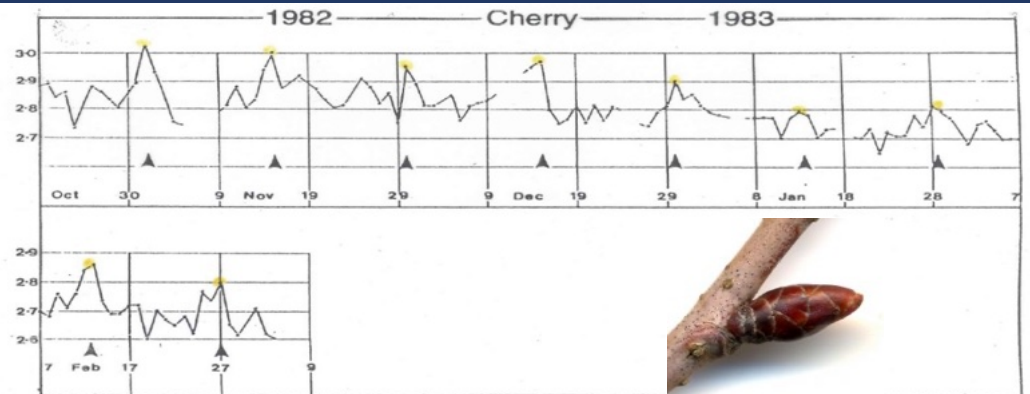
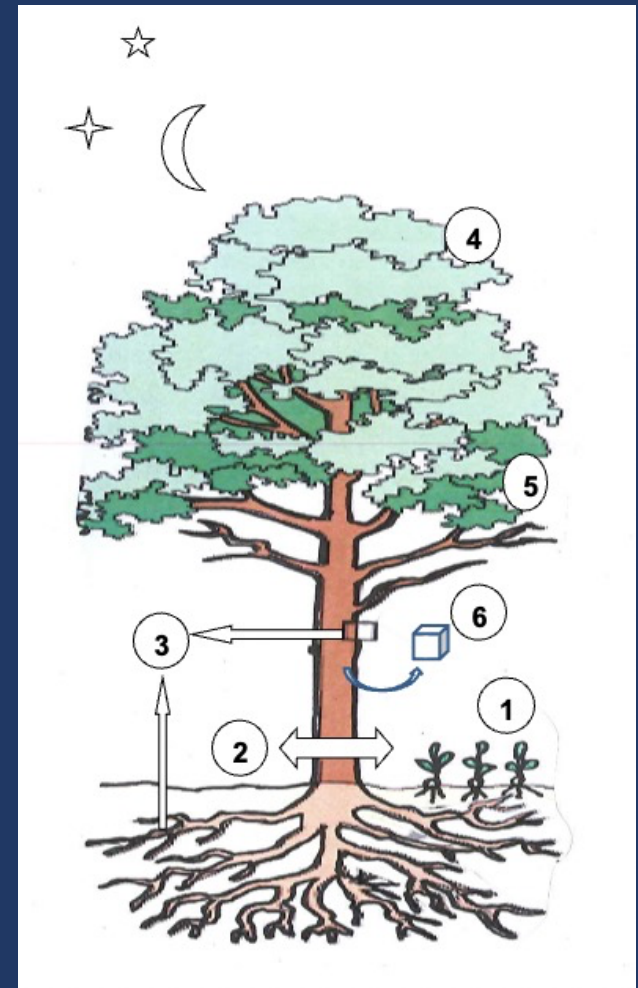


Figure 115. Mean λ values for Cherry leaf buds, winter 1982–83, with corresponding alignments of Sun and Moon. [L. Edwards 1993]

Research fields in chronobiology of trees

1. Germination and initial growth
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Why does wood

Physiological Effects of Touching Wood

MDPI International Journal of Environmental Research

July 2017 · 14(7):801

DOI:[10.3390/ijerph14070801](https://doi.org/10.3390/ijerph14070801)

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Authors:



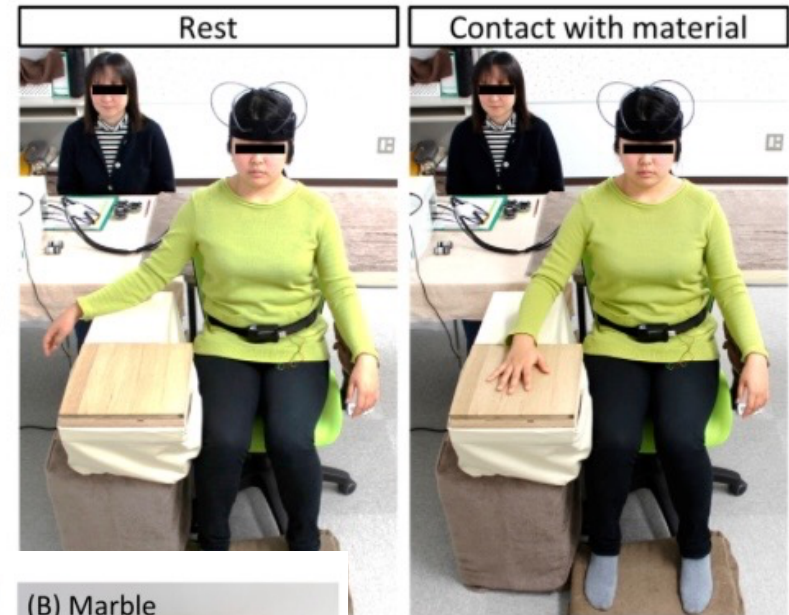
Harumi Ikei
Chiba University



Chorong Song
Kongju National University



Yoshifumi Miyazaki
Chiba University



(A) White oak



(B) Marble



(C) Tile



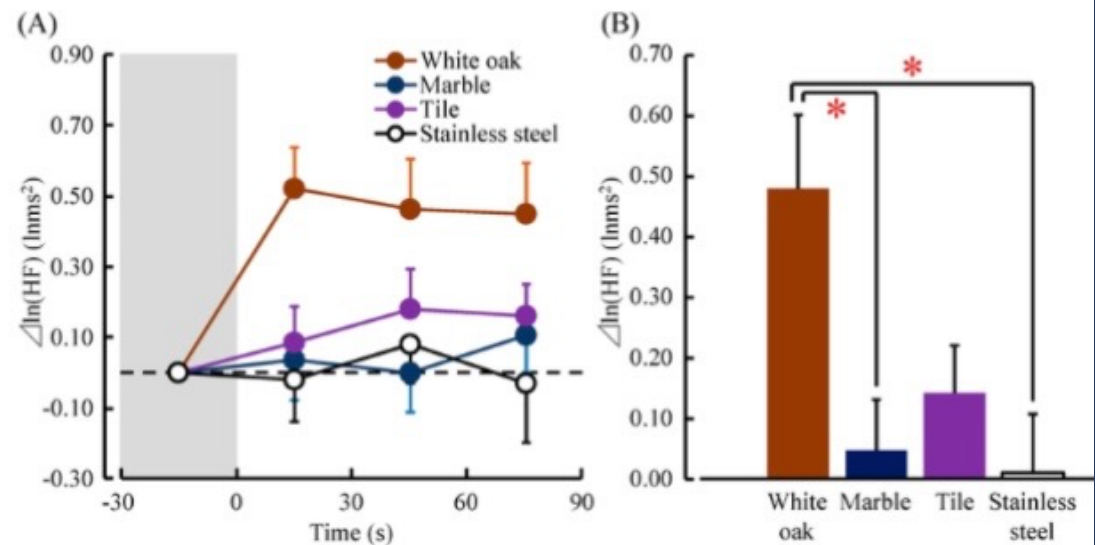
(D) Stainless steel



Why does wood matter ?

☐ Heart rate variability HRV

The 30 s averages and overall mean of the natural logarithm of the high-frequency component (HF) of heart rate variability (HRV) while touching white oak and other materials (marble, tile, and stainless steel). (A) Changes in each 30 s average HF value over 90 s. (B) Overall mean HF values. Data are expressed as the mean \pm standard error, $n = 18$, * $p < 0.05$ as determined by the paired t-test; Holm correction was applied.

