Analogy and Duality

Presented by

Jon Miles
jon@milesresearch.com

Analogy and Duality

- Principles of Truth and Knowledge
- Causality
- Duality
- Analogy
- Equations of Emotion

The Singularity of Existence

The Uniqueness of Actuality

There is only one truth: absolute truth.

Exactly one truth, exactly one actual reality at each moment of time. There is exactly one true history. There is an absolute truth of physics. Whatever is happening (and whatever has happened) – there is only one true activity.

The Plurality of Knowledge

- The term "knowledge" is generally referring to the various information derived from observations of the world by people.
- Plurality: there are many ways of describing a given phenomenon ***(but only one true and actual activity)***.
- As an approximation to reality, knowledge is **never** 100% certain or correct so there is an attribute of probability to the truth and validity of the so-called knowledge.
- Over time, and with further experience, many things that are "known" (believed) to be true are later discarded as erroneous.

Incompleteness of Knowledge

- It is important to recognize the incompleteness of conventional belief.
- There are many various views of the truth, each one an incomplete observation of the single true reality.
- NB: This applies to each person as well as collectively. **There will always be some error!**

The Evolvement of Knowledge

- Consequently, it is best to view "human knowledge" as "human belief" with the understanding that both are subject to change and evolvement.
- The collection of currently accepted human beliefs about reality is best viewed as a model of the world.
- The world model is continuously refined to better fit observational data, and to make better technology.
- The world model always has room for improvement!

The Physical/Logical Duality

Any representation (symbolic or iconic) has the
Physical/Logical Duality:

- Hardware:Software
- Medium:Message
- Channel:Signal
- MemoryDevice:Data
- Like a physical disk drive *versus* a logical disk drive
- There is a physical basis for all recorded knowledge

The Physical/Logical Analogy

- **There is an analogy between:**
  Mass/Energy Transfer and Data Transfer
- **In fact, whenever there is a data transfer, there is also energy transfer.**

Copying magnetic patterns between media

- In computer hardware
- In a person's mind

Representation of the Real World

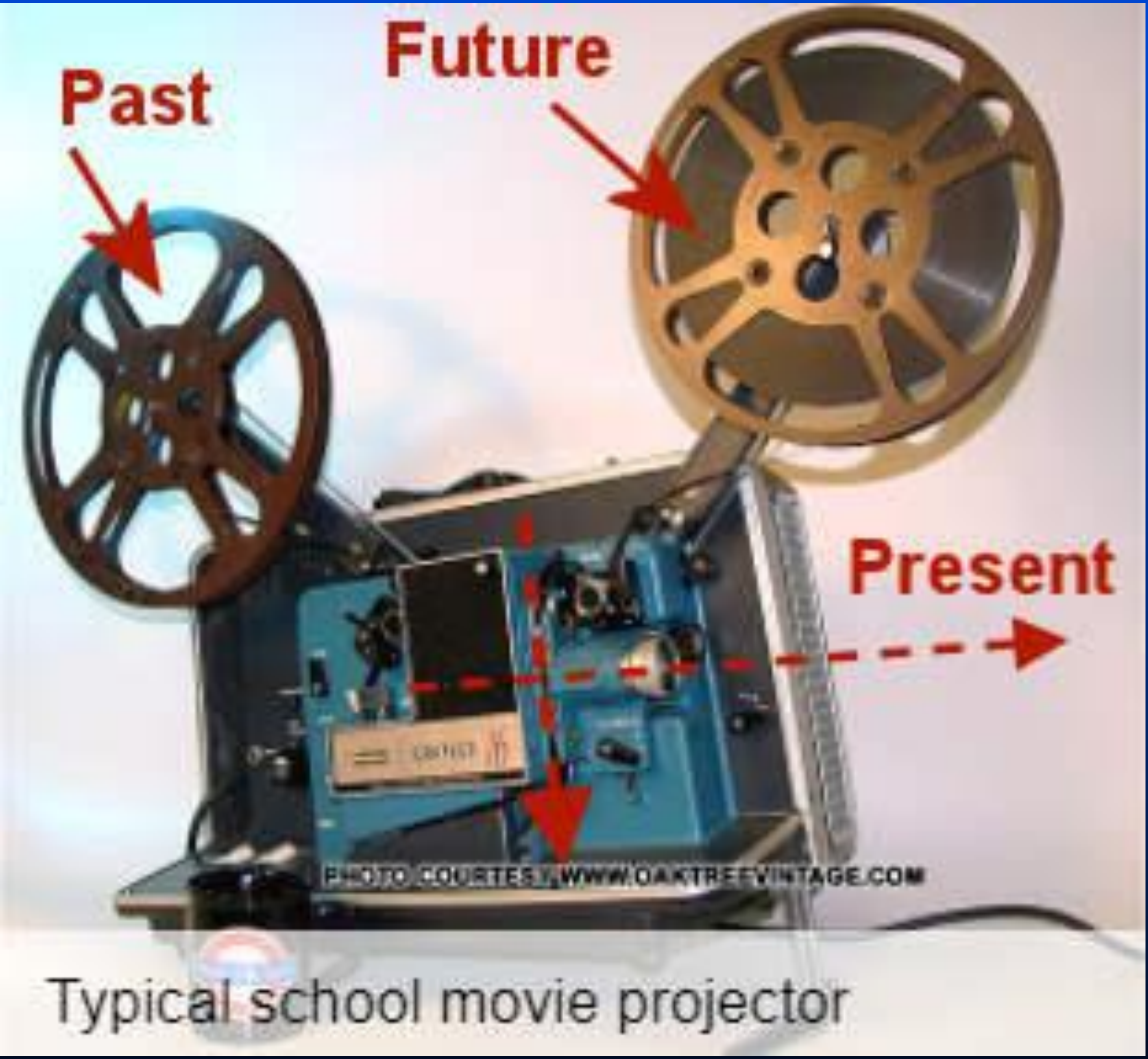
Numerous information modalities (channels) available:

