

This Presentation was Originally Created in Apple's Keynote.
Any funny business results from its conversion to PowerPoint.

Please contact me if i can help...

Stefan Topolski MD

There are many concepts and demonstrations in my live talk
which cannot be captured in an outline.

Please send any questions my way...

Stefan Topolski MD

Chaos & Complexity in the Medical Home

Stefan Topolski MD

U. Mass School of Medicine

Caring in Community
& CottageMed, Inc.

www.cottagemed.org

What is Health ?

Ancient...

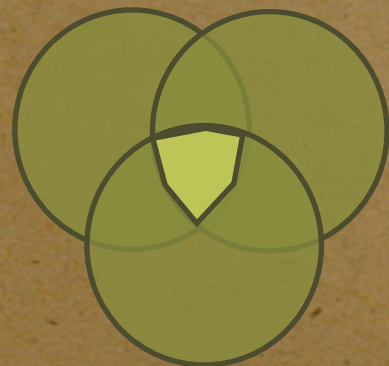
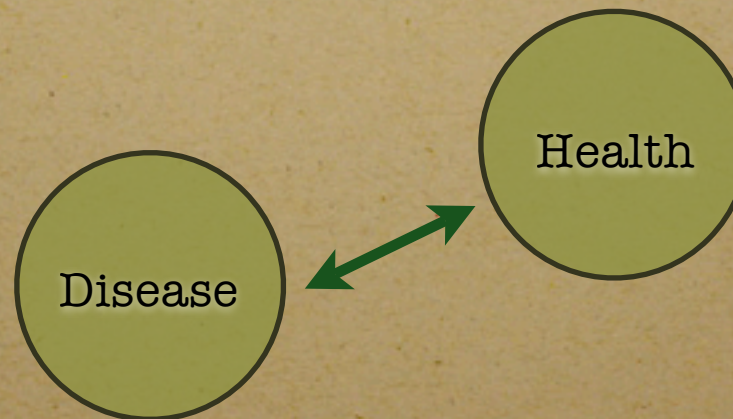
Spirits,
Humours,
& Superstitions



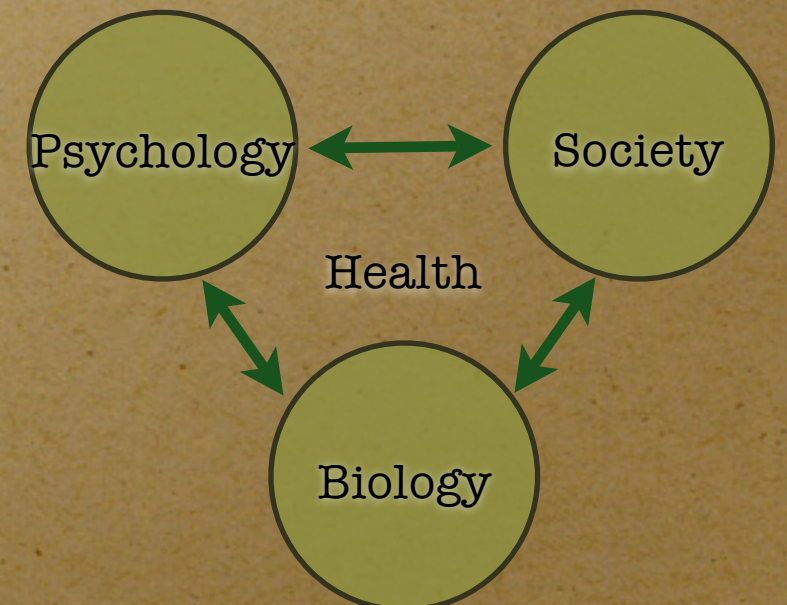
...Modern



Biomedical
Model



BioPsychoSocial
Model



Historical Definitions

in the last 200 years were often negative...

- * lack of overexertion (rest),
- * lack of pain (comfort),
- * lack of dirt (cleanliness), and
- * lack of disease (lack of non-health)...

Negative descriptions show poor understanding and are not true definitions.

Current Definitions...

- * a healthy state of wellbeing free from disease;
- * the general condition of body and mind; "his delicate health"; "in poor health"
wordnet.princeton.edu/perl/webwn

* Health can be defined negatively, as the absence of illness, functionally, as the ability to cope with everyday activities, or positively, as fitness and well-being. In any organism, health is a form of homeostasis (sic.). This is a state of balance, with inputs and outputs of energy and matter in equilibrium (allowing for growth). Health also implies good prospects for continued survival. In sentient creatures such as humans, health is a broader concept. [...undefined]
en.wikipedia.org/wiki/Health

- * a state of complete physical, mental, and social well-being and not just the absence of disease or infirmity.
www.jhsph.edu/publichealthexperts/Glossary.htm

* A state of complete physical, social and mental well-being, and not merely the absence of disease or infirmity.
2. Health is a resource for everyday life, not the object of living. It is a positive concept emphasizing social and personal resources as well as physical capabilities.[1]
www.wfmh.org/wmhday/sec3_pt3_4_glossary.html

- * A dynamic state of complete physical, mental, spiritual and social wellbeing and not merely the absence of disease or infirmity. (WHO'S New Proposed Definition. 101st Session of the WHO Executive Board, Geneva, January 1998. Resolution EB101.R2)
mapp.naccho.org/MAPP_Glossary.asp

* Health is a unity and harmony within the mind, body and spirit which is unique to each person, and is as defined by that person. The level of wellness or health is, in part, determined by the ability to deal with and defend against stress. Health is on a continuum with movements between a state of optimum well-being and illness which is defined as degrees of disharmony. It is determined by physiological, psychological, socio-cultural, spiritual, and developmental stage variables.
www.ptc.edu/departments_nursing/Philosophy.htm

- * Health is a dynamic state on the wellness-illness continuum, ranging from high-level wellness, to states of illness/premature death.
www.frc.mass.edu/sconrad/conceptual_terms.htm

Life is NonLinear.

This is fundamental to studying Health...

Fractals

Chaos Theory

Catastrophe Theory

Complex Systems

Energy

Entropy

Potential

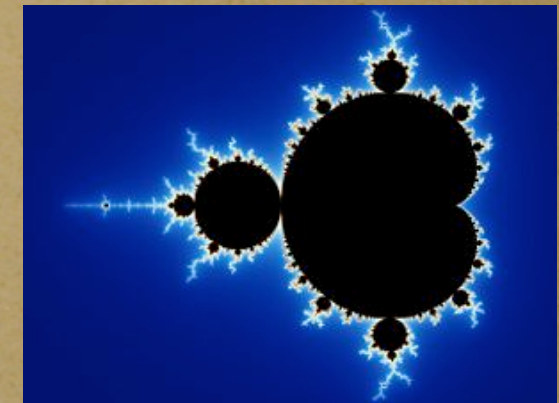
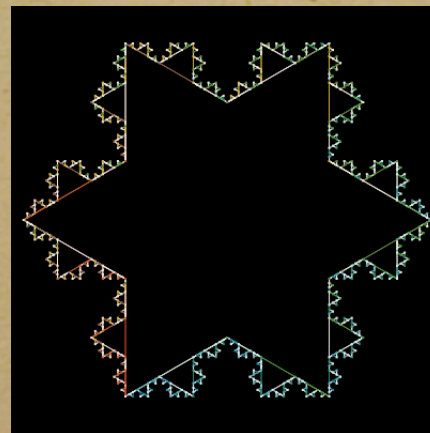
Structure

Scale

Stability

Tension

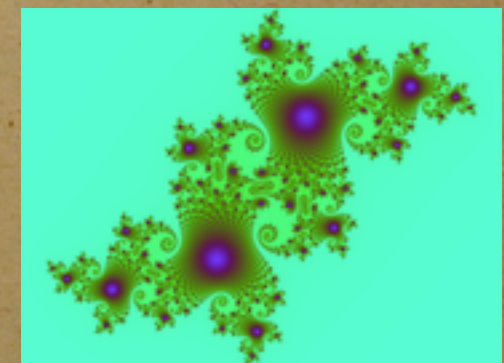
Rebound



Anatomy

Physiology

Biochemistry



Optimized Structure for Nonlinear Function

R. Kopelman (1988) Fractal reaction kinetics, Science, 241, 1620–1626.

M.A. Savageau (1995) Michaelis-Menten mechanism reconsidered: Implications of fractal kinetics, J. Theor. Biol., 176, 115–124.

S. Schnell, T. E. Turner (2004) Reaction kinetics in intracellular environments with macromolecular crowding: simulations and rate laws. Prog. Biophys. Mol. Biol., 85, 235-260.

F. Xu and H. Ding (2007) A new kinetic model for heterogeneous (or spatially confined) enzymatic catalysis: Contributions from the fractal and jamming (overcrowding) effects” Appl. Catal. A Gen. 317, 70-81

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Life is NOT truly Random...

**There are PATTERNS
in the 'Chaos'.**

Patterns can be Described...

Probabilities may be Calculated...

**There is 'Sensitive Dependence
on Initial Conditions'...**

**Long-Term Predicability
is Impossible .**



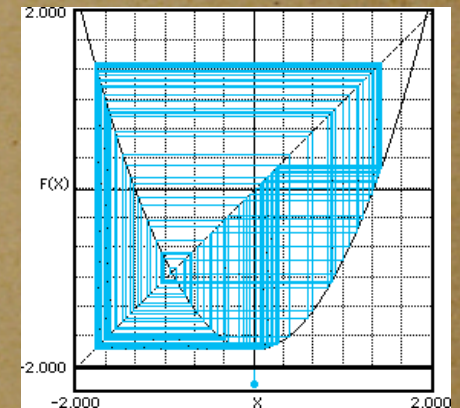
Strange Attractors

This is fundamental to studying Health...

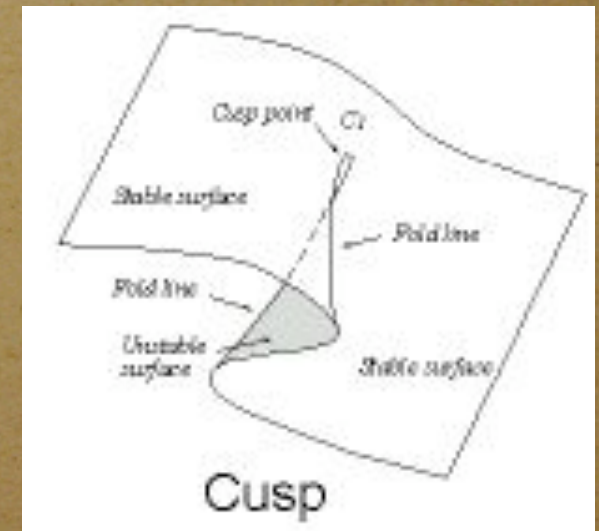
Complex Systems

Scale

Rebound



Builds on study of Bifurcation Behaviors



leongccr@singnet.com.sg

Dr. Linda P. Beckerman

Life is NonLinear.

This is fundamental to studying Health...

Fractals
Chaos Theory
Catastrophe Theory
Complex Systems

‘Systems Approach’
‘Complexity’
‘Complexity Science’

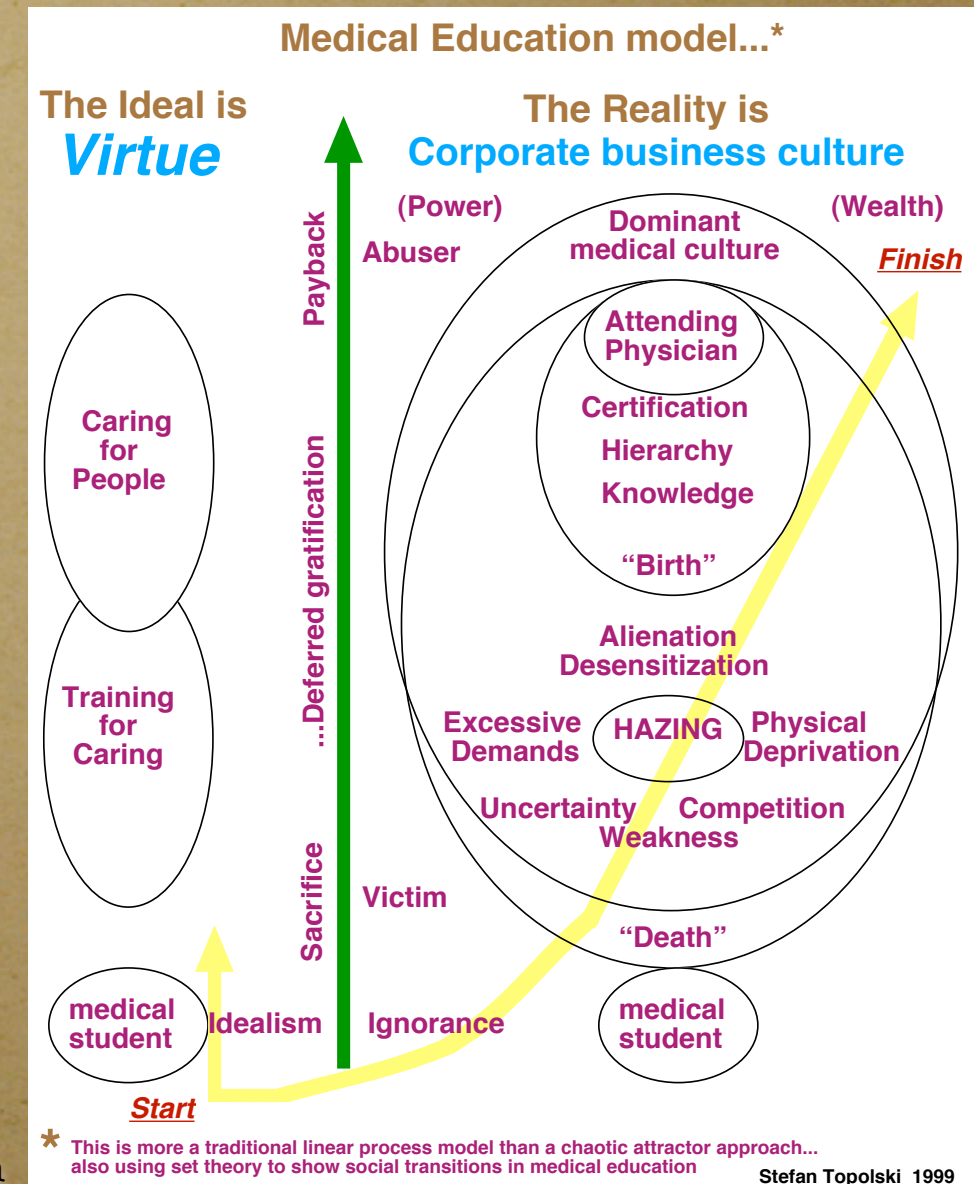
**A New Philosophy
of Scientific Enquiry that
rejects Reductionism.**

**It Emphasizes the Study
of Whole Systems**

Dictionary.com Unabridged (v 1.1)
re·duc·tion·ism [ri-**duhk**-shuh-niz-uhm] -noun

¹the theory that every complex phenomenon, esp. in biology or psychology, can be explained by analyzing the simplest, most basic physical mechanisms that are in operation during the phenomenon.