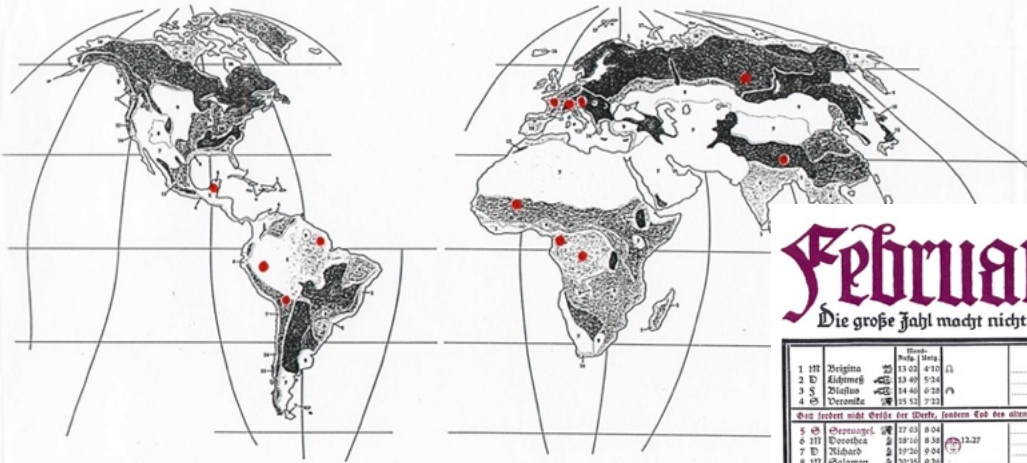


The «feeling» with wood



Traditions worldwide, vestiges of ancient cultures

*TREE FELLING after MOON PHASES
in ancient cultures -----> today*



Februar 
Die große Zahl macht nicht die Wahrheit - Zwingli

Februar		Himmels Wetter	
1	117	Origina	22 13 02 4 10 (1)
2	118	Kleinm	22 13 49 5 24
3	119	Stellen	22 14 40 6 20 (1)
4	120	Veronika	22 15 52 7 22
Was festet nicht Geite der Werte, sondern End des alten Jahres. @ 13. 7. 51. 11. 17. 30			
5	121	Cherap	22 17 03 8 04
6	122	Enoch	22 18 16 9 36
7	123	Nicola	22 19 26 10 04
8	124	Salomon	22 20 35 10 36
9	125	Thelma	22 21 41 11 04
10	126	Thelma	22 22 47 11 36
11	127	Thelma	22 23 50 12 04
Was festet nicht Geite der Werte, sondern End des alten Jahres. @ 13. 7. 51. 11. 17. 30			
12	128	Cherap	22 24 50 12 36
13	129	Enoch	22 25 50 13 04
14	130	Valentin	22 26 50 13 36
15	131	Saglin	22 27 50 14 04
16	132	Juliana	22 28 50 14 36
17	133	Donat	22 29 50 15 04
18	134	Thelma	22 30 50 15 36
Was festet nicht Geite der Werte, sondern End des alten Jahres. @ 13. 7. 51. 11. 17. 30			
19	135	Cherap	22 31 50 16 04
20	136	Enoch	22 32 50 16 36
21	137	Thelma	22 33 50 17 04
22	138	Thelma	22 34 50 17 36
23	139	Thelma	22 35 50 18 04
24	140	Thelma	22 36 50 18 36
25	141	Thelma	22 37 50 19 04
Was festet nicht Geite der Werte, sondern End des alten Jahres. @ 13. 7. 51. 11. 17. 30			
26	142	Thelma	22 38 50 19 36
27	143	Thelma	22 39 50 20 04
28	144	Thelma	22 40 50 20 36
29	145	Thelma	22 41 50 21 04
30	146	Thelma	22 42 50 21 36

Forestry: Practices and rules

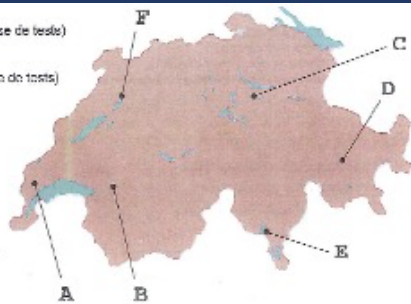
Planting
Pruning, Coppice shoots
Construction timber
Shingles
Chimneys
Firewood
Resonance wood
Barrels



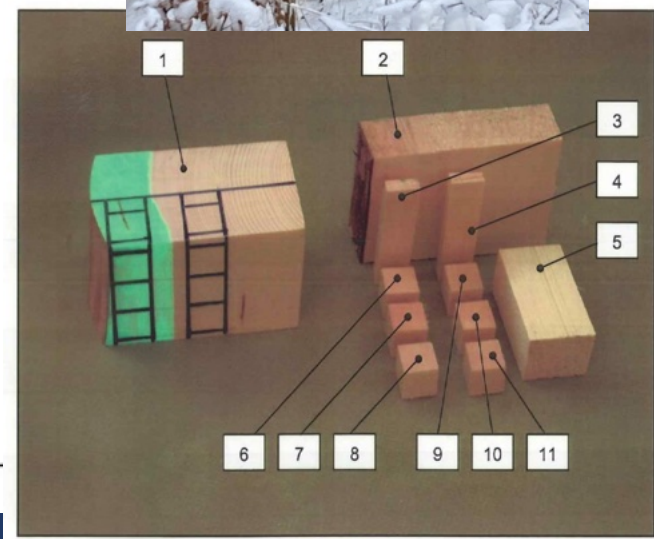
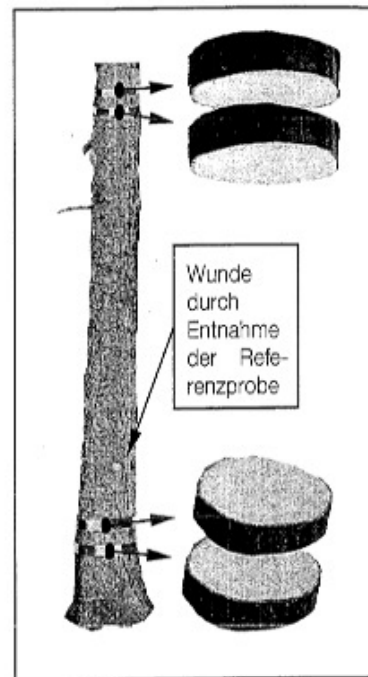
Tree felling date and Wood properties – experimental design