Image of Real World – Experience of Perception as Recorded Data

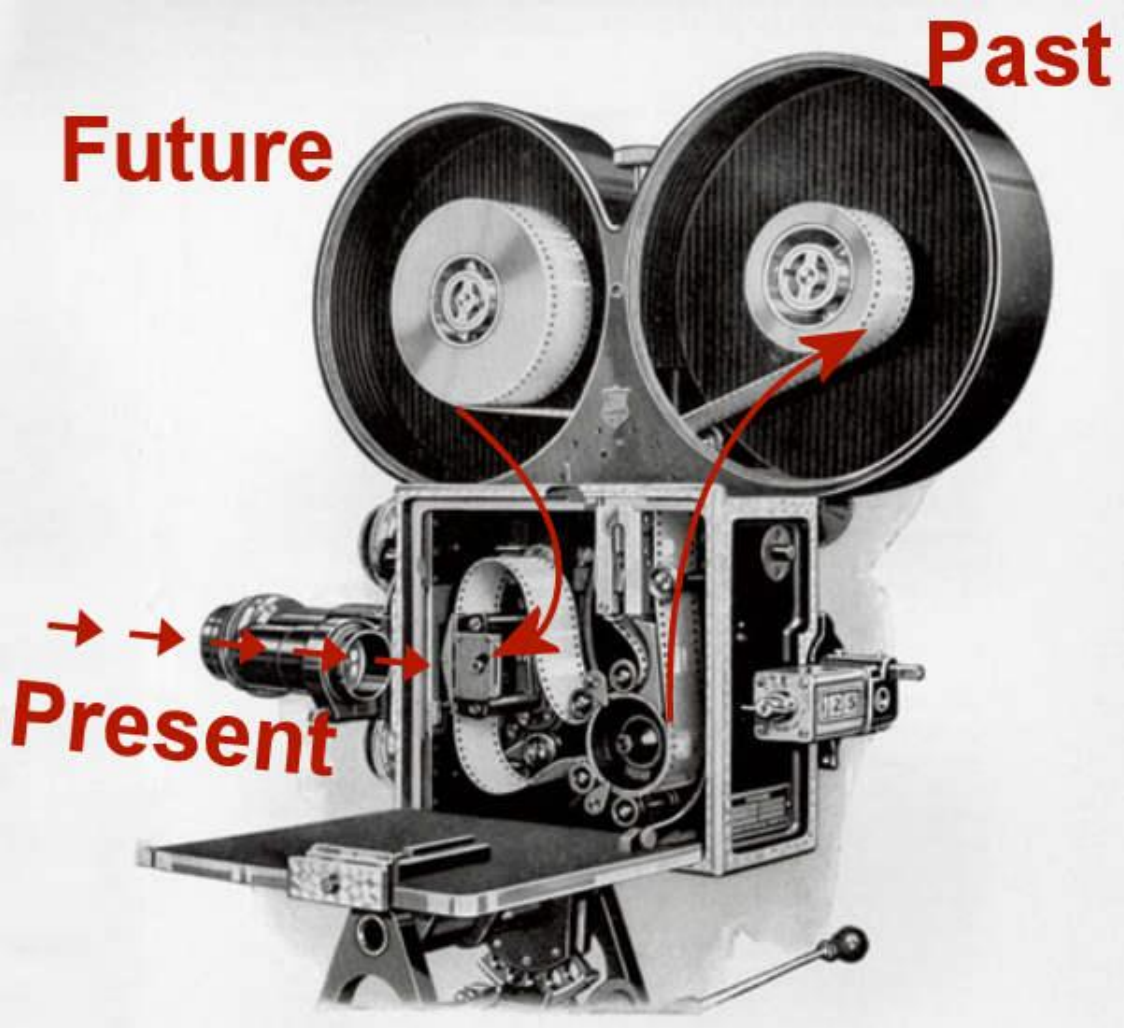
Recording a representation of the real world (actuality)

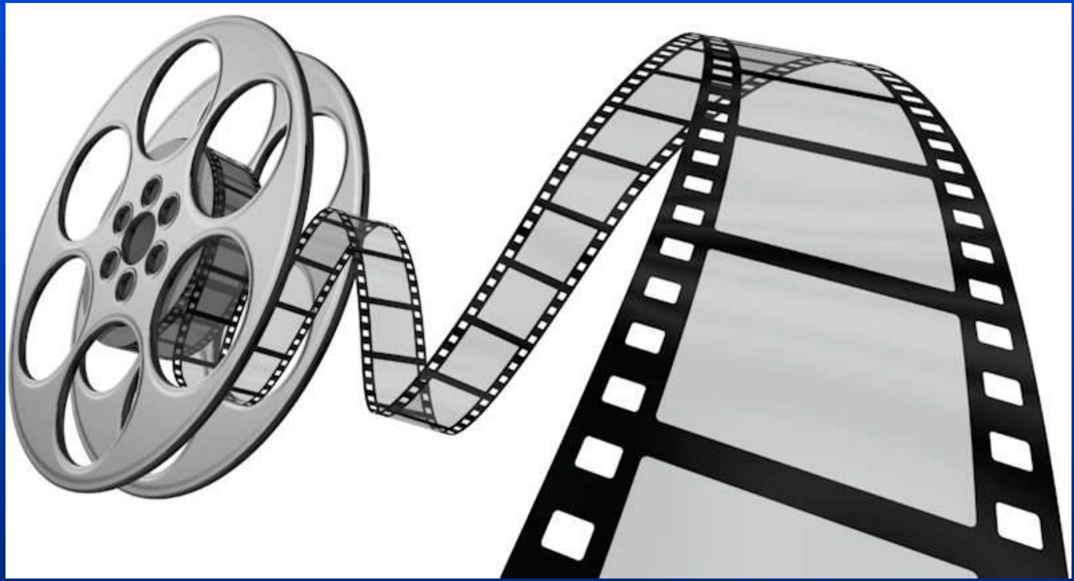
Level	Dimension	Static		Dynamic	
Acoustic/Sonic	M/L^4	🔈	Sound	🔈′	Audio
Optic/Iconic	IL^2	❐	Image	❐′	Video
Text/Graphic	XL	X	Drawing	X′	Animation
Math/Symbolic	#L	#	Expression	#′	Procedure
Digital facsimile/Informatic	ϕL	ϕ	Data	ϕ′	Program

4-Dimensional Spacetime as a 3-d Movie



Experience of Spacetime as Cinematography





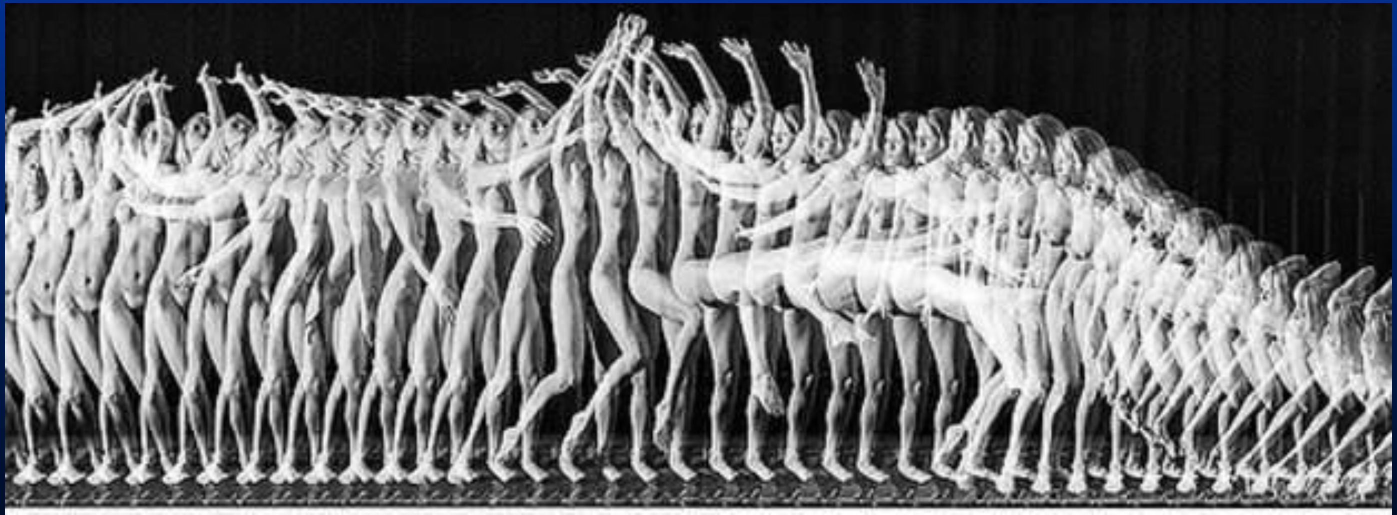
Sensory experience as making a recording;
"remembering" as playing it back.

Dynamics of Experiential Knowledge

- Awareness of the Passage of Time
- Duality of Awareness (Present/Past; Self/Other)
- Just a neurological recording that will fade away over time?