²the practice of simplifying a complex idea, issue, condition, or the like, esp. to the point of minimizing, obscuring, or distorting it.



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Emphasis on...

Computation

Information Theory

Probability

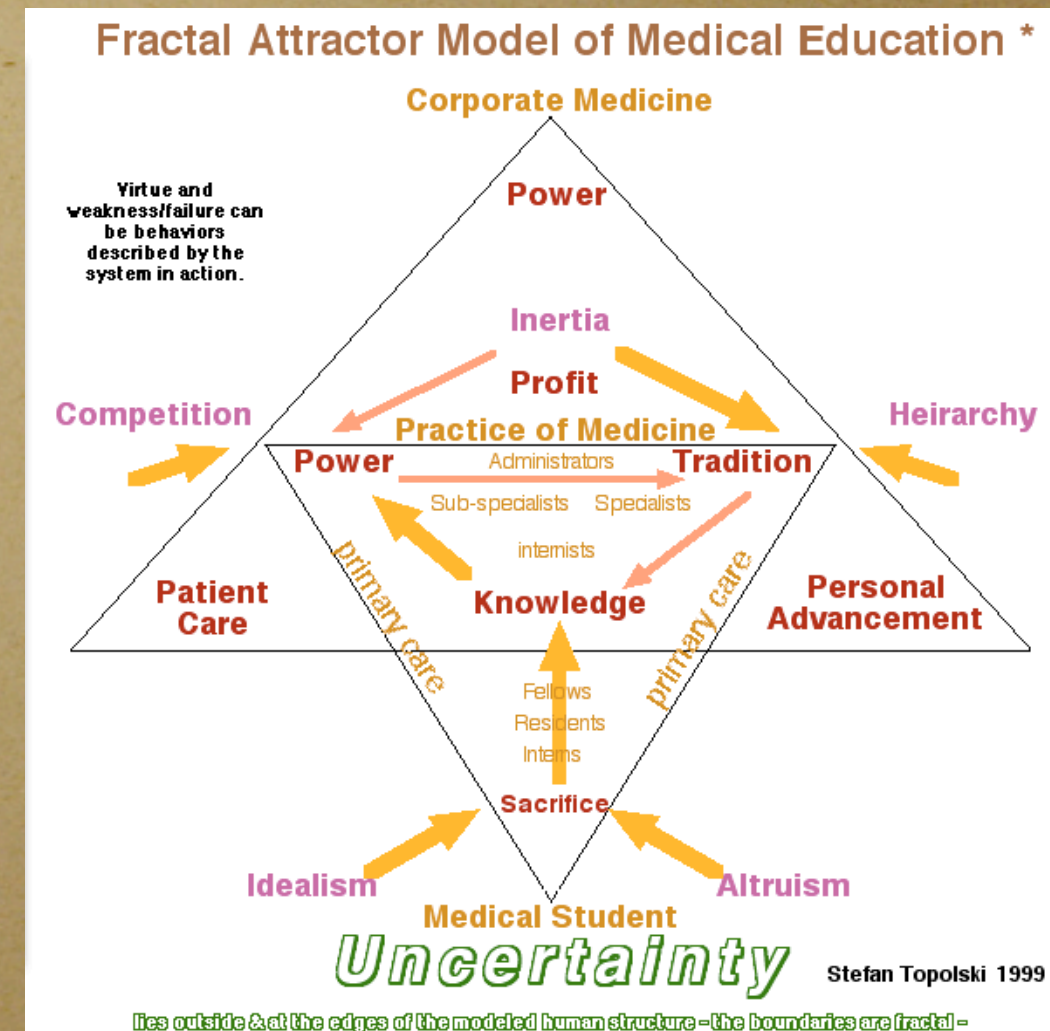
Statistics

Modeling

Cellular Automata

and more...

It Reminds one of the Complexity, Uncertainty and Paradigm Shift which Quantum Mechanics brought to Classical Physics.



Modeling Health From First Principles

Fractals

Chaos Theory

Catastrophe Theory

Complex Systems

HEALTH is analogous to ENERGY.

Good Health & Bad Health have...

Energy

Entropy

Potential

Structure

Scale

Inertia

Friction

Momentum

etc.

How do we define 'Good' vs. 'Bad' Health?

Stability

Tension

Rebound

Modeling Health From First Principles

Fractals

Chaos Theory

Catastrophe Theory

Complex Systems

Energy

Entropy

Potential

Structure

Scale

Stability

Tension

Rebound

**Good Health vs. Bad Health
is**

Greater Order vs. Greater Disorder

BUT it is ALSO

Less Entropy vs. More Entropy

**There is a contradiction here if you look at
health as a linear continuum. And what do
we really mean by 'Order'?**

**"Life exists, grows and maintains life by
exporting Entropy from the cell and the
organism to delay the constraints of the
second law of thermodynamics."¹**

¹ E. Schrodinger, What is Life? Mind and Matter, New Ed (Cambridge University Press, 1944, 1968).

Modeling Health From First Principles

Fractals
Chaos Theory
Catastrophe Theory
Complex Systems

Energy
Entropy
Potential
Structure
Scale

Stability
Tension
Rebound

**Potential & Flexibility
Decrease as
Structure Increases.**

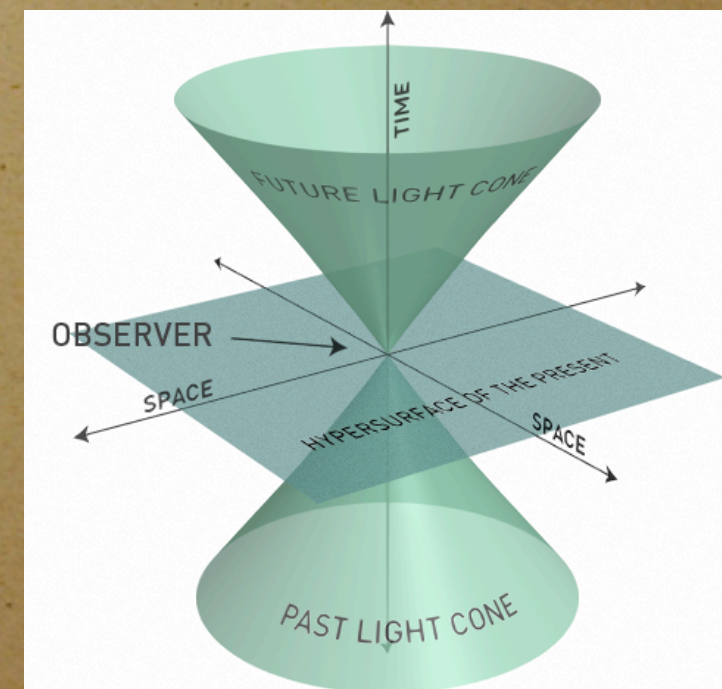
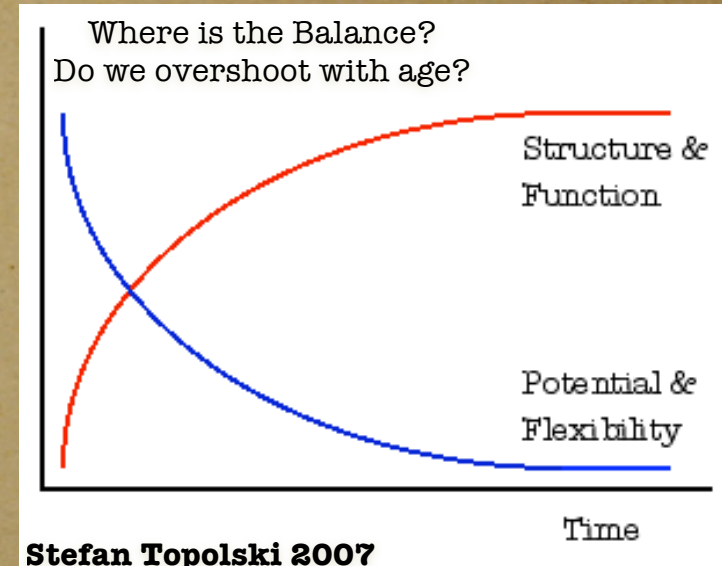
Cone of Potentiality¹

**Past Potentials converge
on the Present Condition
&
the Current Condition
determines the diversity
of Future Potential Conditions.**

potentiality (p-tnsh-l-t) American Heritage® Dictionary

1. The state of being potential.

2.a. Inherent capacity for growth, development, or coming into existence.



http://evankeane.files.wordpress.com/2007/04/world_line.png

Modeling Health From First Principles

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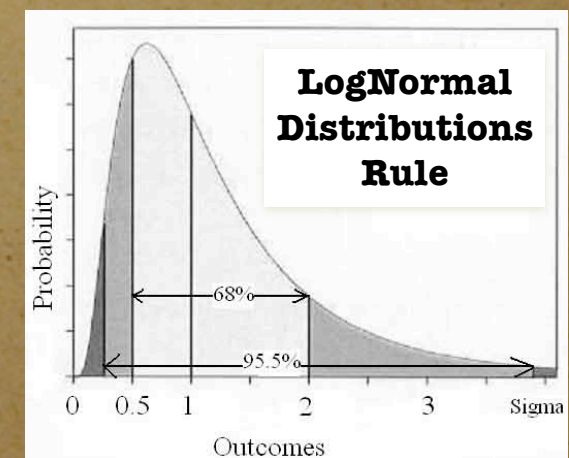
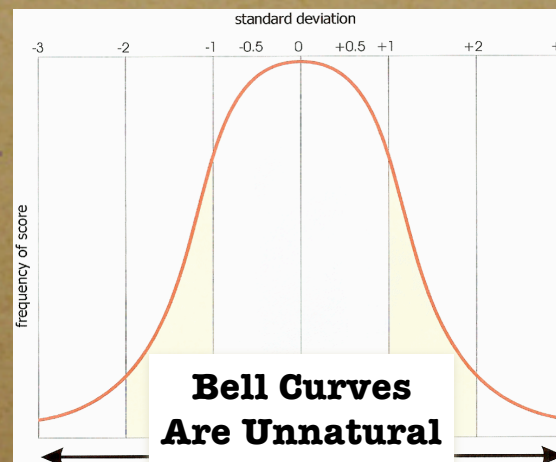
Tension

Rebound

**The CHANCE of finding certain structures
in biology and the SHAPE of biological structures
can follow Biological Distributions.¹**

This will be very relevant later...

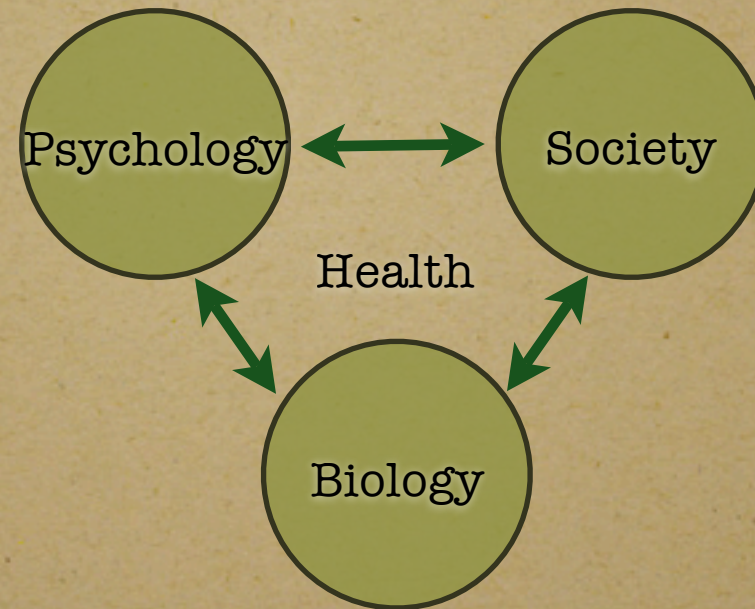
**Life is NOT Random... and
Statistical Distributions in Medicine are
RARELY Random.**



¹Nicholas J. Schork et al., "On the asymmetry of biological frequency distributions," *Genetic Epidemiology* 7, no. 6 (1990): 427-446.