Densité (pour différentes humidités)
Résistance à la compression (2e. phase de tests)
Modul lors du séchage
L'hygroscopicité (2e. phase de tests)
Résistance aux intempéries (2e. phase de tests)

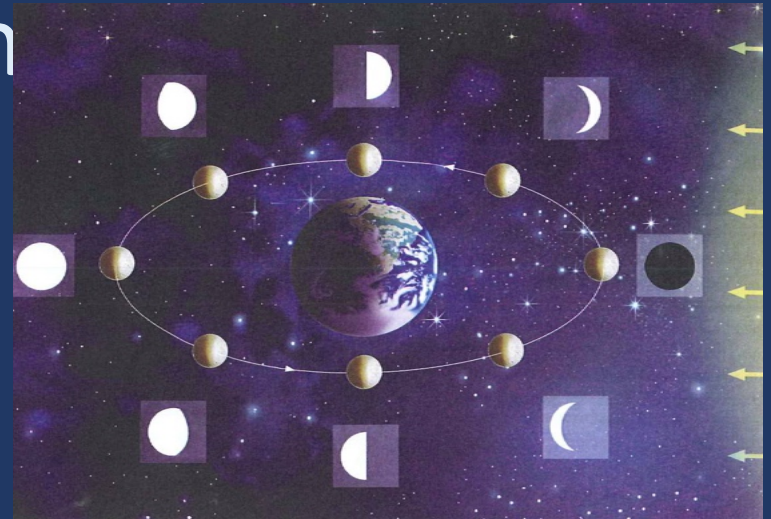
Jura VD Marchissy
Préalpes VD Château d'Oax
Préalpes SZ Einsiedeln
Alpes Centrales GR Bergün
Sud des Alpes TI Goma
Plateau RF (2004-2005) Biel/Bienne



Autor(en)	Jahr	Baumart(en)	Anzahl Fälldaten	Anzahl Bäume
Gäumann, E.	1930	Fichte, Tanne	12 (monatlich)	24
Kauchel, H.	1930	Fichte, Tanne	12 (monatlich)	24
Kauchel, H.	1936	Buche	alle 15 bis 30 Tage	32
Triebel, J.	1998	Fichte	6 (mit 2 Wochen Intervall)	120
Seeling, U., Herz, A.	1998	Fichte	6 (mit 2 Wochen Intervall)	60
Rösch, P.	1999	Fichte	6 (mit ca. 2 Wochen Intervall)	30
Zürcher, E., Giudici, F., Roggenmoser, Ch.	2004	Fichte Edelkastanie Weissanne	48 (zweimal wöchentlich)	621



New Moon, Full Moon a first level of observation



Looking for differences in wood properties as a function of the felling date: lunar phase-correlated variations in the drying behavior of Norway Spruce (*Picea abies* Karst.) and Sweet Chestnut (*Castanea sativa* Mill.)