Passage of Time in 4-Dimensional Space

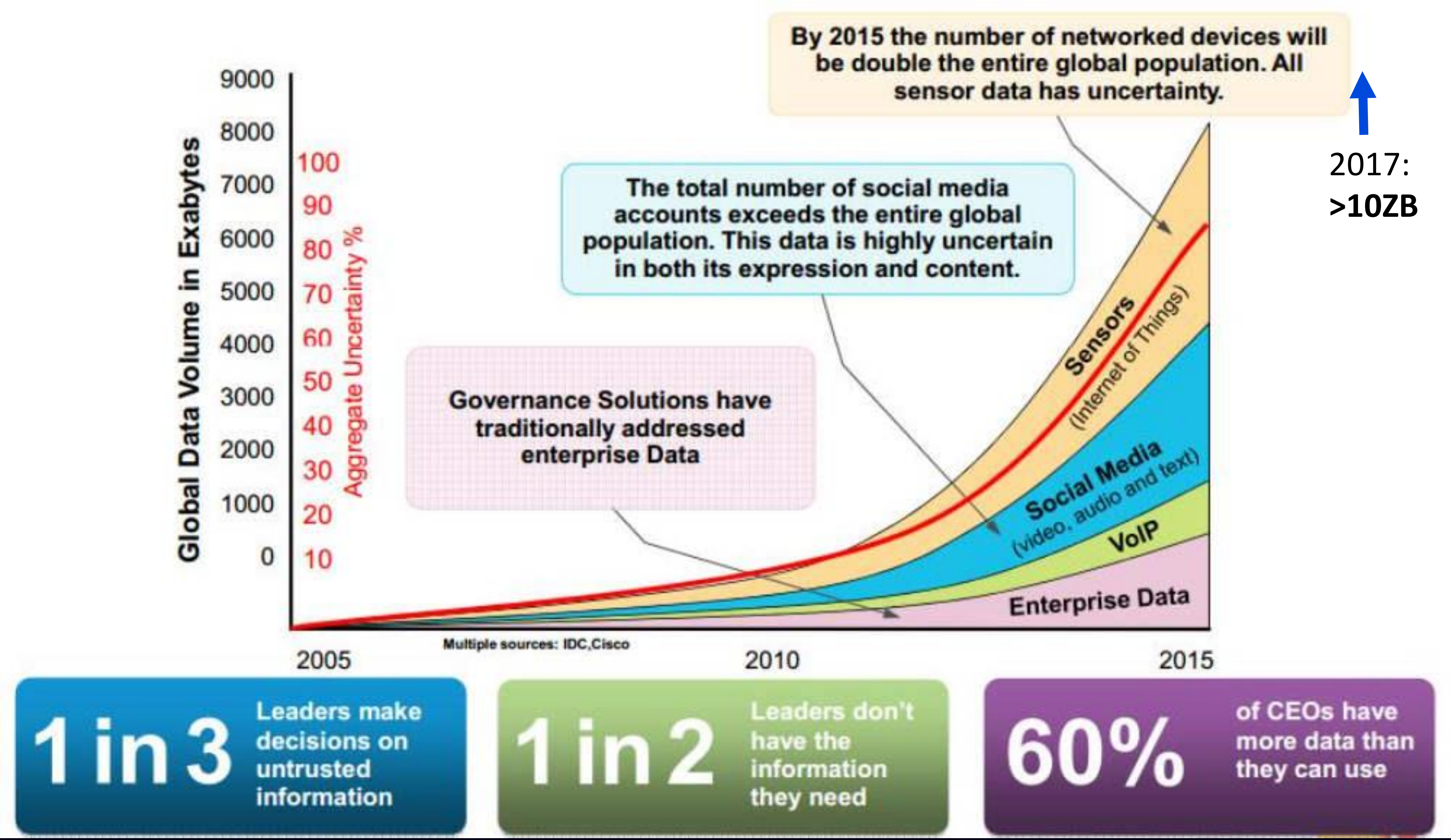
- Reality as 4-d recording, as it is being created from moment to moment. We only experience the present moment.
- Possibility of a Permanent Past, which continues to exist (we just no longer have the same access to past as we do to present)



Data Content of Your Life

- Consider the possibility that **everyone knows everything**. Like telepathically identifying a person's reality when face to face.
- Suppose each person has the potential ability to know anything about another person's life.
- Attempting deception would be pointless
- A logical basis for sincerity, honesty, non-denial, truthfulness: NO PRIVACY!

Acceleration of Data Flow



2017:
>10ZB

Data Content of Your Life

Information Content of a Person's Lifetime

in terms of:

Amount of data storage required for 24/7 recording

Years	Days	Hours	Minutes	Audio (1MB/min) MP3 (TB)	Video (1GB/hr) MP4 (TB)
1	365	8,754	525,240	0.5	8.8
10	3,648	87,540	5,252,400	5	88
20	7,295	175,080	10,504,800	11	175
30	10,943	262,620	15,757,200	16	263
40	14,590	350,160	21,009,600	21	350
50	18,238	437,700	26,262,000	26	438
60	21,885	525,240	31,514,400	32	525
70	25,533	612,780	36,766,800	37	613
80	29,180	700,320	42,019,200	42	700 TB
90	32,828	787,860	47,271,600	47	788
100	36,475	875,400	52,524,000	53	875

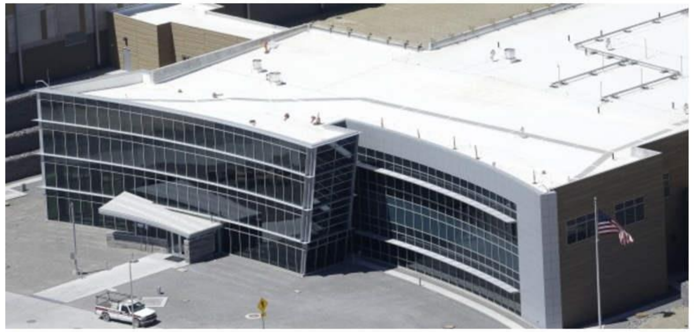
Personal Data Volume

Utah Data Center

Value	Metric	
1000^1	kB	kilobyte
1000^2	MB	megabyte
1000^3	GB	gigabyte
1000^4	TB	terabyte
1000^5	PB	petabyte
1000^6	EB	exabyte
1000^7	ZB	zettabyte
1000^8	YB	yottabyte

Estimated
Storage Capacity:
"3 to 12 Exabytes"
Cost: $4B
Power/yr: $40M (65MW)

- **Size:** 1 million square feet. 100,000 square feet will compose four data halls with data-storage servers. 900,000 square feet will serve for technical and administrative support staff,which is expected to be less than 200 employees.



This June 6, 2013, photo, shows an aerial view of the NSA's Utah Data Center in Bluffdale, Utah. The nation's new billion-dollar epicenter for fighting global cyberthreats sits just south of Salt Lake City, tucked away on a National Guard base at the foot of snow-capped mountains. The long, squat buildings span 1.5 million square feet, and are filled with super-powered computers designed to store massive amounts of information gathered secretly from phone calls and emails. (Photo: AP/Rick Bowmer)

- **Why Utah?:** Lots of water for cooling massive servers, low utility rates, workforce and low potential for extreme weather-related disasters. There's also room for expansion.

It turns out that everything you do online IS being recorded!