Modeling Health From First Principles

Fractals
Chaos Theory
Catastrophe Theory
Complex Systems



Energy
Entropy
Potential

Structure
Scale

Stability
Tension

We mentioned 'Order'... do we mean 'Structure'?

Does 'Greater' Order mean 'More Complex' Structure?

This brings us back to Fractals... which are self-similar processes that are most complex.

Scale-Free Fractal structure exists throughout life.

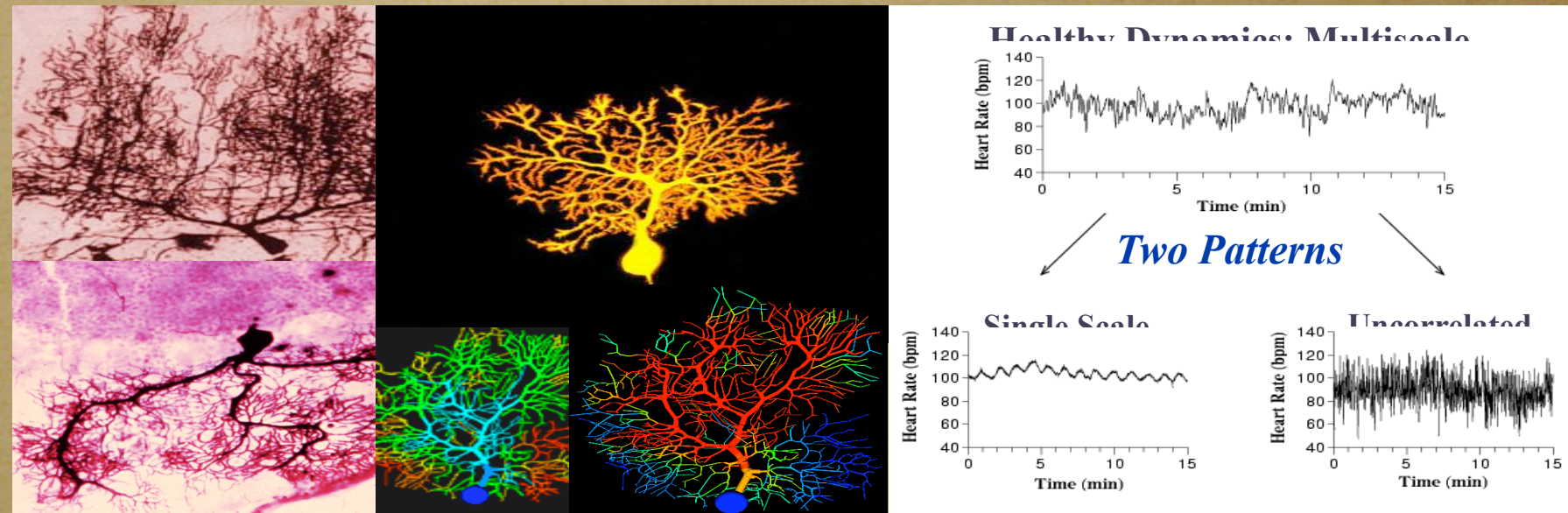
Modeling Health From First Principles

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Stability
Tension
Rebound



Ary L. Goldberger, M.D.

Heart: His-Purkinje Fibers, Coronary Artery Network

Lung: Airway structure

Brain: Dendrite Structure & Neural Networks

Biology: Phalanges, Fingers, Forearm, Arm

Psyche: Security, Love, Achievement, 'Self-Actualizing'

Society: Family, Community, Nation, World

Modeling Health From First Principles

Fractals

Chaos Theory

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Traditional Medical Physiology has emphasized Health as a STATE of Homeostasis... a “mean [s of] maintenance of static, or constant, conditions in the internal environment.”¹

Complex Systems study suggests this is INCORRECT.

The Human body and Human health are rather dynamic PROCESSES of constant change to maximize sensitivity and robustness to the challenge of constant environmental variation.

**The body achieves health through a dynamic stability between tension and rebound.
Homeostasis, however, is death.**

¹ Arthur C. Guyton and John E. Hall, Textbook of Medical Physiology, 10th (W.B. Saunders Company, 2000), p. 3& 8.

Intermission -

Stretch those legs and

Bring up those questions!

Health in the Medical Home: a New Definition for the 21st Century

Independent Derivation of Health

Methods will include :

Qualitative Observation
Quantitative Definition
Linear Addition
Fractal Dimension

Physical
Emotional
Mental

Internal

Environmental
Social
(Wisdom/Spiritual)

External

The Result of
9 years of
qualitative
factor analysis

Later we compare it to the WHO definition* (brief version)...

* In this context, health is viewed holistically as an interacting system with mental, emotional and physical components. We define health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO 1994). We also consider health as a basic and dynamic force in our daily lives, influenced by our circumstances, beliefs, culture and social, economic and physical environments. ...¹

¹www.swc-cfc.gc.ca/pubs/pubspr/0662334035/200303_0662334035_3_e.html

Health in the Medical Home: a New Definition for the 21st Century

Independent Derivation of Health

Physical
Emotional
Mental Internal

Environmental
Social
(Wisdom/
Spiritual) External

Health Definitions - scraped from wikipedia...

Far too many, All are incomplete, as ours likely is too...

*Health is the functional and/or metabolic efficiency of an organism, at any moment in time, at both the cellular and global levels. All individual organisms, from the simplest to the most complex, vary between optimum health and zero health (dead).

*In the medical field, health is commonly defined as an organism's ability to efficiently respond to challenges (stressors) and effectively restore and sustain a "state of balance," known as homeostasis.

*Another widely accepted definition of health is that of the World Health Organization "WHO". It states that "health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"[1]. In more recent years, this statement has been modified to include the ability to lead a "socially and economically productive life."

*The WHO definition is not without criticism, as some argue that health cannot be defined as a state at all, but must be seen as a process of continuous adjustment to the changing demands of living and of the changing meanings we give to life. The WHO definition is therefore considered by many as an idealistic goal rather than a realistic proposition.

*The LaLonde report suggested that there are four general determinants of health which he called "human biology", "environment", "lifestyle", and "healthcare organization"[2]

*An increasing measure of the health of populations is height, which is strongly regulated by nutrition and health care, among other standard of living and quality of life matters. The study of human growth, its regulators and its implications is known as auxology.

*Wellness is a term sometimes used to describe the psychological state of being healthy, but is most often used in the field of alternative medicine to describe one's state of being.

Health in the Medical Home: a New Definition for the 21st Century

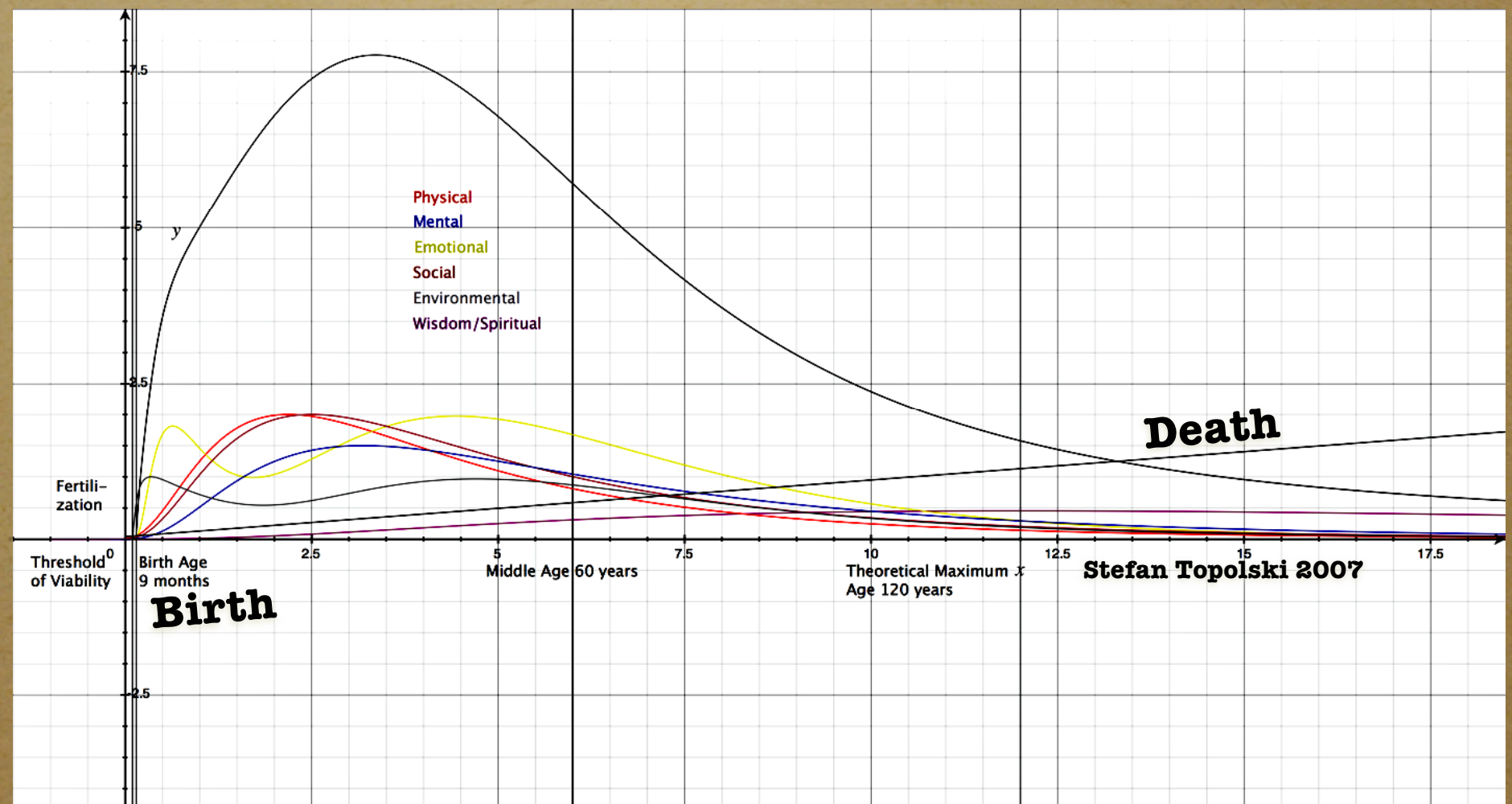
**Independent
Derivation of
Health**

Physical
Emotional
Mental Internal

Environmental
Social
(Wisdom/
Spiritual) External

Log Normals

**Log Normal Curves are here again -
One individual over an average lifetime**



Who sees a soft geometric proof?

Health in the Medical Home: a New Definition for the 21st Century

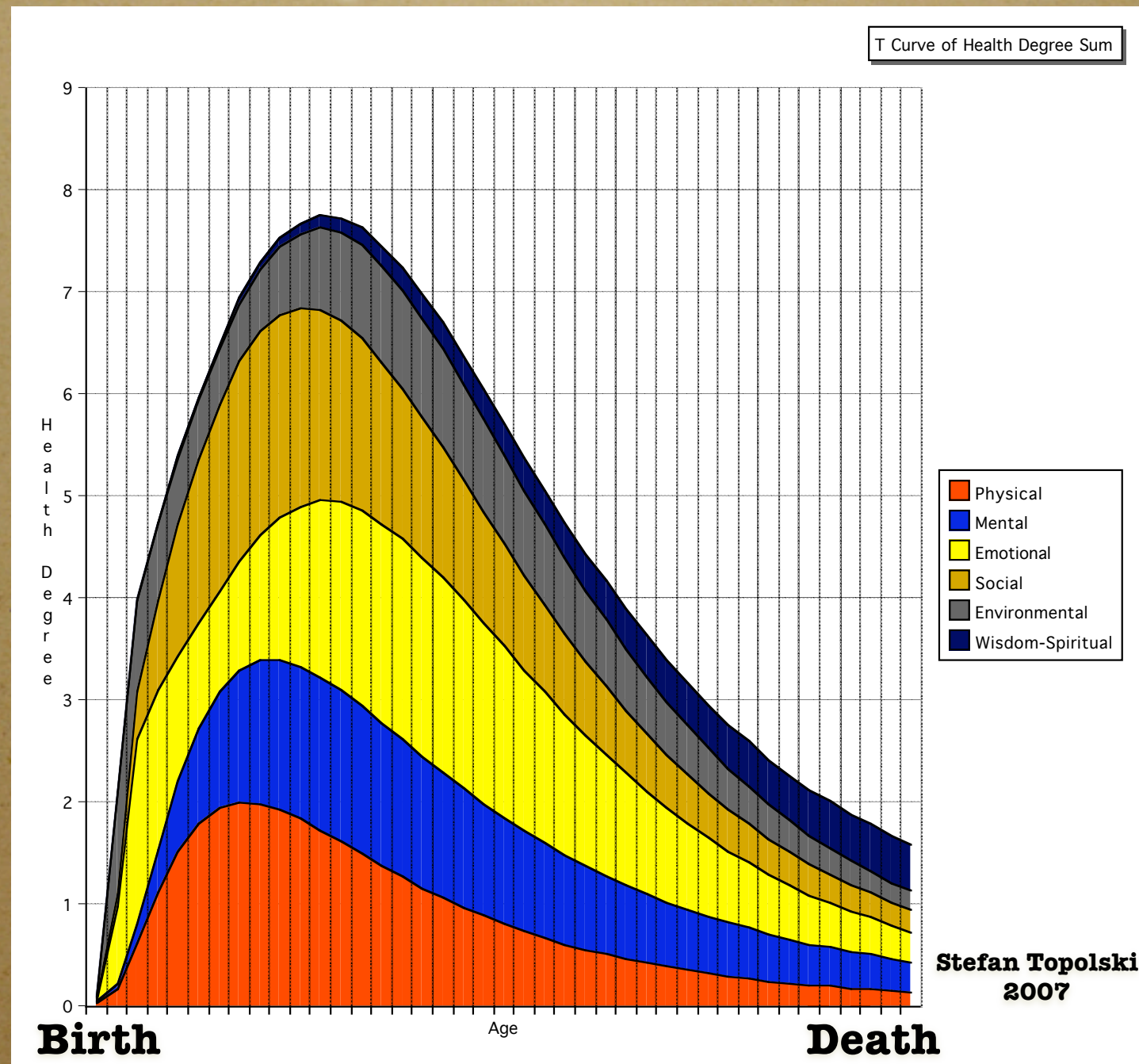
Independent Derivation of Health

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Spiritual) External

Log Normals

Relative Proportion of Summed Curves



How to Support Health in the Medical Home?