Ernst Zürcher · R. Schlaepfer · M. Conedera ·
F. Giudici

Trees (2010) 24:31–41

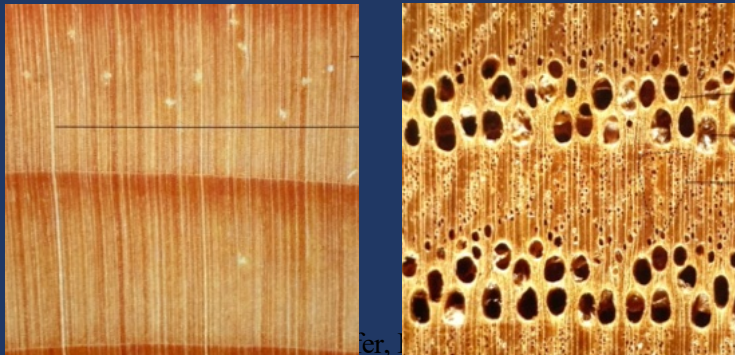
DOI 10.1007/s00468-009-0376-2

ORIGINAL PAPER

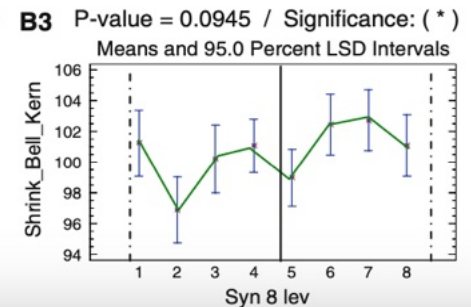
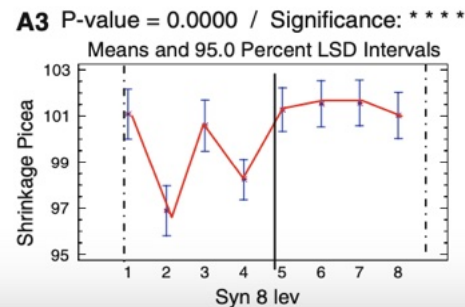
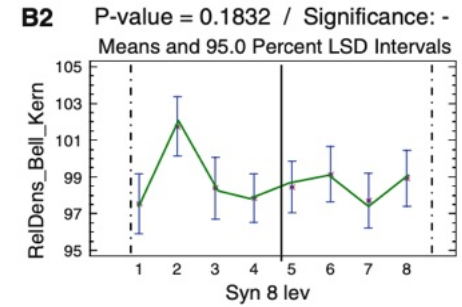
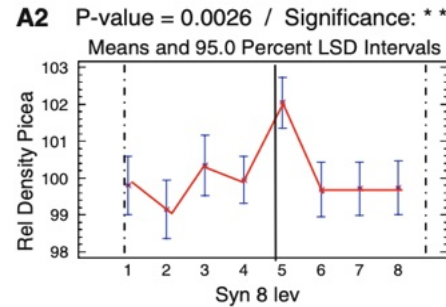
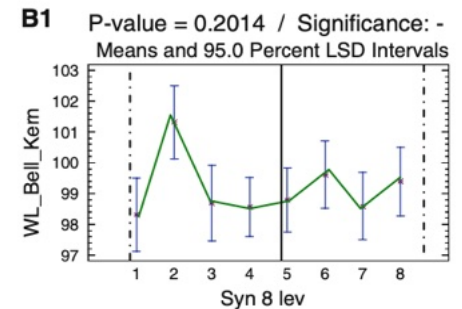
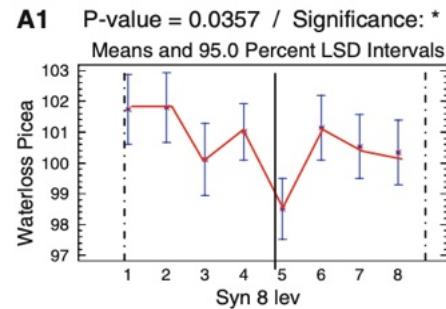
Variations according to the synodic lunar cycle