See Kevin Shipp on YouTube

He explains the distinction between shadow government and deep state

Big Data:
Storage Requirements for Records on All People

Personal Data Volume

100TB	per person	1TB	per person	1GB	per person
100PB	x1000	1PB	x1000	1TB	x1000
100EB	x1000000	1EB	x1000000	1PB	x1000000
100ZB	x1000000000	1ZB	x1000000000	1EB	x1000000000
1YB	10 billion people	0.01YB	10 billion people	10EB	10 billion people

Causality - Transmission of Influence

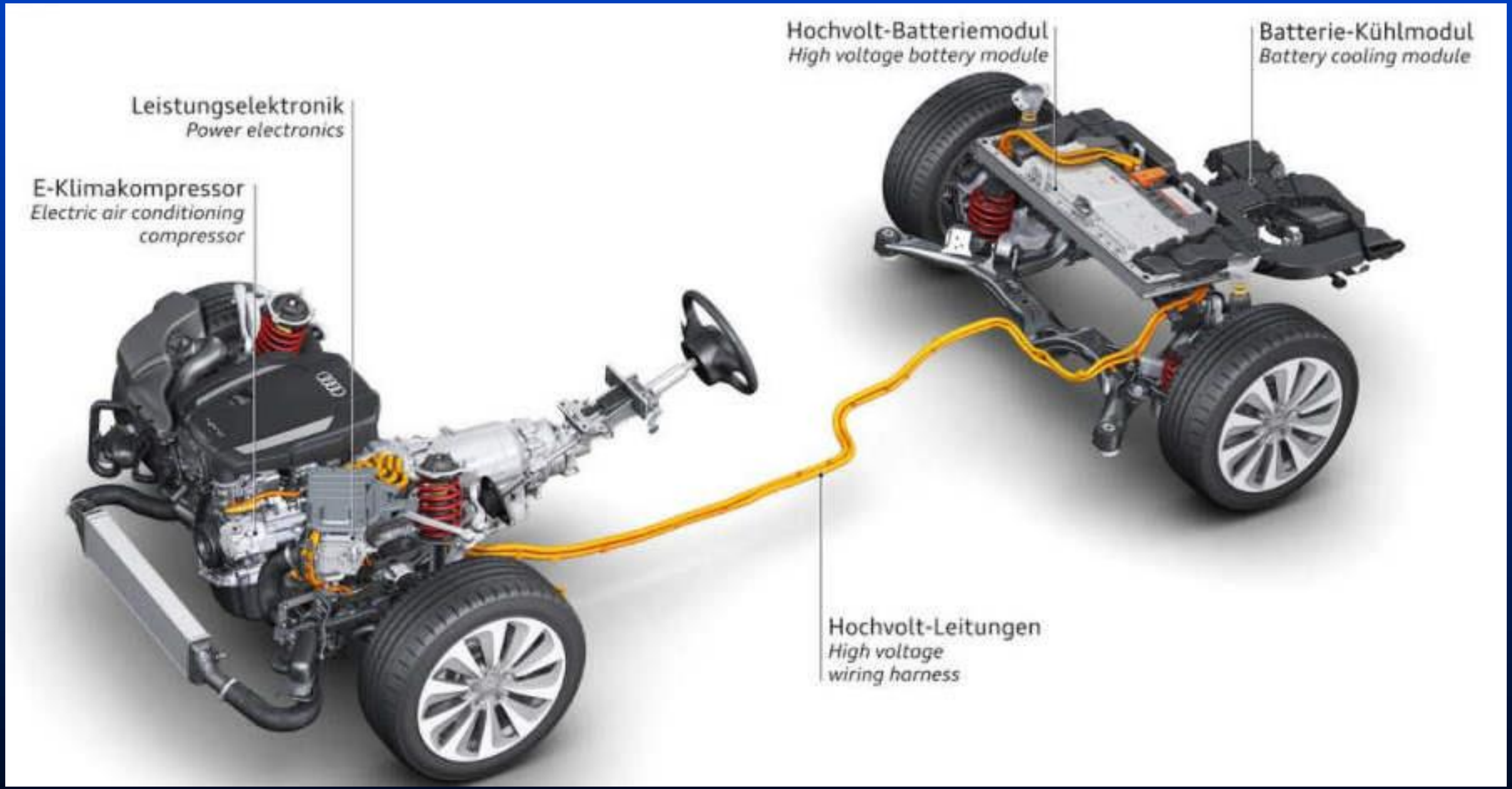
Paradox of Unbroken Chain of Causal Events

- If there is a reason for everything, and nature operates according to fixed laws, do we have free will?
- Stochastic Determinism
- Chaotic processes:
  Sensitive Dependence on Initial Conditions (SDIC)
- Free Will: is it engaged, or are you a creature of habit?
- Many people are running on autopilot

Will as Power Train of a Vehicle

Power/Drive Train Parameters – Emotive force as voltage field

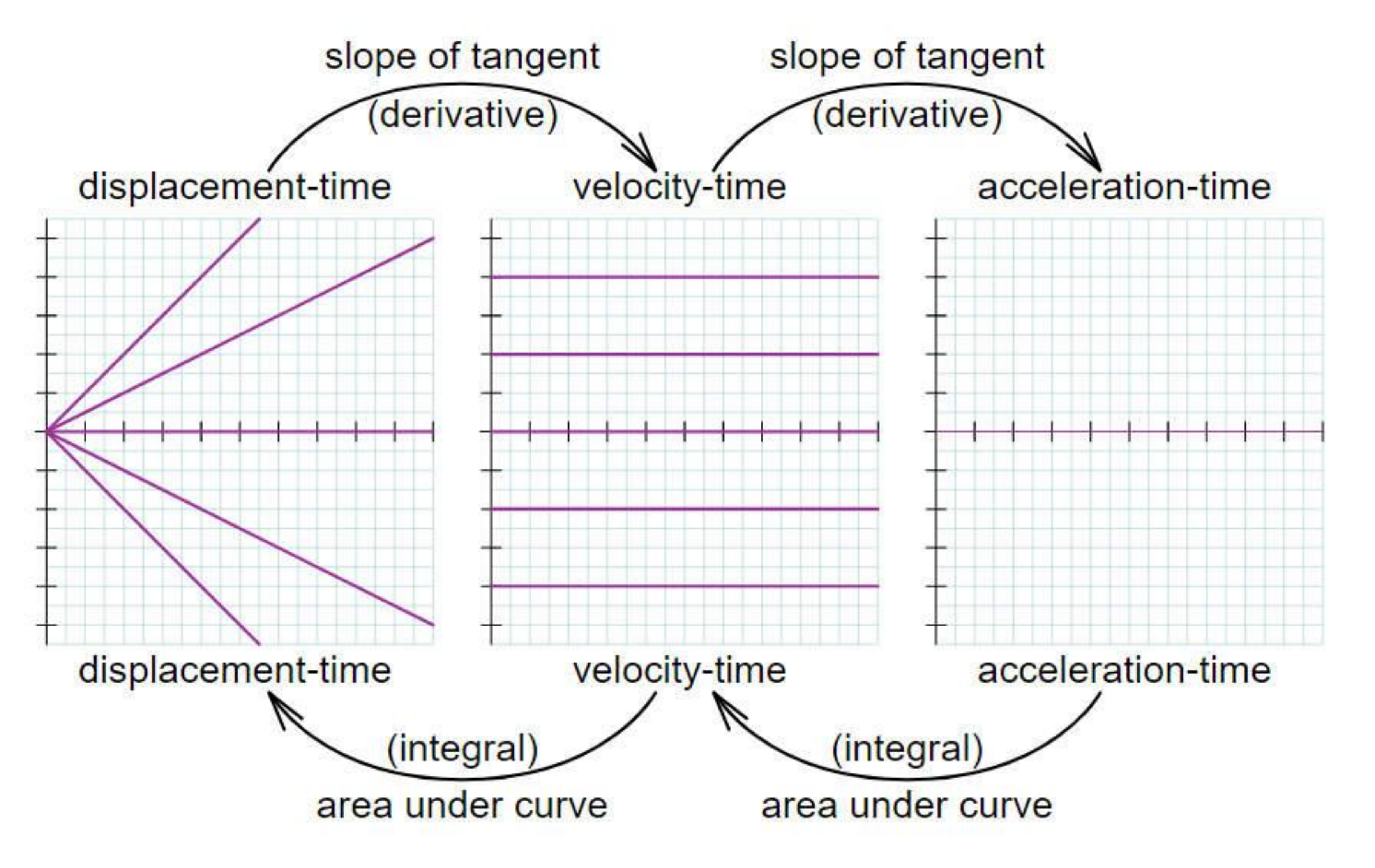
- Direction (Steering)
- Forward/Reverse (Gear)
- Speed (Velocity)
- Effective engagement of Will also requires sufficient torque to match the load and to overcome impedance.