-Best access to
the **External**.

-Biggest return
from the **Most
Proportionate**.

-Biggest danger
is in a **Bimodal**
period.

Health in the Medical Home: a New Definition for the 21st Century

Independent Derivation of Health

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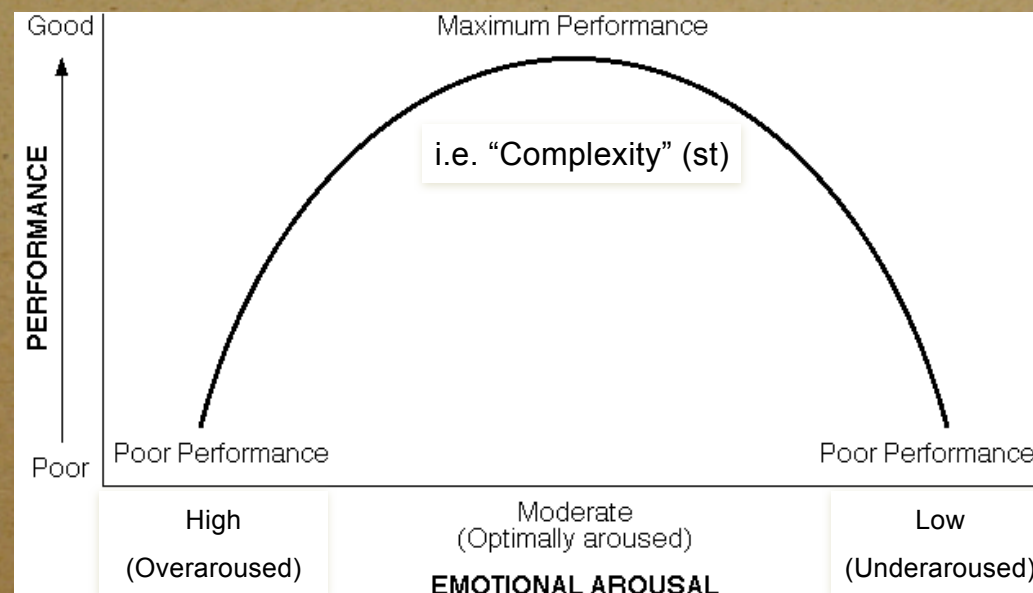
Log Normals

Entropy/Energy

What about Entropy, Energy, Information theory and the rest?

Inverted U Curves exist for Each Health Potential:

| Curve | Excess Stimulation | Lack of Stimulation |
|-------------------------|--|---|
| Physique Environment | Overtraining Soft Cushy Plush Weak | Couch Potato Hunger Cold Insecurity |
| Emotion Social | Party Harder Syndrome Spoiled Dependent | Lonely Depressed Isolated Vulnerable |
| Mind (Wisdom/Spirit) | Disconnect in Reality/"Breakdown" Disconnect Reality/"lose love?" | Ignorant Confused "Fool" Follower |



Williams, J.M., Landers, D.M., Boutcher, S.H., (1993). Arousal-Performance Relationships, Applied Sport Psychology; Personal Growth to Peak Performance, pgs 170-184, 2



Basic Modeling Principle - Don't seek symmetry...

- the wisdom / spiritual is both external and internal...
- it is very hard to define what could be too much wisdom
- it is very easy to define what could be too much spirituality
- wisdom may be a human construct that doesn't exist
- spirituality can be a negative and not a mark of health
- too little wisdom may be foolish while
too little spirituality may be smart

In the end, these two may be non-compatible concepts
stuck together and into the model to keep all happy -

Is there a different concept that we can use?

Health in the Medical Home: a New Definition for the 21st Century

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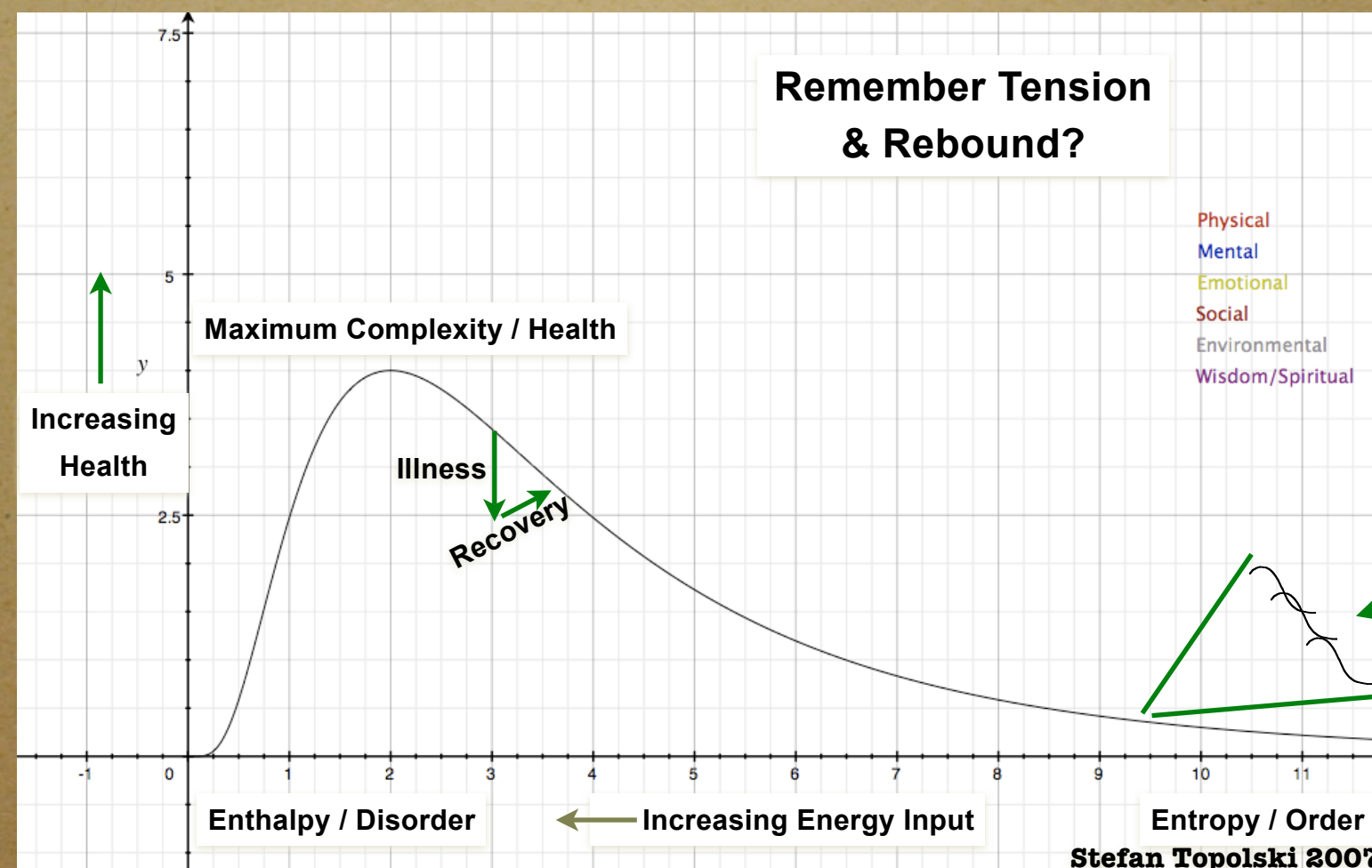
Entropy/Energy

Curve Addition

Since:

- 1) Complexity is described by information theory as an inverted U-shaped curve
- 2) Enthalpy (body temperature) declines after death by a sigmoid curve with tail
- 3) We lack quantitative data of the relation in human biology of enthalpy to complexity

I Propose: a curve union describing Complexity at time t on an entropy axis z .



Health in the Medical Home: a New Definition for the 21st Century

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Entropy/Energy

Curve Addition

René Leriche
(1879-1955)



Health is equivalent to the
'silence of the body in its organs'.

Arranged by Stephen Lewis

Again, the current state of Health Theory is inadequate. Complexity and experience teach that it is the **quality**, not the quantity, of body signaling which changes between health and disease...

.....Who remembers their first hockey game?

Health in the Medical Home: a New Definition for the 21st Century

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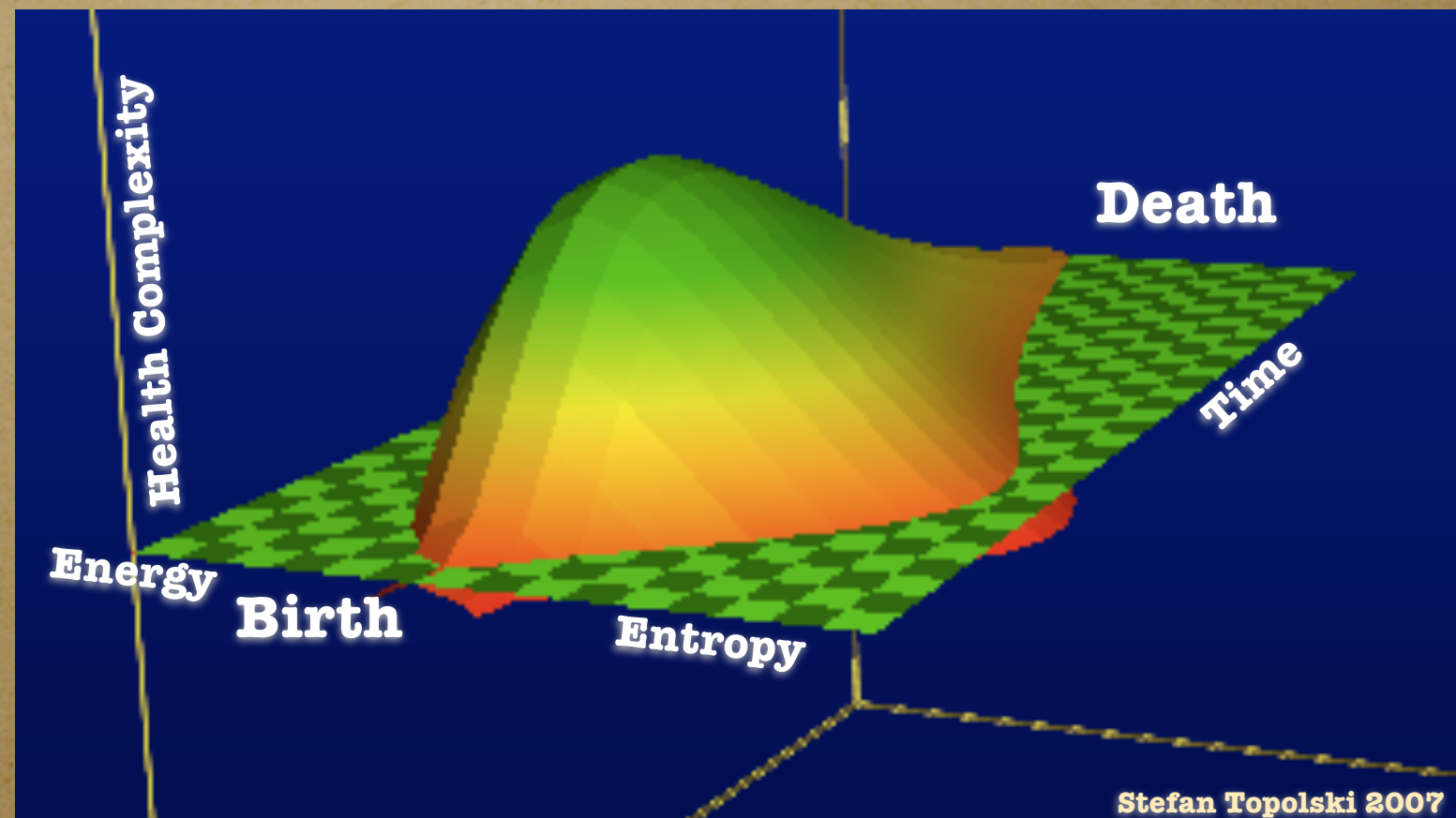
Log Normals

Entropy/Energy

Curve Addition

Fractal

Complexity and Chaos create a potential space for a New Definition of Health



**Health is maximum complexity, a high fractal dimension
distributed on a surface of health potential which
we traverse from birth to death.**