- Waterloss
- Relative density
- Shrinkage

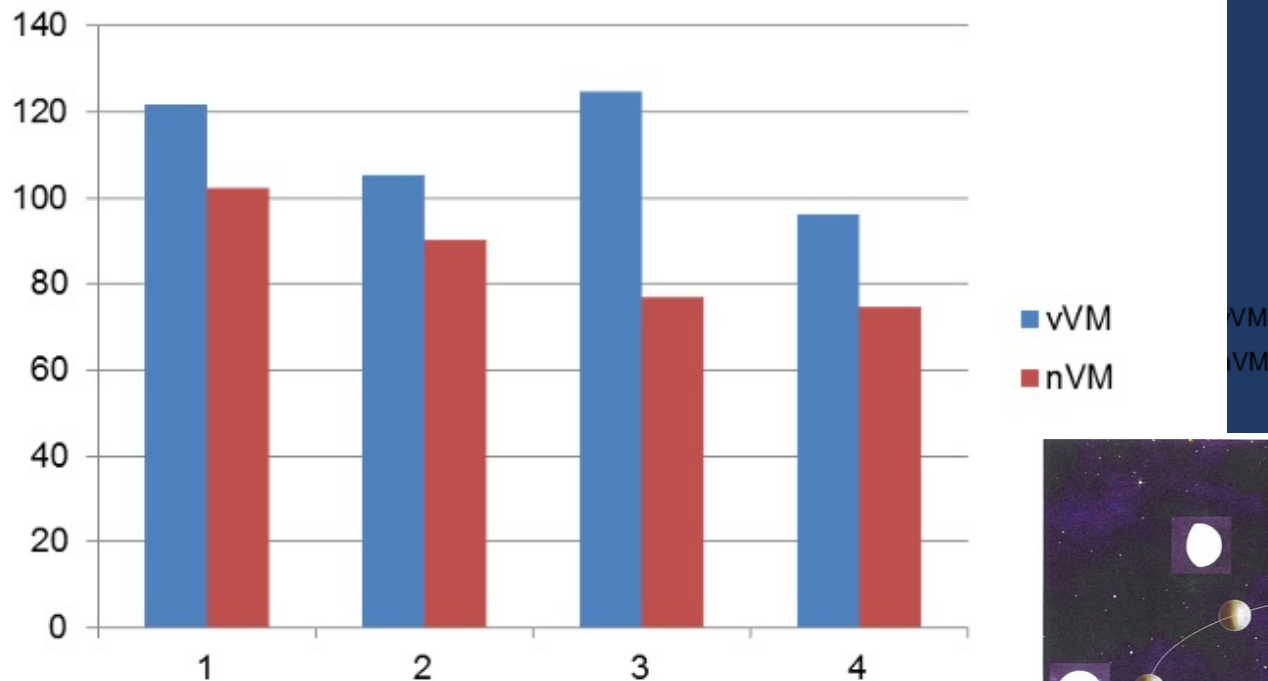
Spruce / Sweet Chestnut



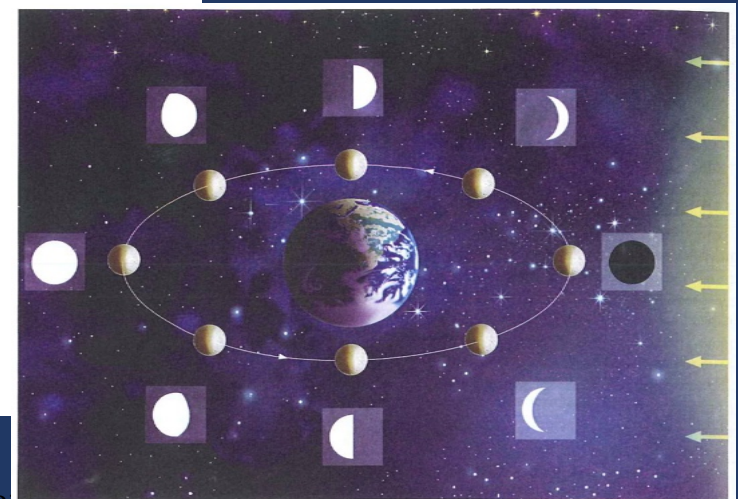
F.Giudici 2010



Spruce: Water absorption after drying (hygroscopicity) of wood felled just before / just after Full Moon (E. Zürcher, C. Rogenmoser, Soleimany Kartalaei 2012)