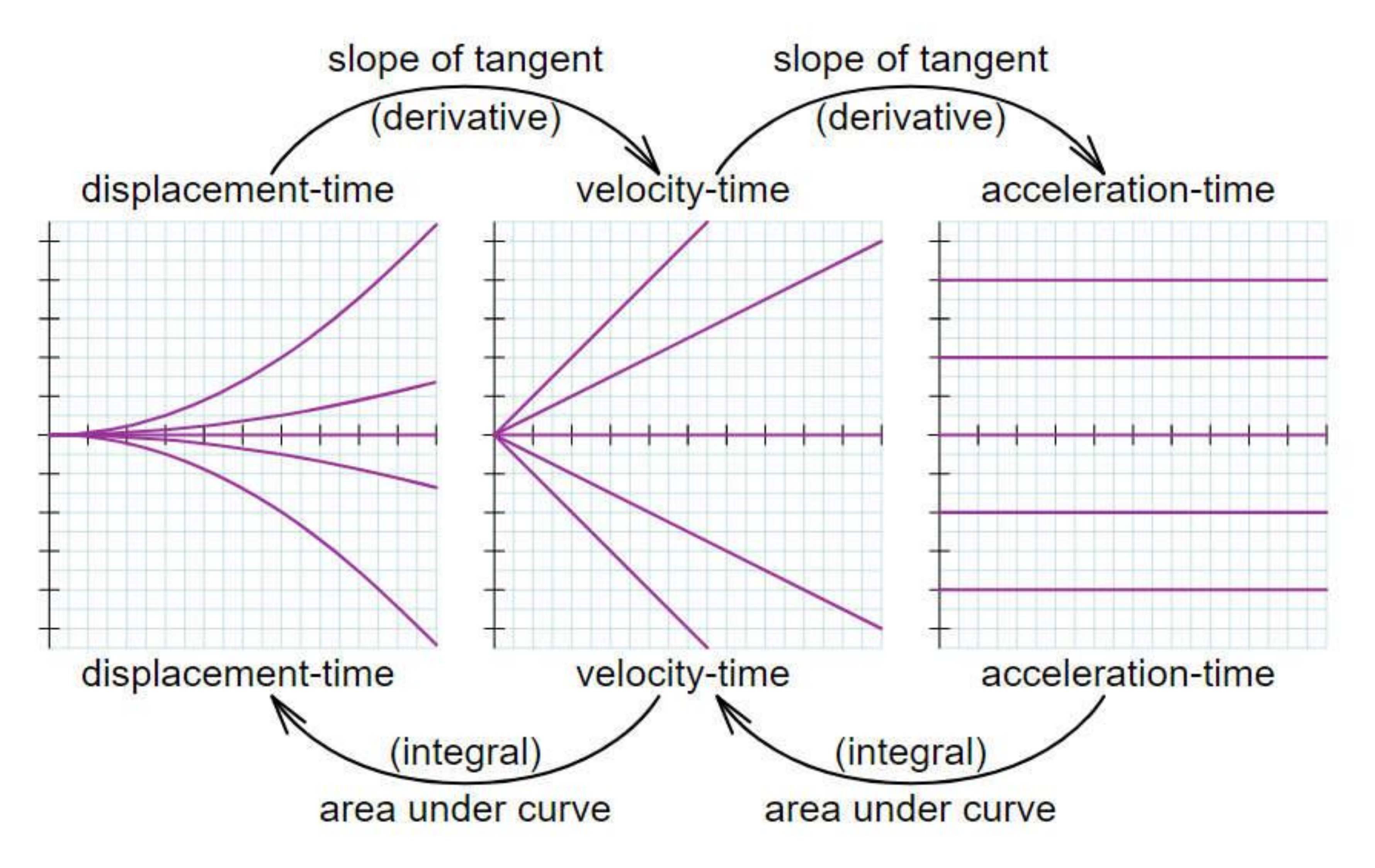
Paradox of Change from Zero Position

- The transition from stationary to in motion:
- Change in position – from stationary at x_1 (x_1=0 for a long time) to a new stationary position implies movement: $x_1 \rightarrow x_1 + \Delta \mathbf{x}$
  implies Δ^n**x** changes from zero to non-zero
- If **x** changes from 0 to 1, then Δ**x** changes 0 to 1
- If Δ**x** changes from 0 to 1, then Δ^2**x** changes 0 to 1
- If Δ^2**x** changes 0 to 1 , then Δ^3**x** changes 0 to 1, *etc*
- To consider: is $\mathbf{\Delta x^n}$ a cause or an effect?

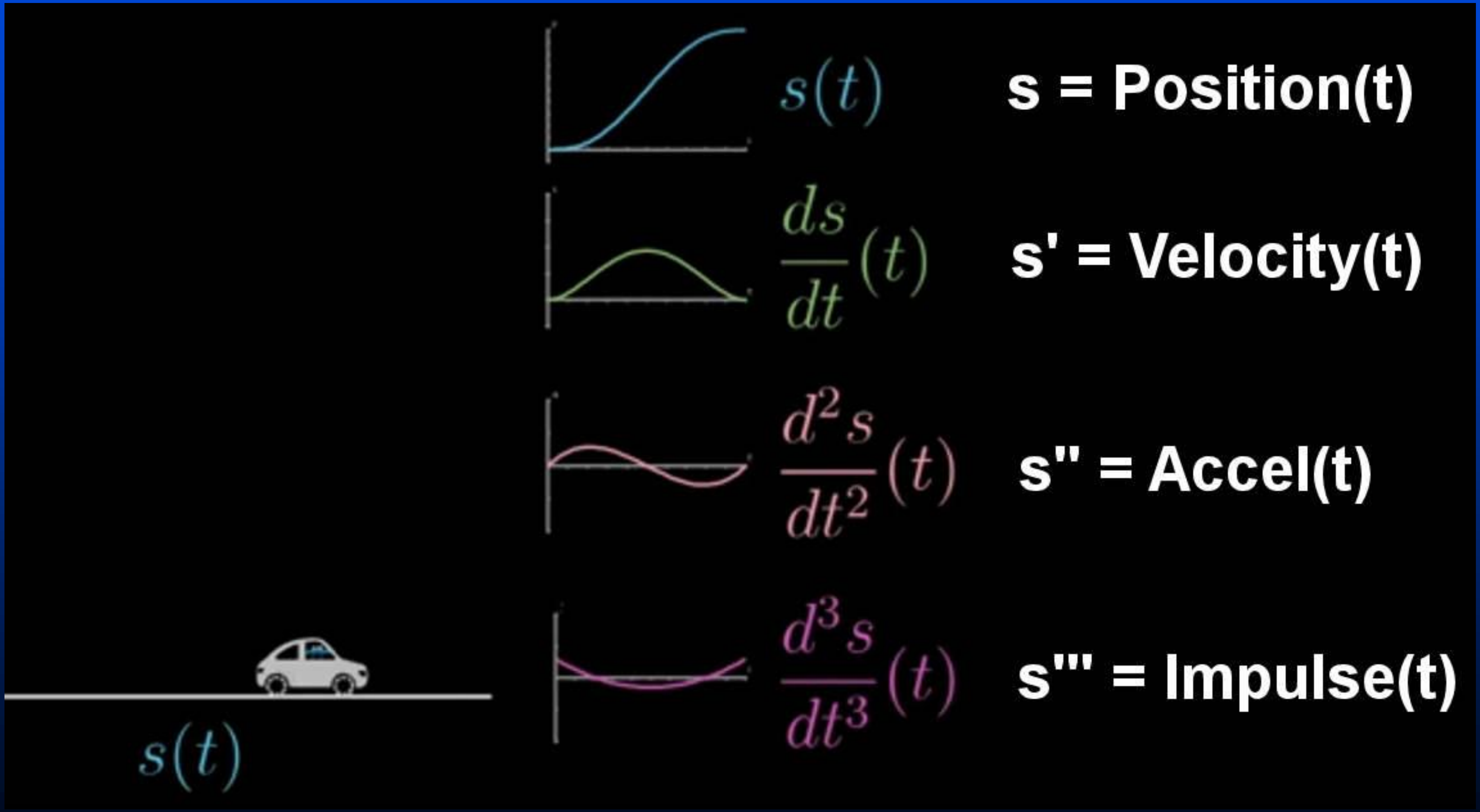
First 2 derivatives of position (wrt time)