Health in the Medical Home: a New Definition for the 21st Century

Independent Derivation of Health

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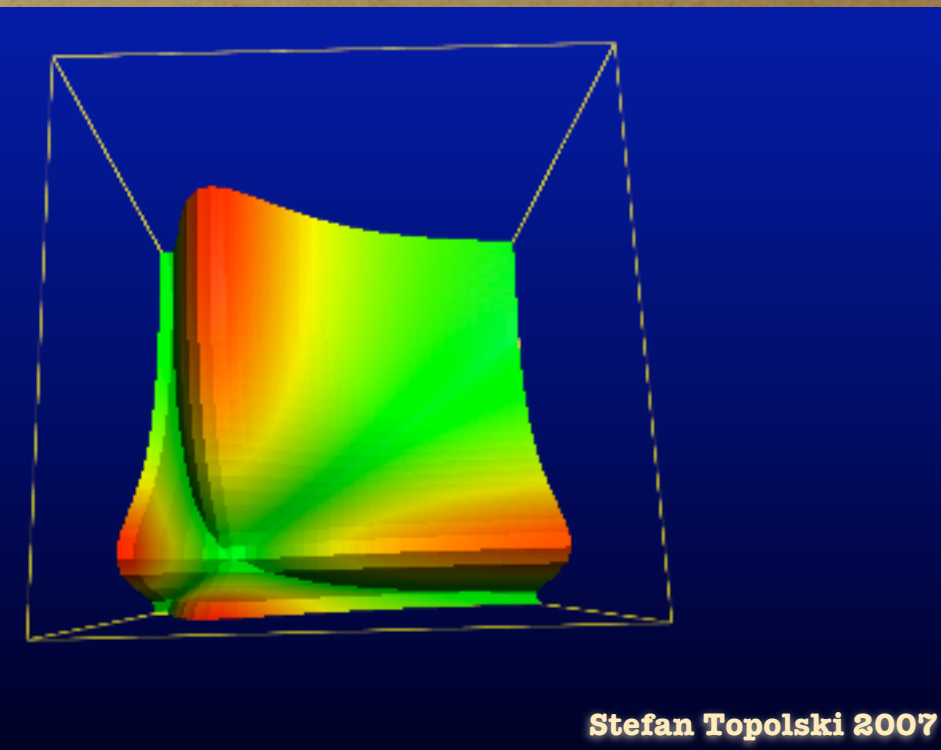
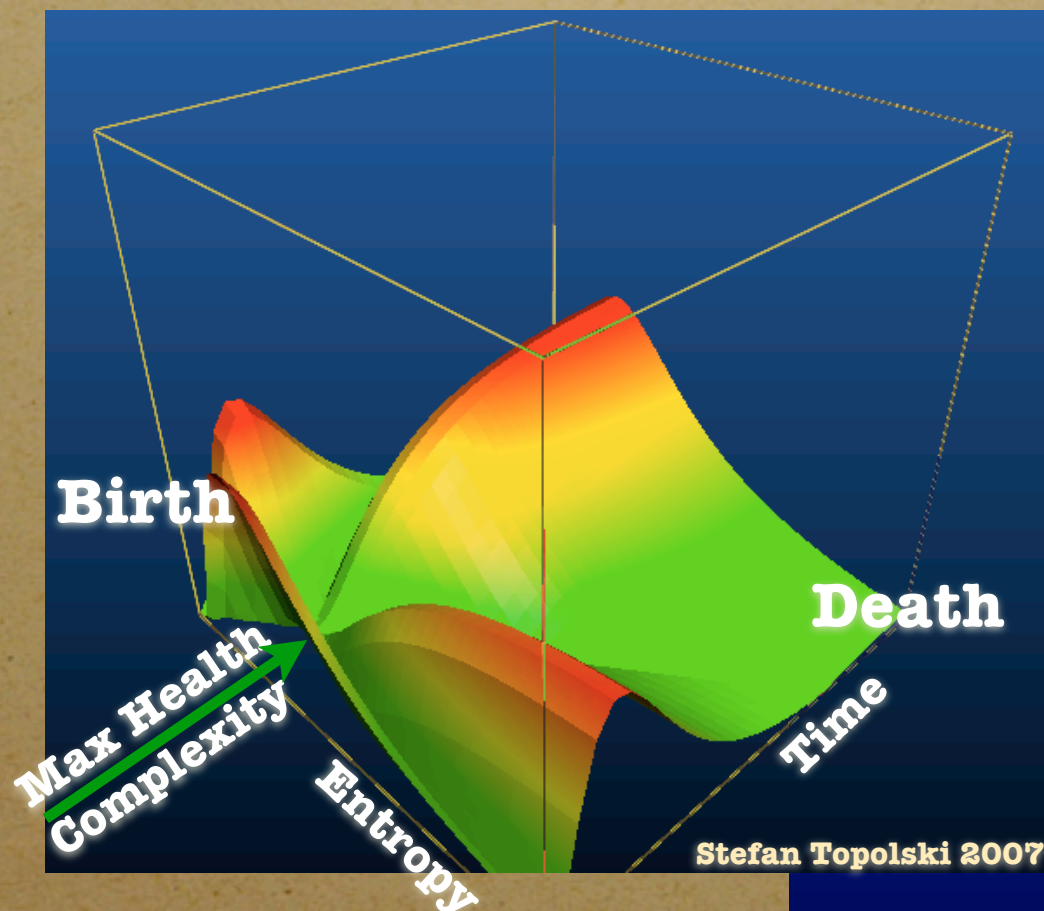
Log Normals

Entropy/Energy

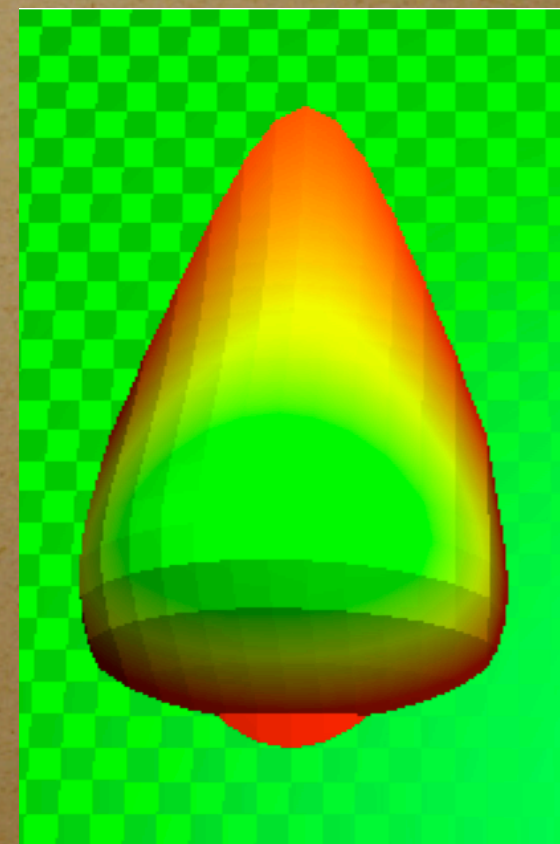
Curve Addition

Fractal&Strange

Nonlinear methods can suggest an
Attraction Basin for our new definition of health.



SO...



Health in the Medical Home: What does complexity do for us ?

Physical
Emotional
Mental Internal
Environmental
Social
(Wisdom/
Spiritual) External

Log Normals

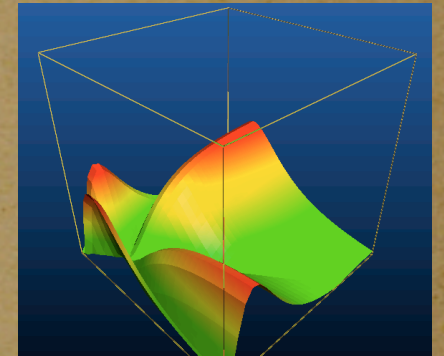
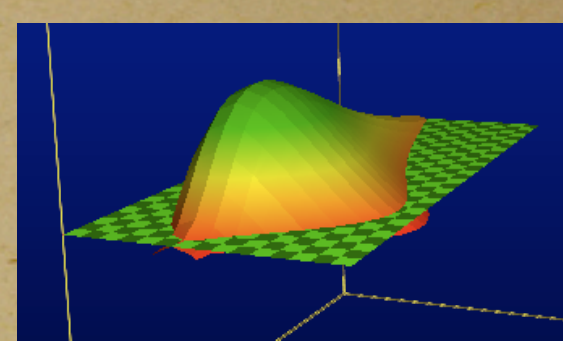
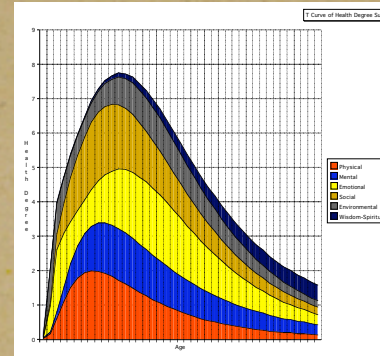
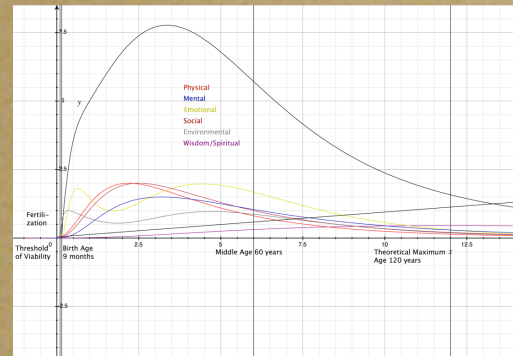
Entropy/Energy

Curve Addition

Fractal Surface

Strange Attractor

The Inverted 'U'...



Novel Predictions:

Health is MORE complex than the biopsychosocial model describes.

Health has internal AND external factors.

Health at different ages is NOT equivalent -

Healthy infants and children are categorically LESS healthy than healthy teenagers and adults.

Chronic Illness comes in two Distinct and OPPOSITE forms - Excess Entropy (Underuse) or Excess Energy (Overuse) - which heal through fundamentally OPPOSITE processes.

Acute Illness is a THIRD form with a fundamentally DIFFERENT healing process from the 2 forms of Chronic Illness.

A new concept of VIABILITY THRESHOLD with slope changed by age, rare genetic or infectious illnesses.

Health and Illness can be defined by slope of surface, fractal texture of surface, total complexity of system, or total complexity of system minus viability threshold,

More clearly shows which health interventions have large yield or small yield.

The healthy human being may be a nearly infinite fractal image of human health, but we can still crudely picture changes in health over time by modeling with effective simplification.

**“Folly, all is folly...
for there is nothing new under the sun.”**

Eclaiasticus

| | |
|--------------|---|
| “Physical | Fitness. Nutrition. Medical self-care. Control of substance abuse |
| Emotional | Care for emotional crisis. Stress Management |
| Intellectual | Educational. Achievement. Career development |
| Spiritual | Love. Hope. Charity. |
| Social | Communities. Families. Friends ... |

Health promotion is the science and art of helping people change their lifestyle to move toward a state of optimal health. Optimal health is defined as a balance of physical, emotional, social, spiritual, and intellectual health. Lifestyle change can be facilitated through a combination of efforts to enhance awareness, change behavior and create environments that support good health practices. Of the three, supportive environments will probably have the greatest impact in producing lasting change. ”¹

¹ American Journal of Health Promotion, 1989,3,3,5

“Blessed be the Peacemakers, not the HgbA1c checkers...”

Questions !

Stefan Topolski MD

U. Mass School of Medicine

Caring in Community
& CottageMed, Inc.

www.cottagemed.org

Addenda...

Health in the Medical Home: What does complexity do for us ?

Physical
Emotional
Mental Internal
Environmental
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Log Normals

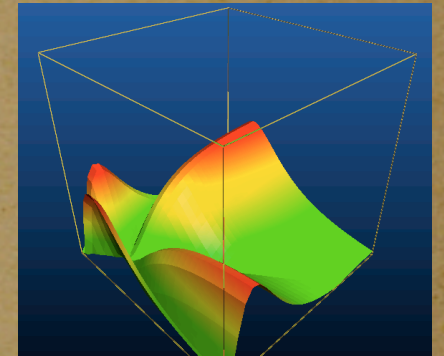
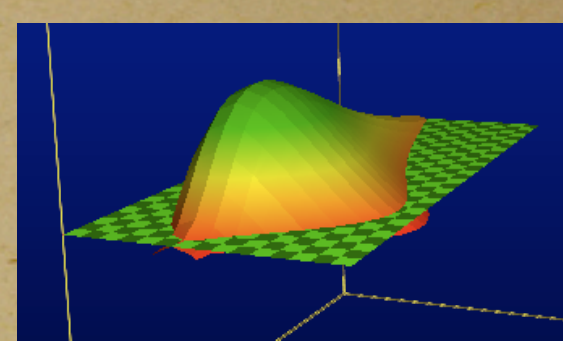
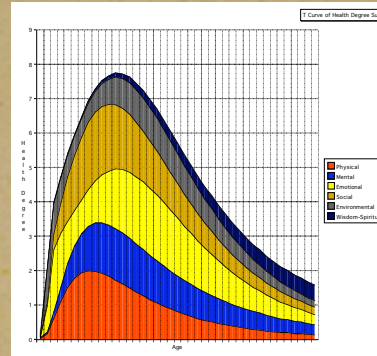
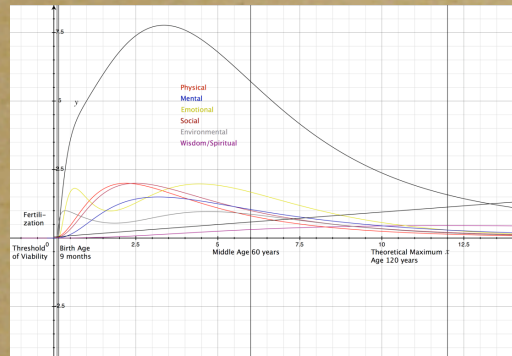
Entropy/Energy

Curve Addition

Fractal Surface

Strange Attractor

The Inverted 'U'...



New Solutions : (1/3)

A clearer understanding of health and illness. A more adaptable model to reflect different realities of time and culture.

There are specific areas of health where we can make the most use of limited resources.

- External vs. Internal loci of curves - you can affect the externals easier.
- focus on lows to maintain balance.
- focus on lags early because of sensitivity to initial conditions.
- numerous examples in child development with lack of complete catch-up if delayed too far.