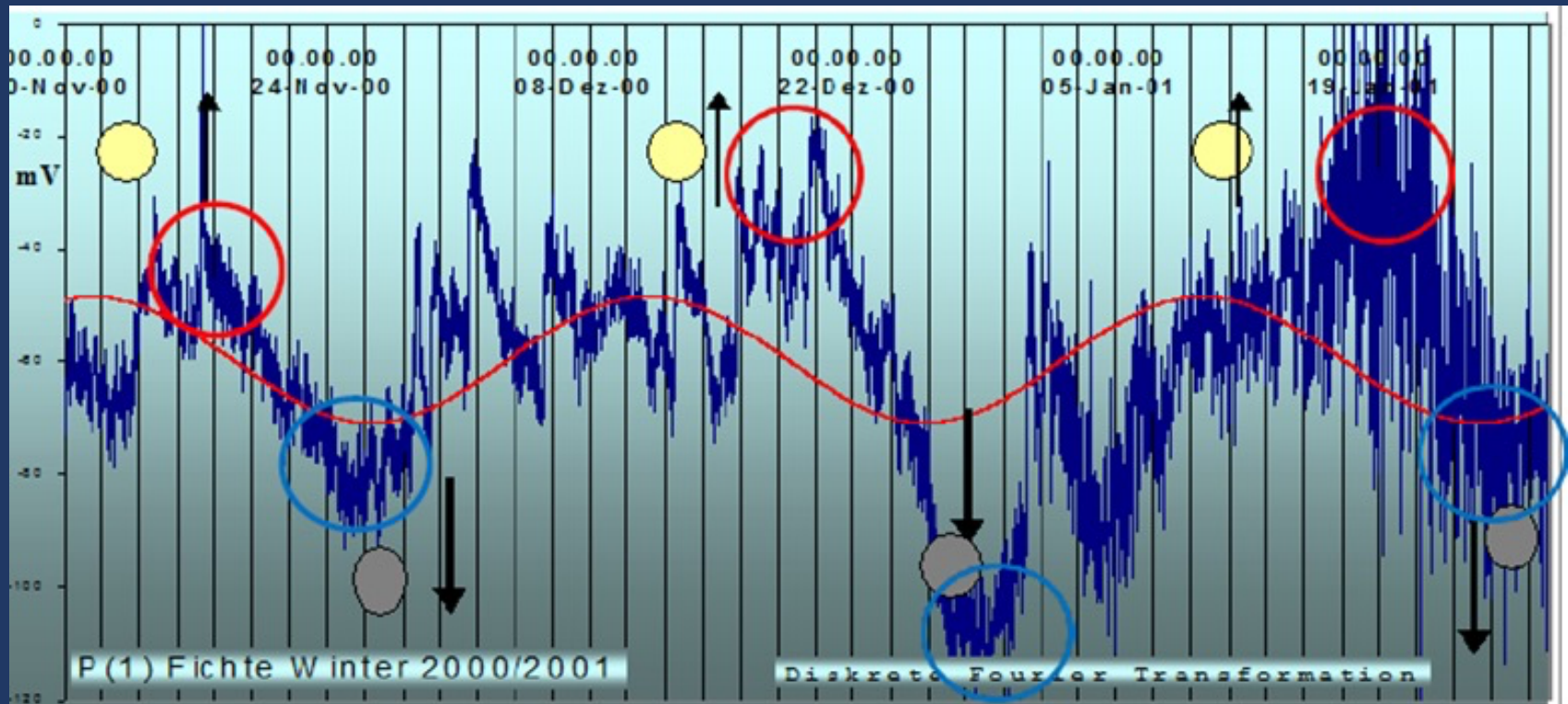


3.5 Tage vor, resp. 3.5 Tage nach Vollmond
November / Dezember / Januar / Februar

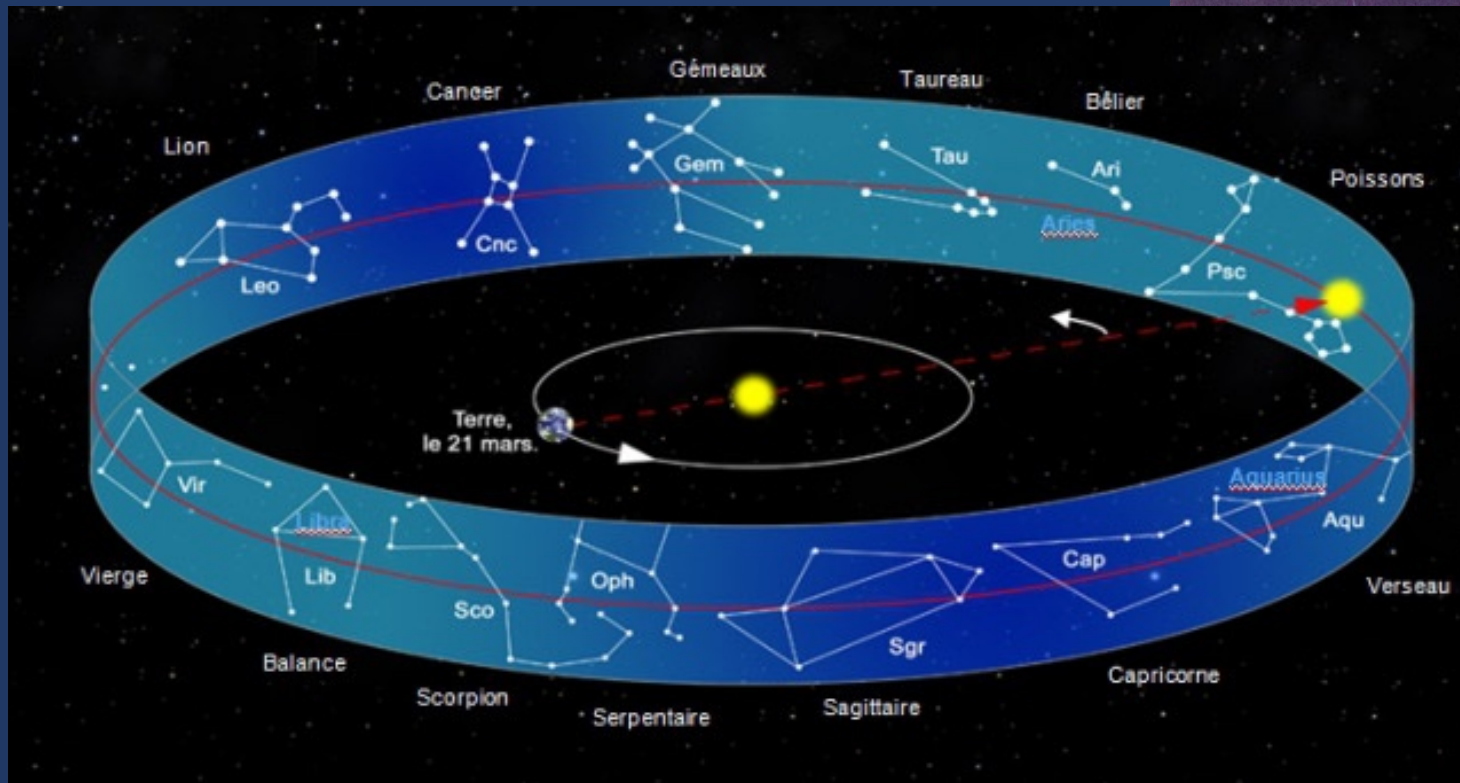


Bioelectric potentials in the rhythm of Moon phases and tides (K. Holzknecht 2002)

→ A real *Biotechnology* !



Constellations as variation factor (sidereal rhythm)

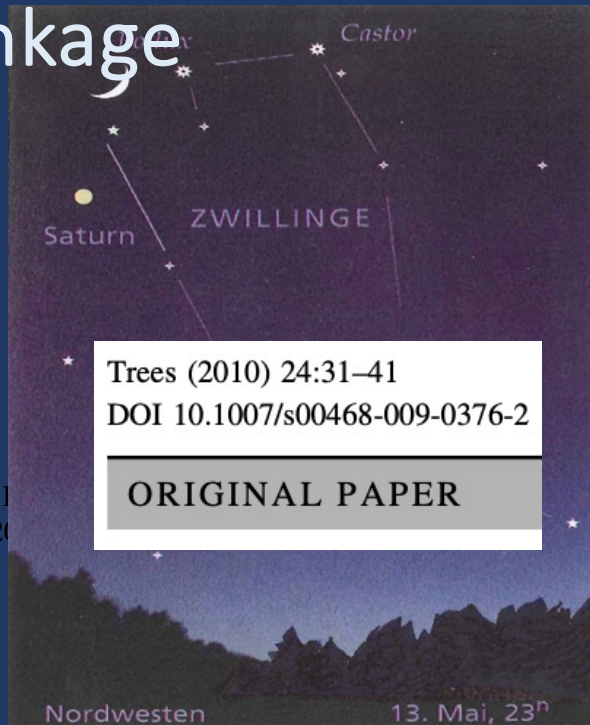


Astronomical constellations, in 4 traditional groups (since Empedocles, c.494 – c.434 BC)