First 2 derivatives of position (wrt time)



First 3 derivatives of position (wrt time)



Differential Grid (Δx midway between x_n & x_{n+1})

Differentials

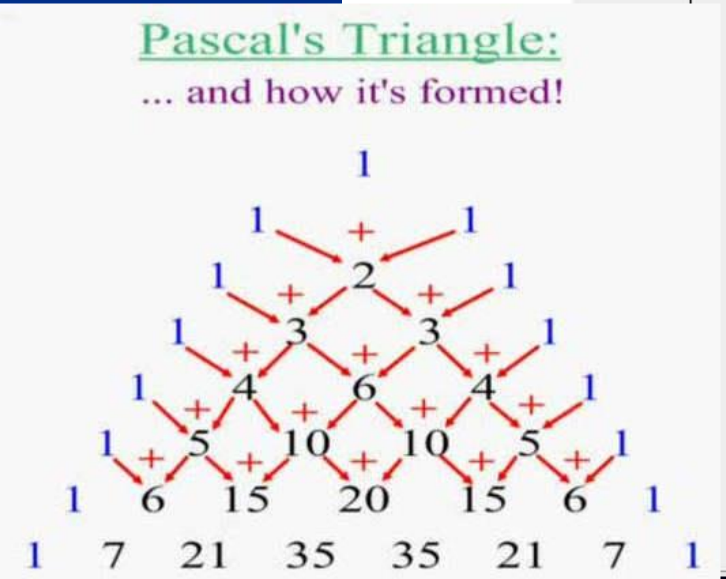
Difference Order:		1	2	3	4	5	6	7	8	9
Derivative:		$\Delta x/\Delta t$	$\Delta^2x/\Delta t^2$	$\Delta^3x/\Delta t^3$	$\Delta^4x/\Delta t^4$	$\Delta^5x/\Delta t^5$	$\Delta^6x/\Delta t^6$	$\Delta^7x/\Delta t^7$	$\Delta^8x/\Delta t^8$	$\Delta^9x/\Delta t^9$
t	x	x'	x''	x'''	x''''	x'''''	x''''''	x'''''''	x''''''''	x'''''''''
0	1									
		0								
1	1		0							
		0		0						
2	1		0		0					
		0		0		0				
3	1		0		0		0			
		0		0		0		0		
4	1		0		0		0		0	
		0		0		0		0		0
5	1		0		0		0		0	
		0		0		0		0		1
6	1		0		0		0		1	
		0		0		0		1		-8
7	1		0		0		1		-7	
		0		0		1		-6		28
8	1		0		1		-5		21	
		0		1		-4		15		-56
9	1		1		-3		10		-35	
		1		-2		6		-20		70
10	2		-1		3		-10		35	
		0		1		-4		15		-56

Differential Grid

Differentials

Differential Pascal Triangle

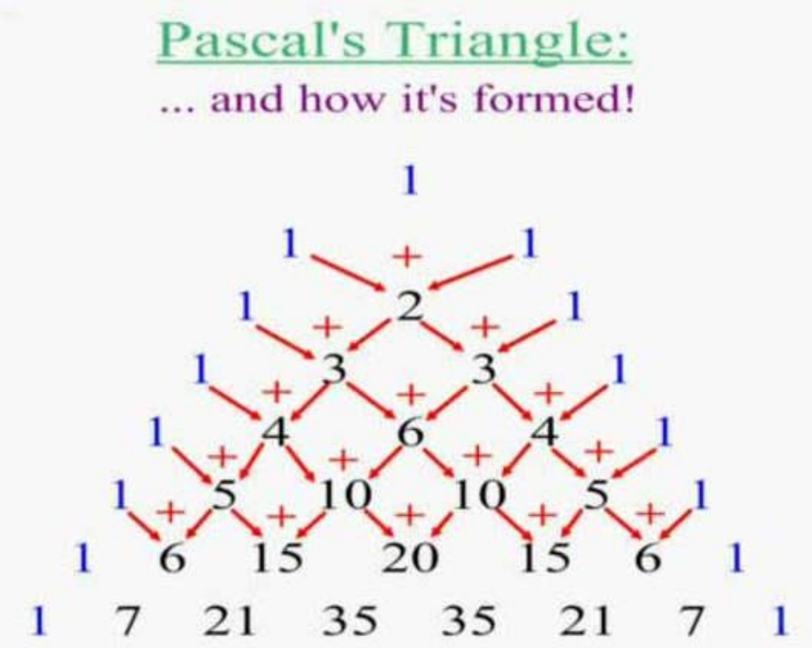
Difference Order:		1	2	3	4	5	6	7	8	9
Derivative:		$\Delta x/\Delta t$	$\Delta^2 x/\Delta t^2$	$\Delta^3 x/\Delta t^3$	$\Delta^4 x/\Delta t^4$	$\Delta^5 x/\Delta t^5$	$\Delta^6 x/\Delta t^6$	$\Delta^7 x/\Delta t^7$	$\Delta^8 x/\Delta t^8$	$\Delta^9 x/\Delta t^9$
t	x	x'	x''	x'''	x''''	x'''''	x''''''	x'''''''	x''''''''	x'''''''''
0	1									
1	1	0								
2	1	0	0							
3	1	0	0	0						
4	1	0	0	0	0					
5	1	0	0	0	0	0				
6	1	0	0	0	0	0	0			
7	1	0	0	0	0	0	0	0		
8	1	0	0	0	0	0	0	0	0	
	1	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0
	2	1	1	1	1	1	1	1	1	1
	3	1	0	-1	-2	-3	-4	-5	-6	-7
	4	1	0	0	1	3	6	10	15	21
	5	1	0	0	0	-1	-4	-10	-20	-35
	6	1	0	0	0	0	1	5	15	35
	7	1	0	0	0	0	0	-1	-6	-21
	8	1	0	0	0	0	0	0	1	7
	9	1	0	0	0	0	0	0	0	-1
	10	1	0	0	0	0	0	0	0	0
	12	2	1	1	1	1	1	1	1	1
	14	2	0	-1	-2	-3	-4	-5	-6	-7