Cross-section shallow infancy slopes increase to highly peaked with age as predicted.

Degree of Complexity or Fractal Dimension (not the threshold itself) with distance **to** the viability threshold can define health.

Emphasizes that plasticity goes down as structure and function go up.

- there is stochastic and energy / entropy theory for this.

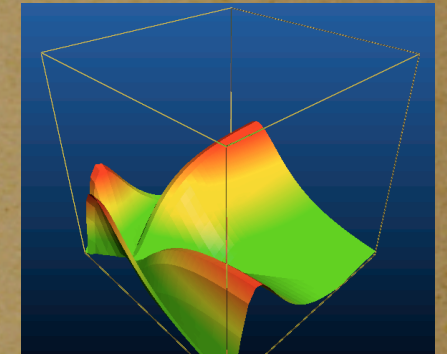
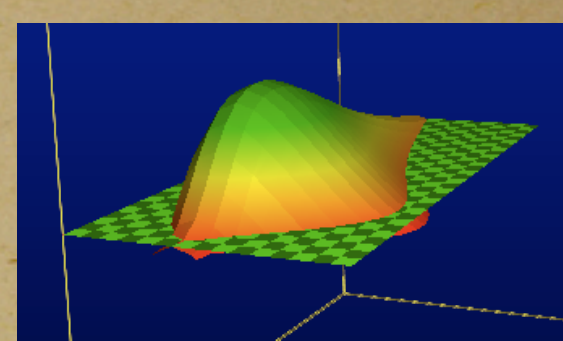
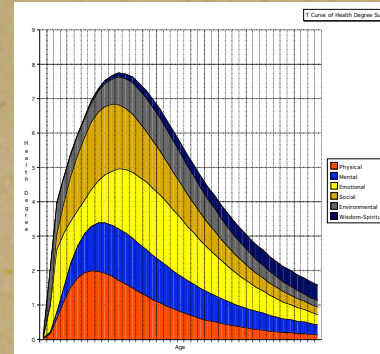
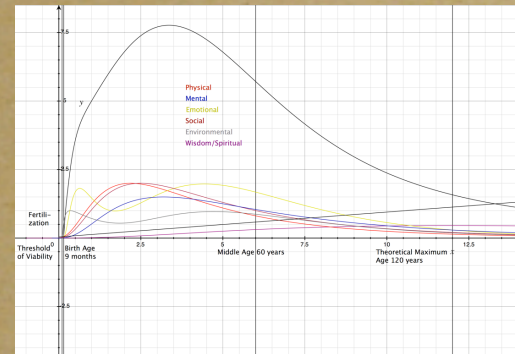
Top-down view matches our view of maximal health change and choice early in life.

Industrialized Western society prolongs childhood (lack of appropriate stimulation) and exaggerates adolescence and adolescent illness.

The healthy human being is a nearly infinite fractal image of human health, but we can still crudely picture changes in health over time by modeling with effective simplification.

Health in the Medical Home: What does complexity do for us ?

Physical
Emotional
Mental Internal
Environmental
Social
(Wisdom/
Spiritual) External



New Solutions : (2/3)

Location on curve affects (can slow) recovery time but not onset.

Symptoms outpace Objective change and often reflect speed of change rather than quantity of change.

Speed of Recovery lags Speed of Decline.

Fractal surface affects risk, severity, and course.

The rate of change in health is generally more important (Von Neumann game theory) than the quantity of change. Thus the slope of the curve (differential) of the fractal surface can be a measure of subjective health.

On recovery from illness, metabolism's fine structure changes fast while large structure changes slowly - this describes the difference between recovery time from viral illness and from bacterial illness.

Phenomena of Like cures Like & Worse before Better:

-Traditional homeopathy had stated the rx does the work of creating sx's for the body so it can begin to heal, but this is not quite right by this model.

-Gentler rx's lead to slower recovery & Tougher rx's lead to faster recovery unless they're so hard the body breaks (using a loaded spring analogy of disease as tension/rebound)

TB is a different example - slow chronic illnesses that don't go down then up on the curve. Instead they
1- dwindle down and decrease fractal dimension of curve,
2- increase the viability threshold's inclination implying more energy required to reduce entropy, and
3- then the weakened spring of the body finally breaks.

Log Normals

Entropy/Energy

Curve Addition

Fractal Surface

Strange Attractor

The Inverted 'U'...

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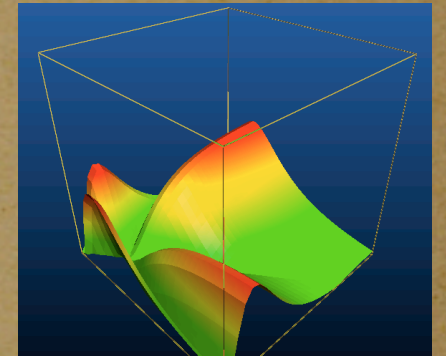
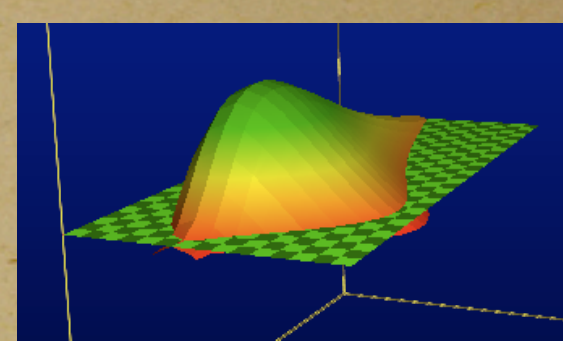
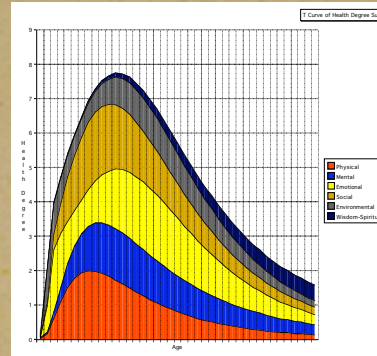
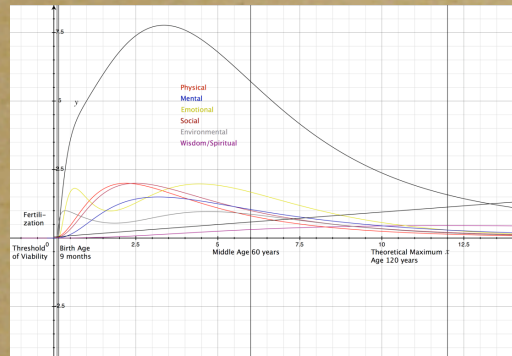
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New Solutions : (3/3)

Unvalidated normal or poisson curves are endemic in medicine.

More chaos (and erraticity) does NOT always mean more health.

There is a plausible cone of action potential.

What about illness, injury, sudden death of a young athlete? What of a sudden discontinuity? The young have far greater health reserve in this model and indeed a far greater chance of surviving such harms.

Fractal structure, scale-free behavior, power curves and log-normal curves are everywhere.

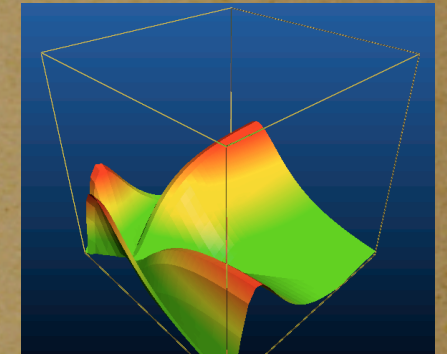
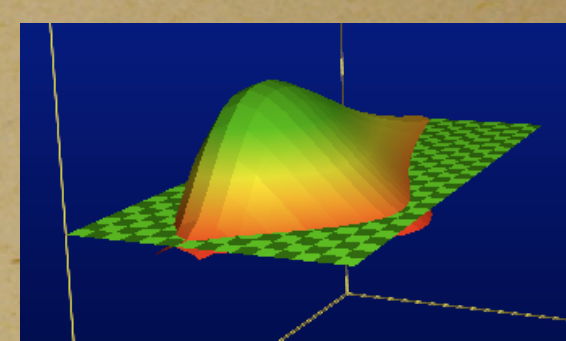
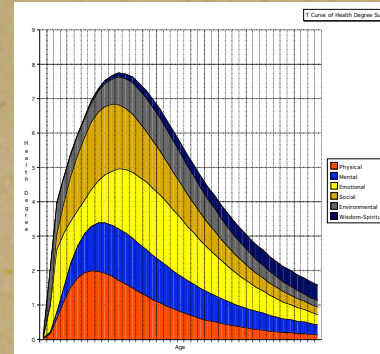
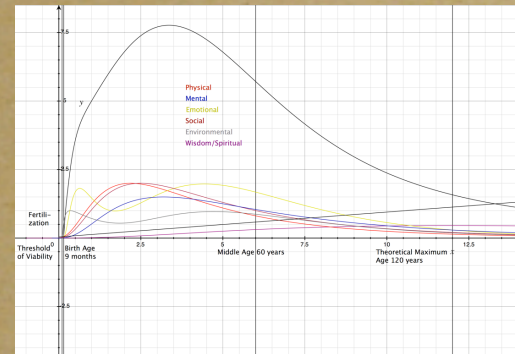
Fractal complexity can be robust, deep, self-similar and it can mean more health.

Aristotle defined the purpose of life as **Eudymonia** - joy - a full flowering...

Defining health as a fractal dimensioned curve of many parts is simply allowing some small way of measuring, observing and comparing what he already thought.

Health in the Medical Home: What does complexity do for us ?

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Problems : (1/3)

Need to find far better ways to measure health. Current methods are non-starters.

Rate of cell growth in first days/wks can't calibrate model because the data is very nonlinear over 9 months of gestation

Can't assume consistent growth rates across the first 18 years, but we're not measuring physical size alone

Power curve varies with age from broad/low to normal/higher to narrow/highest - why?

Are the ratios of values from infancy to youth to adulthood accurate?

- do the ratios change if we reduce the maximum values?
- or does the log-normal curve form keep all ratios similar as maximum value is varied?

Although location on curve affects event, the fine fractal structure and slope of the health curve basin edge at illness onset can also vary (often on time of day / biorhythm)

Compare parameter space for other possible situations.

- other curves - war, poor, schizophrenia, severe injury/illness, the middle ages
- test threshold of viability and attempt to replace linear approximation with curve likely coved upwards

Test age, nutrition, top-down view, other tangents in the model - and change angle, altitude, 'insert curved curve' or change the curve that makes bottom of 3D trajectory threshold line

- is model robustness and the graphic proof important or just expected properties of log-normal curves?

The Inverted 'U'...

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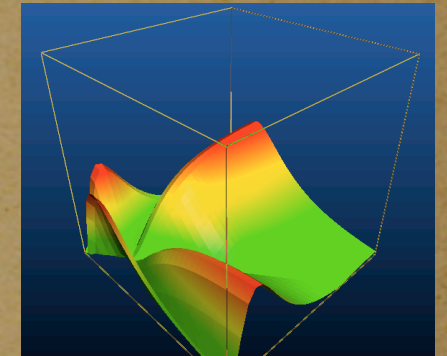
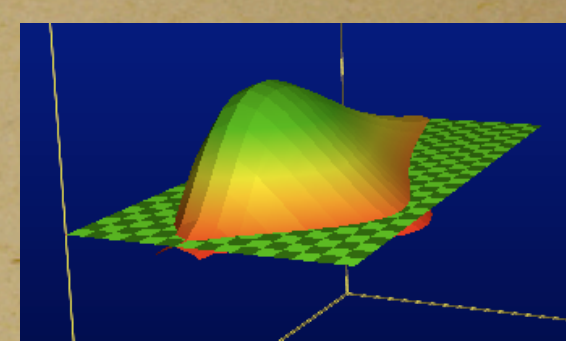
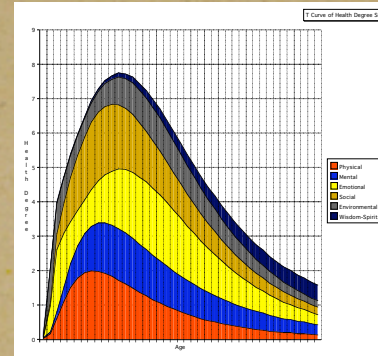
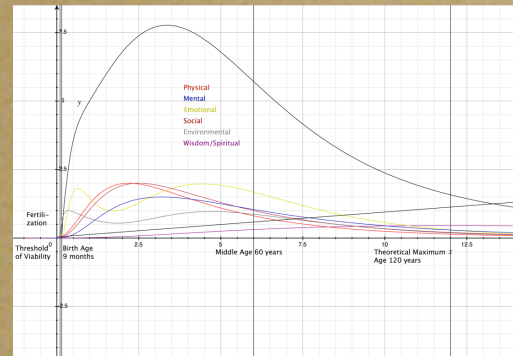
Entropy/Energy

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Strange Attractor

The Inverted 'U'...



Problems : (2/3)

Creative and wisdom curves trade off on each other over a lifetime.

- wisdom continues to grow while creativity declines after mid-life.
- are human-created religions/cults spiritual? or wise? or healthy? or not? It's a definite anomaly to be wrestled with.

More variable external curves are lowered to reduce bias to system but they should have more equal weight.

Emotional lag (the Bimodal curve) is a complex industrialized society effect not applicable to other cultures and societies.

- there are likely other culture- or society-dependent curves we have not yet discussed.

Inverted U entropy curve reflects the Golden Mean but doesn't reflect reality as well as the log-normal entropy curve (z-axis).

Biases - Up as good & down as 'bad'.

That more complexity is better than less (but it's NOT a bias - gotcha!).