Four levels of the sidereal cycle Tested	Sidereal 1	Sidereal 2	Sidereal 3	Sidereal 4
Successive constellations crossed by the moon, and their astronomical extension	Aries	Taurus	Gemini	Cancer
	29°–53°	53°–89°	89°–117°	117°–138°
	Leo	Virgo	Libra	Scorpio
	138°–173°	173°–219°	219°–238°	238°–268°
	Sagittarius	Capricorn	Aquarius	Pisces
	268°–298°	298°–326°	326°–351°	351°–29°
Traditional «quality», or «element»	“Fire”	“Earth”	“Air”	“Water”

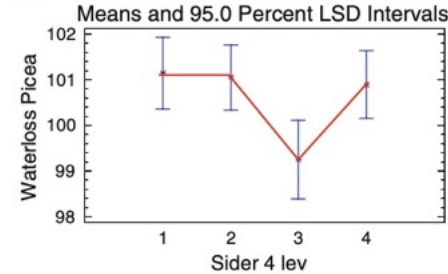
Variations according to the sidereal lunar cycle

- Waterloss
- Relative density
- Shrinkage

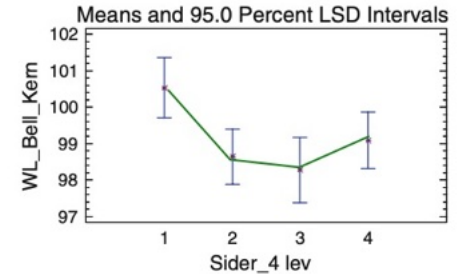


E.Zürcher, I.
F.Giudici 20

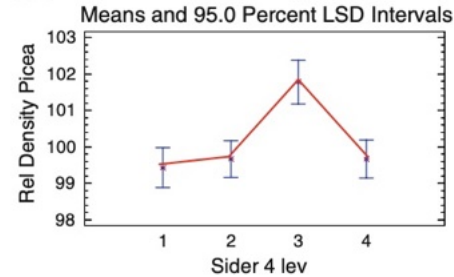
A1 P-value = 0.0759 / Significance: (*)



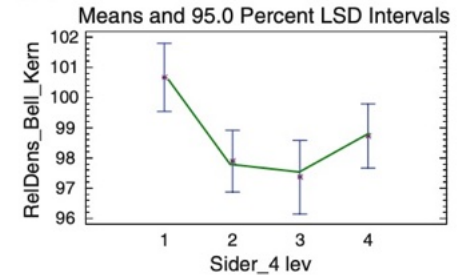
B1 P-value = 0.0298 / Significance: *



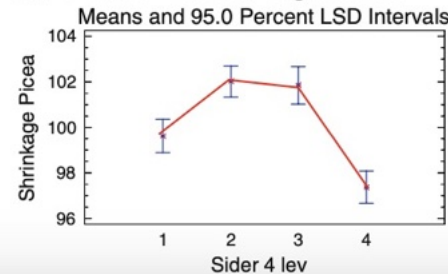
A2 P-value = 0.0001 / Significance: ***



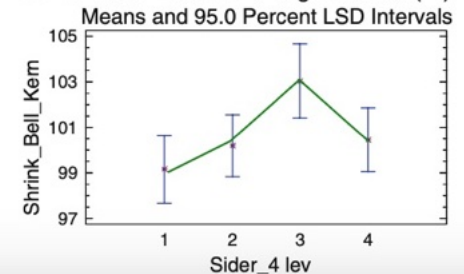
B2 P-value = 0.0160 / Significance: *



A3 P-value = 0.0000 / Significance: ***



B3 P-value = 0.0844 / Significance: (*)



Science «discovers» traditional knowledge

“Dr. Mark Plotkin, a scientist from Conservation International, collecting herbarium specimens of medicinal plants with the advice of a Wayana medicine man, southeastern Surinam. The opportunities for gaining such knowledge are rapidly being lost as tribal cultures disappear and whole groups of people lose their traditional life styles. Valuable knowledge that has accumulated through thousands of years of trial and error is being forgotten in a very short period of time. Much of this information has been transmitted orally, and written records do not exist.”

“Biology of Plants” Raven, Evert, Eichhorn 1992



„trial and error“

→ Is it that simple ?