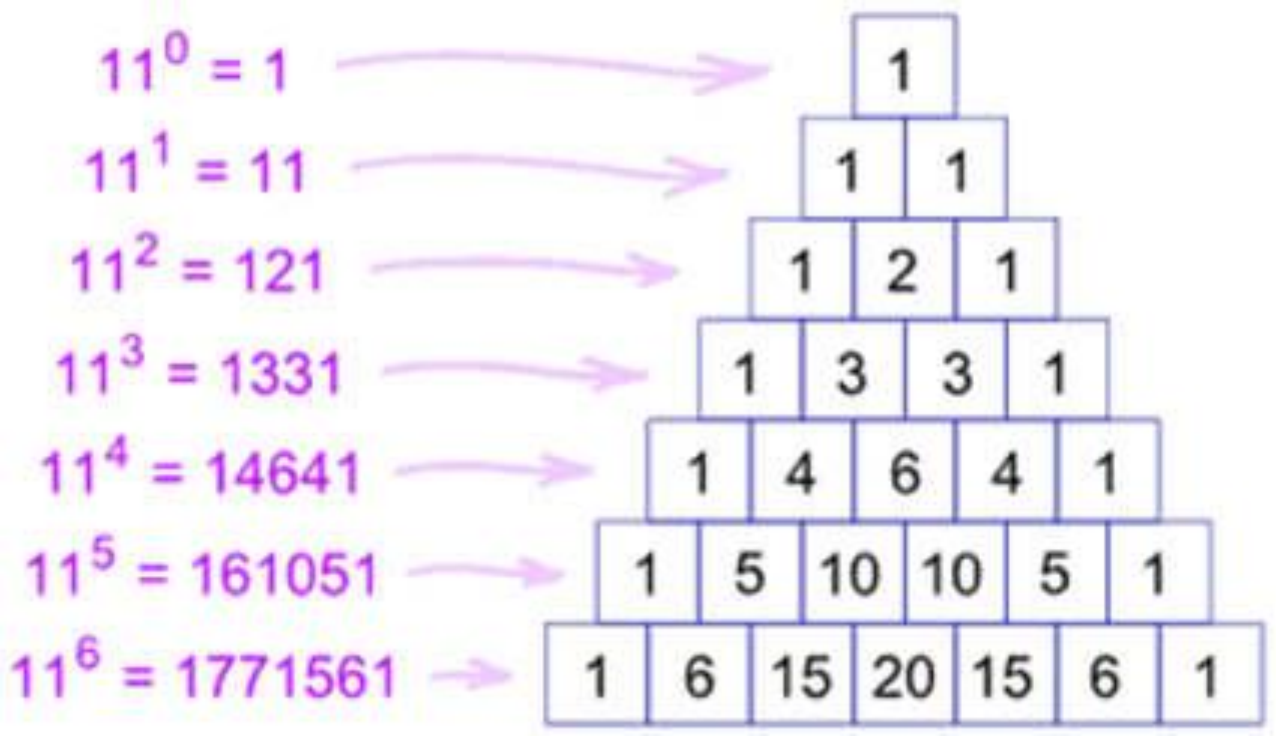
Differential Grid (closer view)

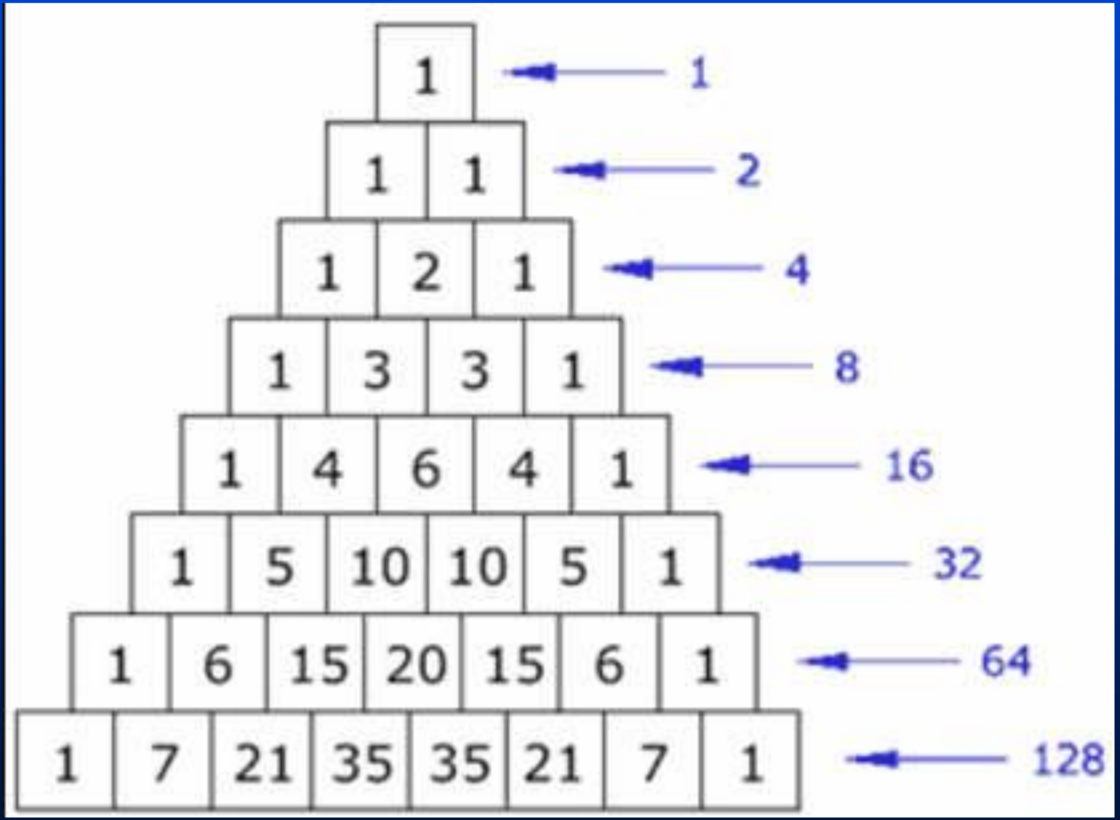
Differentials

Difference Order:		1	2	3	4	5	6	7	8	9
Derivative:		$\Delta x/\Delta t$	$\Delta^2x/\Delta t^2$	$\Delta^3x/\Delta t^3$	$\Delta^4x/\Delta t^4$	$\Delta^5x/\Delta t^5$	$\Delta^6x/\Delta t^6$	$\Delta^7x/\Delta t^7$	$\Delta^8x/\Delta t^8$	$\Delta^9x/\Delta t^9$
t	x	x'	x''	x'''	x''''	x'''''	x''''''	x'''''''	x''''''''	x'''''''''
10	1	0	0	0	0	0	0	0	0	0
11	2	1	1	1	1	1	1	1	1	1
12	3	1	0	-1	-2	-3	-4	-5	-6	-7
13	4	1	0	0	1	3	6	10	15	21
		1	0	0	0	-1	-4	-10	-20	-35
		1	0	0	0	0	1	5	15	35
		1	0	0	0	0	0	-1	-6	-21
		1	0	0	0	0	0	0	1	7
		1	0	0	0	0	0	0	0	-1
		1	0	0	0	0	0	0	0	0
		2	1	1	1	1	1	1	1	1
		2	0	-1	-2	-3	-4	-5	-6	-7
		2	0	0	1	3	6	10	15	21