Different societies will observe or rank the 6 curves differently, but the summed curve is fairly robust.

The fractal dimension of the T-curve should be culture-independent but data is lacking.

Curve intersections at the origin are hard to display and may not yet accurately reflect data we have for health and development before birth.

Large Physical illness and Large Viral illness have different healing patterns. Why is viral recovery far faster - healing and returning to the curve not far below before? And is its return to curve flat or curved up, and curved up log accelerate or log decelerate?

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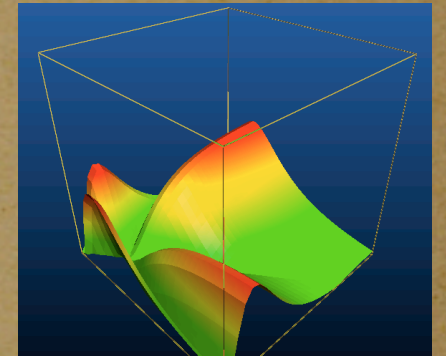
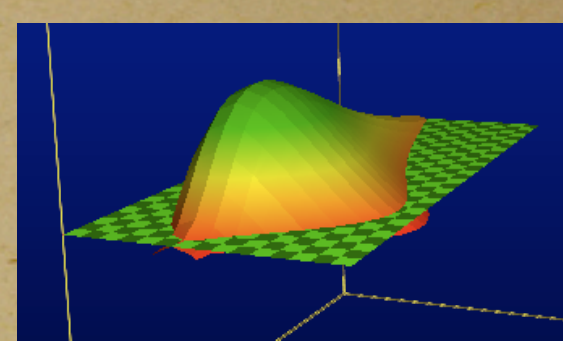
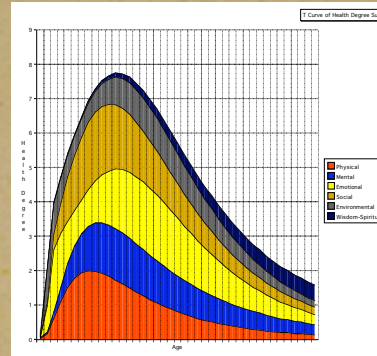
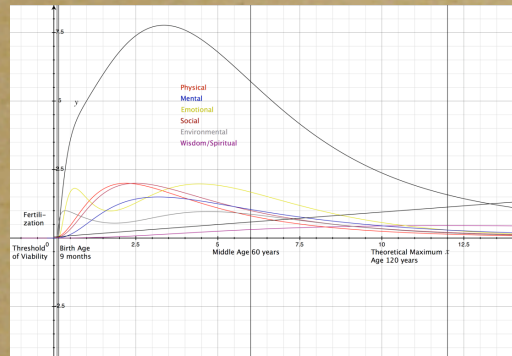
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Problems : (3/3)

One viability threshold is related to all 6 curves

- do they represent the same process or measure of friction or entropy ? (unlikely)
- are there individual thresholds for each curve ? (unlikely)

We want an empirically derived entropy/complexity curve but in the end we combined both due to insufficient data

Emotional curve is highly variable over time but also crucial to human health so we give it full value

Mental curve is less than other full curves - you can be very healthy with very little of it, and not always healthier with more...

the Pareto 'Principle' is not reflected in this model, but it's not clear that it should be

Future Research:

More data acquisition - we begin here today.

Simplify the model - in complex systems simpler models reveal fundamental relationships more clearly

Suggestions?

Errata...

Mostly from Stephen Lewis,

but a few from me...

Consequentialism

allows majority over minority

Possibly William James' type...

relationship-based and wholistic

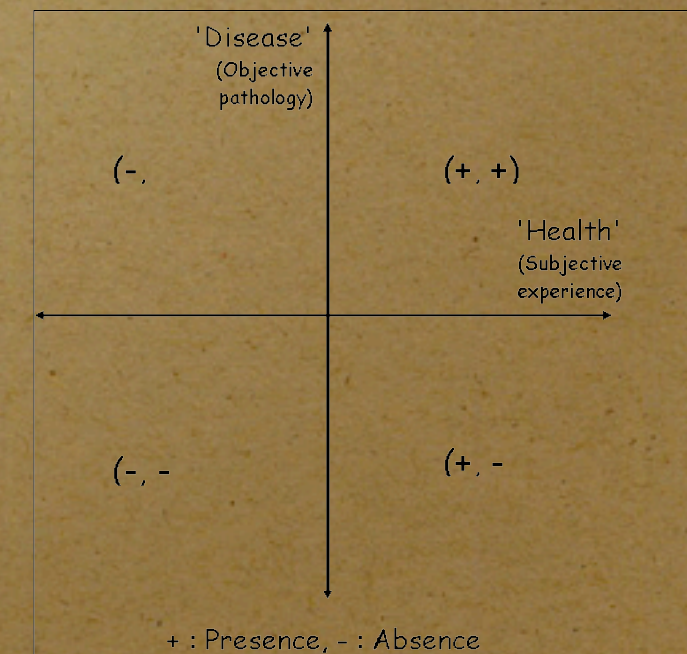
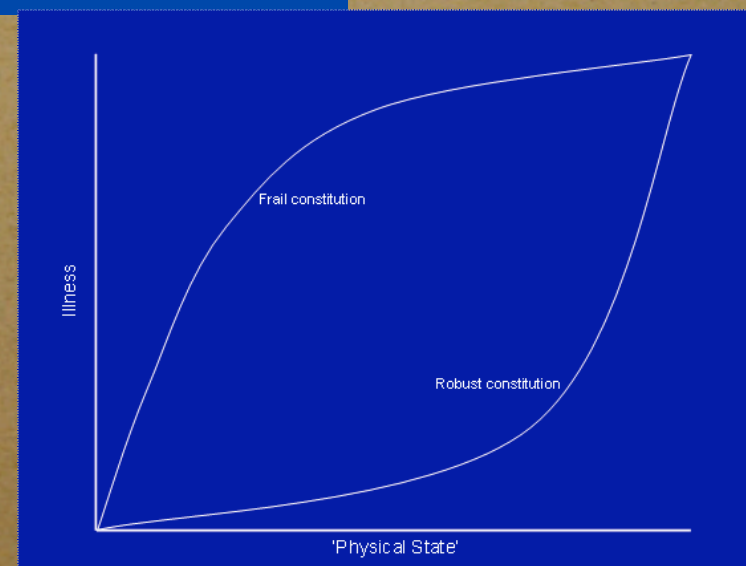
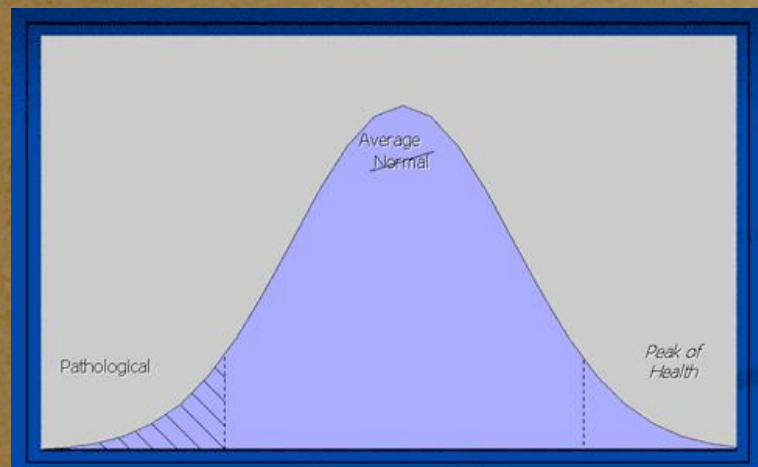
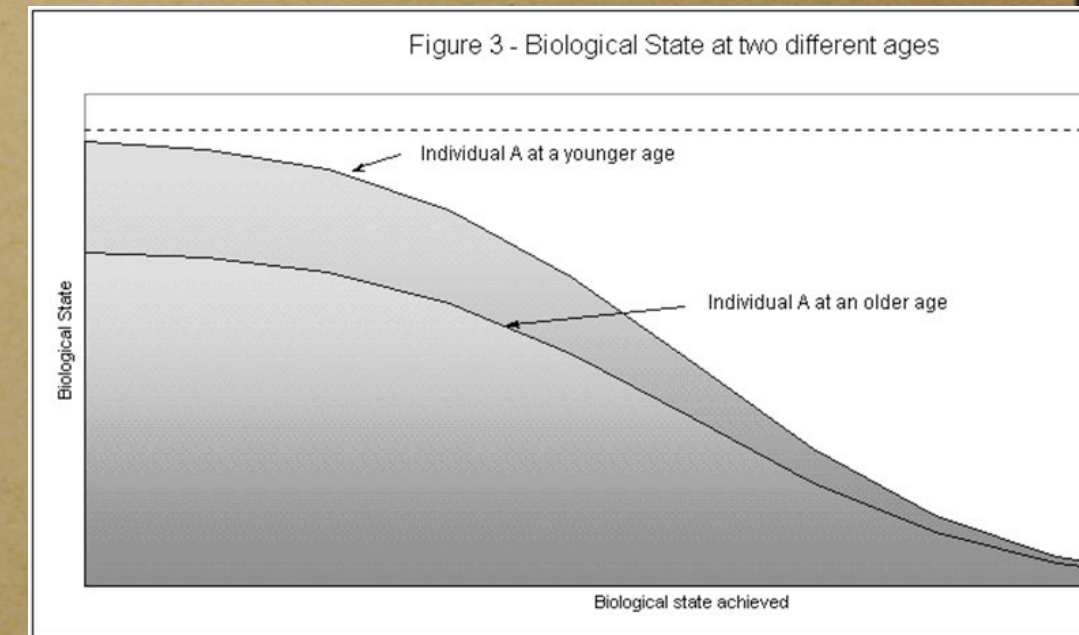
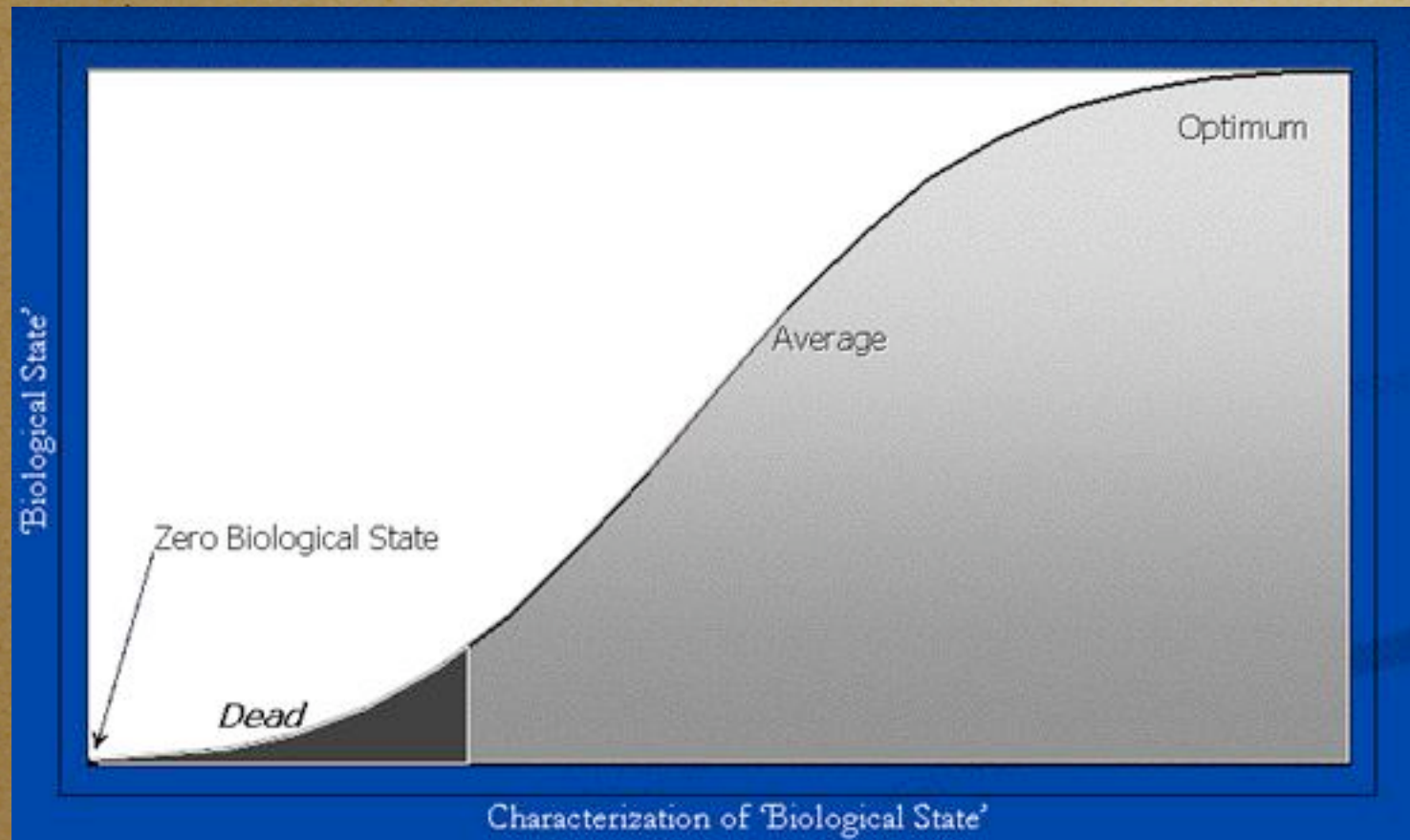
implicit contract, etc.

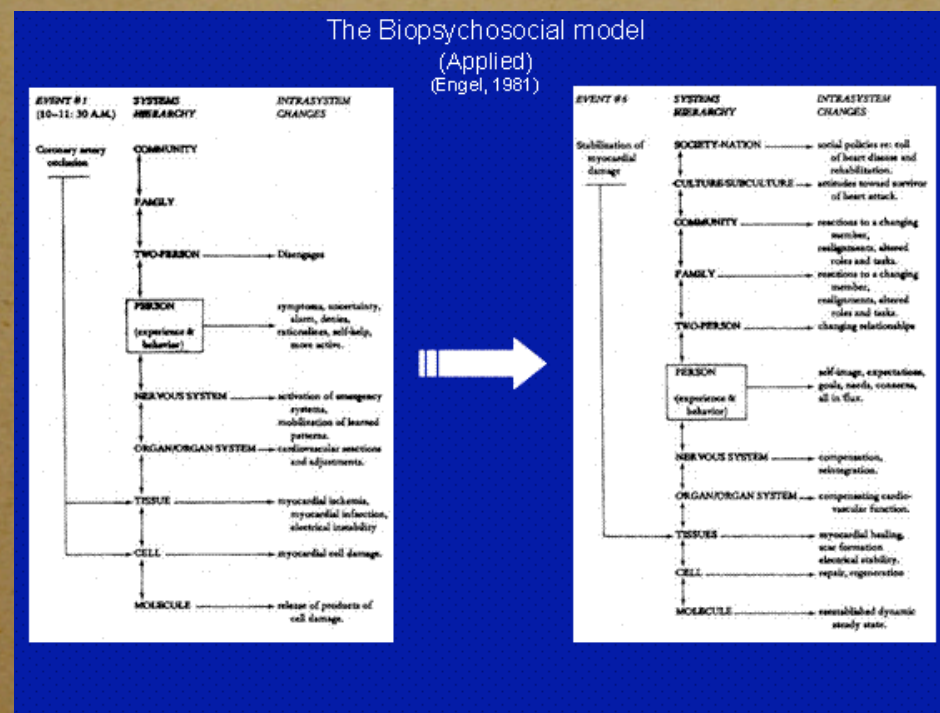
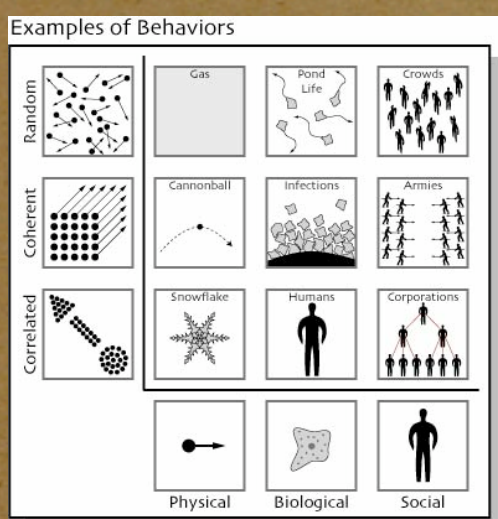
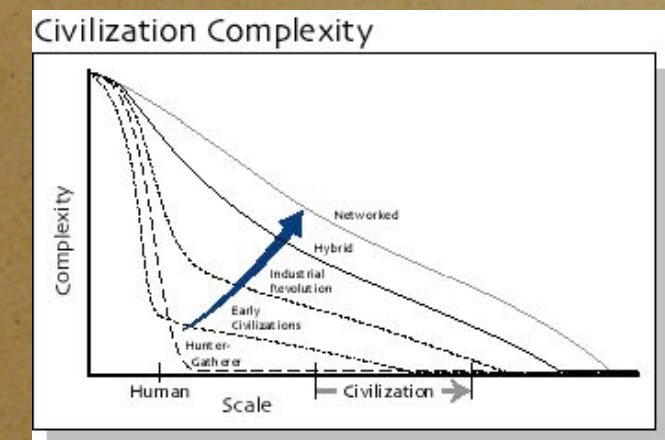
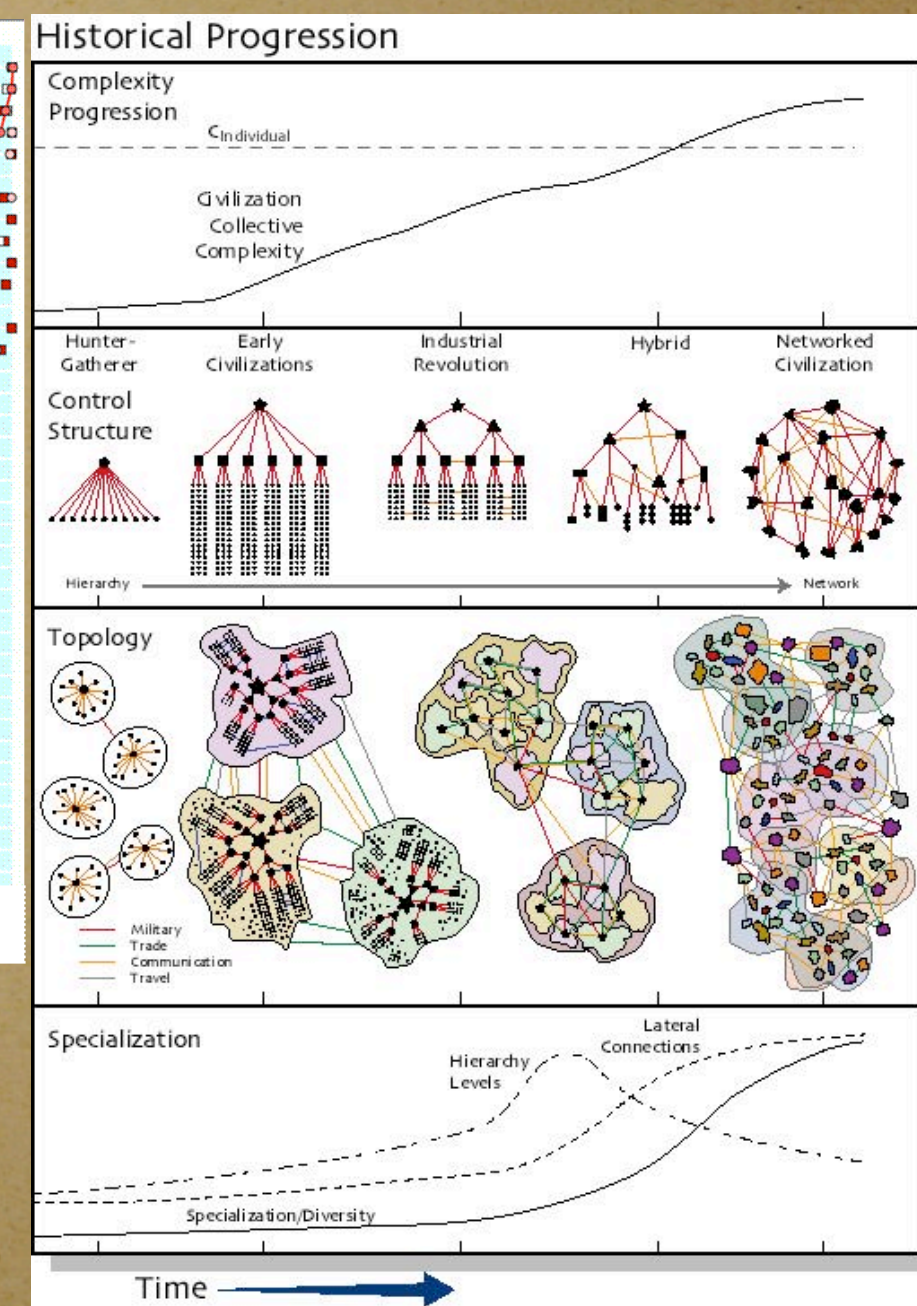
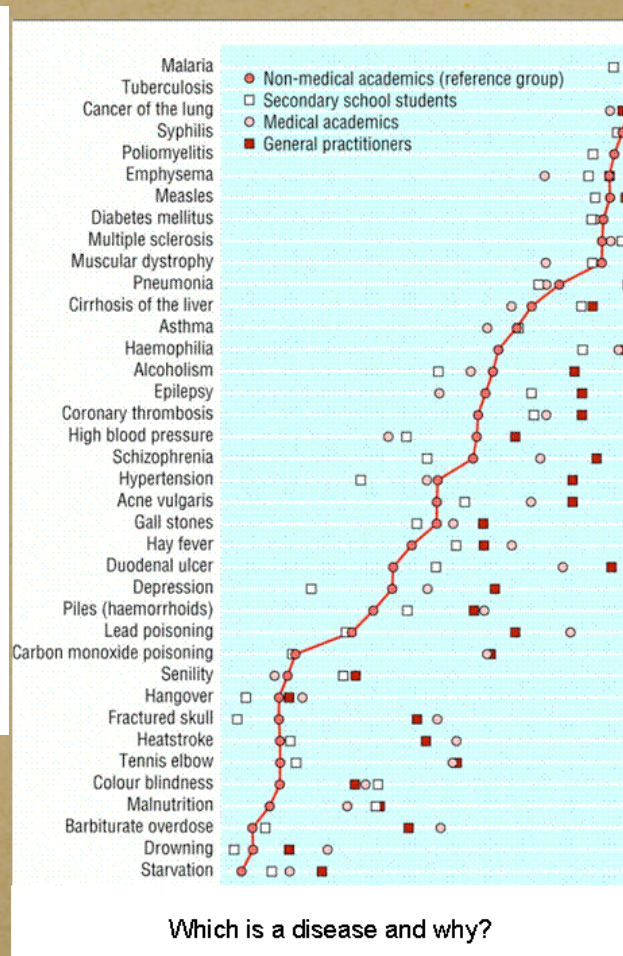
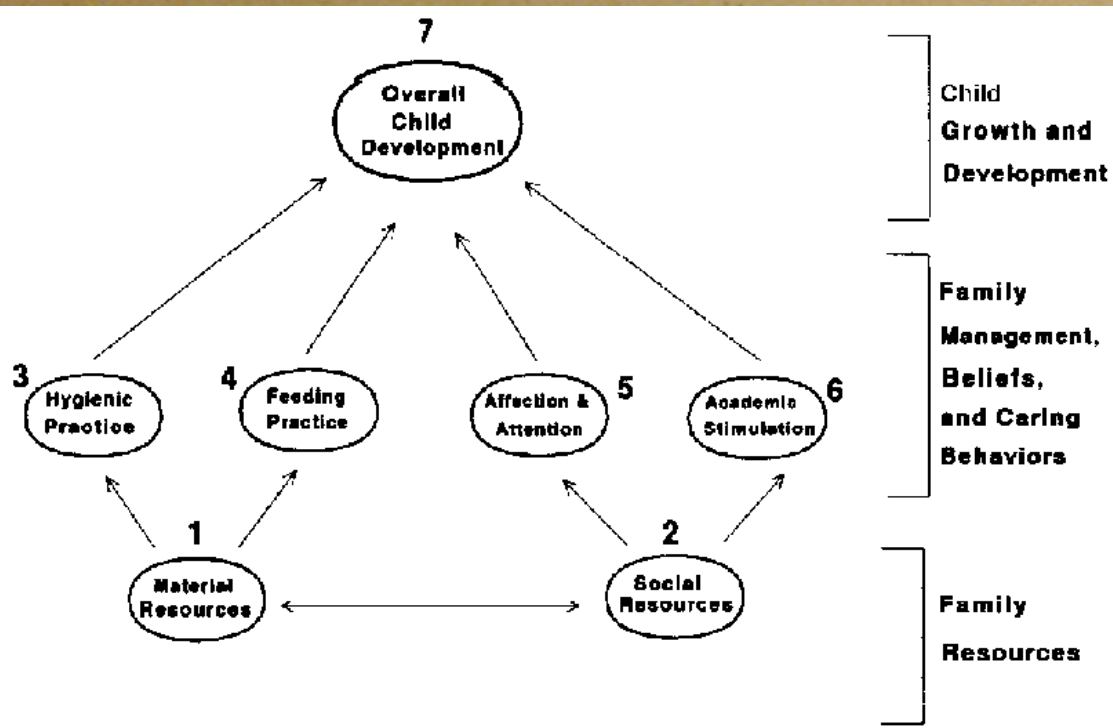
pt-centered method

rank qualities

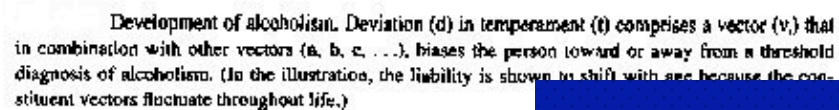
extensible whether pt, family, community, or larger

to celebrate life with increased joy as greatest fractal dimension as goal and ethics = how to choose right; this could describe a method...

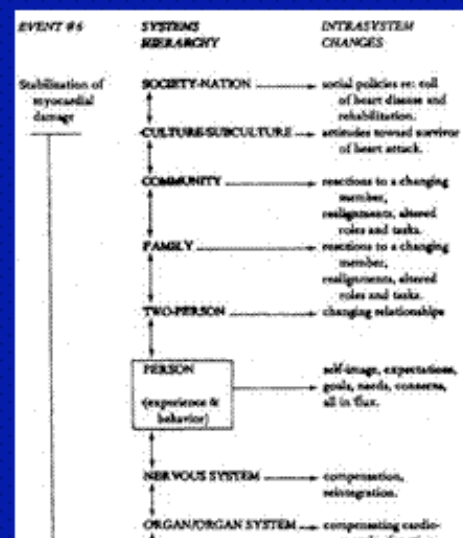




<http://www.eigenpedia.org/figs/histprog.jpg>



(Applied)
(Engel, 1981)



Theoretical basis
(Engel, 1981)