Pascal's Triangle
interesting patterns





Differential Grid

		Differentials								
Difference Order:		1	2	3	4	5	6	7	8	9
Derivative:		$\Delta x/\Delta t$	$\Delta^2 x/\Delta t^2$	$\Delta^3 x/\Delta t^3$	$\Delta^4 x/\Delta t^4$	$\Delta^5 x/\Delta t^5$	$\Delta^6 x/\Delta t^6$	$\Delta^7 x/\Delta t^7$	$\Delta^8 x/\Delta t^8$	$\Delta^9 x/\Delta t^9$
t	x	x'	x''	x'''	x''''	x'''''	x''''''	x'''''''	x''''''''	x'''''''''
19	10	1	0	0	0	0	0	0	0	0
20	12	2	1	1	1	1	1	1	1	1
21	14	2	0	-1	-2	-3	-4	-5	-6	-7
22	16	2	0	0	1	3	6	10	15	21
23	18	2	0	0	0	-1	-4	-10	-20	-35
24	20	2	0	0	0	0	1	5	15	35
25	22	2	0	0	0	0	0	-1	-6	-21
26	24	2	0	0	0	0	0	0	1	7
27	26	2	0	0	0	0	0	0	0	-1
28	28	2	0	0	0	0	0	0	0	0
29	30	2	0	0	0	0	0	0	0	0
30	30	0	-2	-2	-2	-2	-2	-2	-2	-2
31	28	-2	-2	0	2	4	6	8	10	12
32	26	-2	0	2	2	0	-4	-10	-18	-28
33	24	-2	0	0	-2	-4	-4	0	10	28
34	22	-2	0	0	0	2	6	10	10	0
35	20	-2	0	0	0	0	-2	-8	-18	-28
36	18	-2	0	0	0	0	0	2	10	28
37	16	-2	0	0	0	0	0	0	-2	-12
38	14	-2	0	0	0	0	0	0	0	2
39	12	-2	0	0	0	0	0	0	0	0
40	10	-2	0	0	0	0	0	0	0	0
41	8	-2	0	0	0	0	0	0	0	0

Paradox of Change from Zero Position

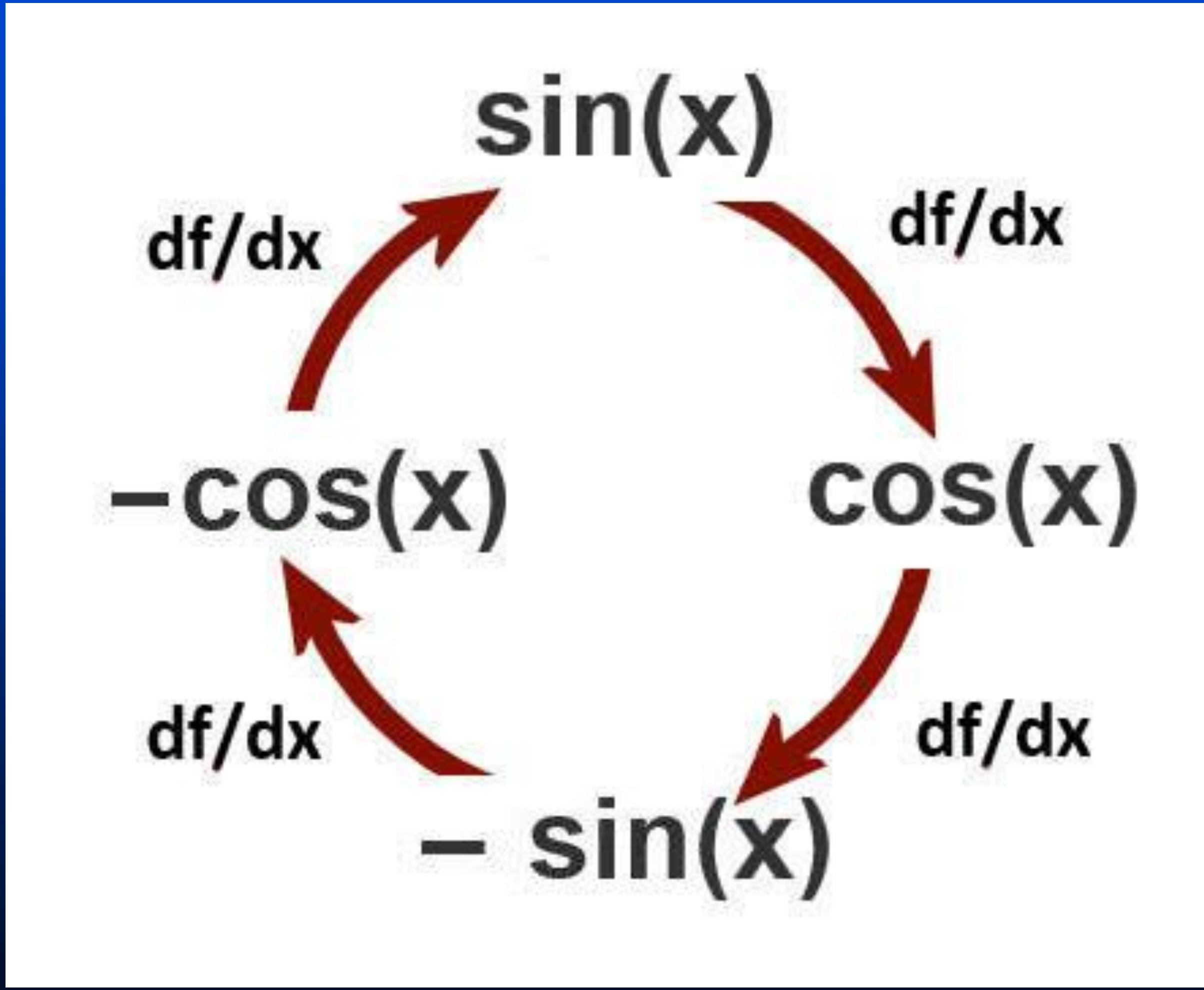
- If Δx changes, then $\Delta^2 x$ changes
- If $\Delta^2 x$ changes, then $\Delta^3 x$ changes, *etc (where does it end?)*

Resolution:

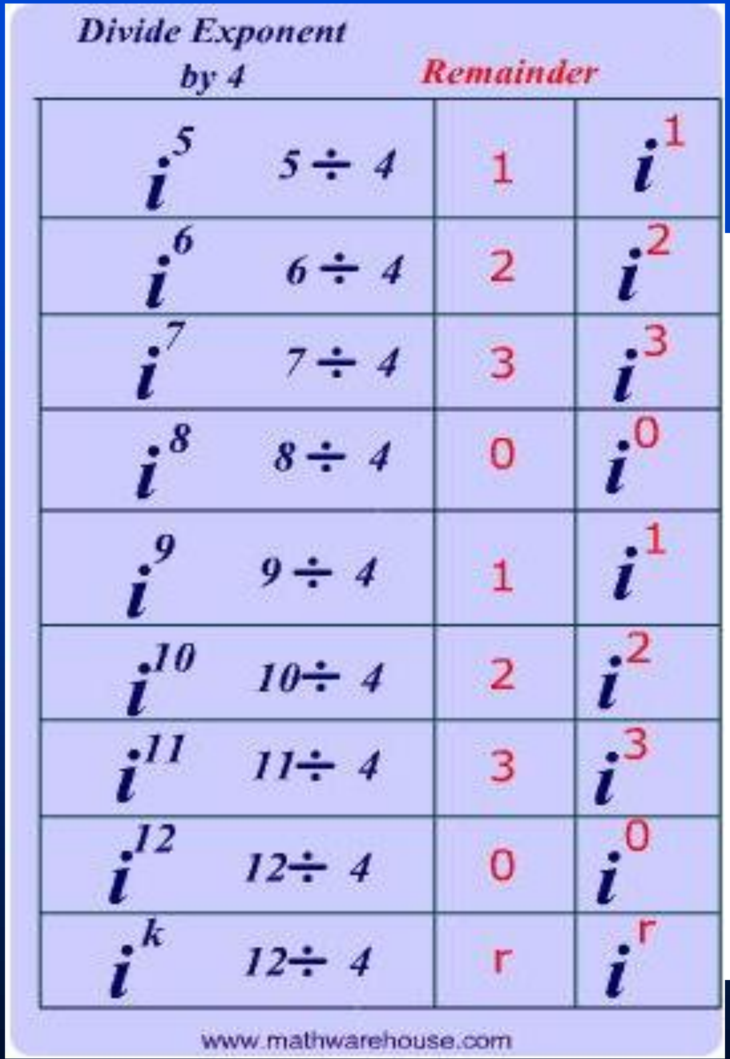
1. Everything is always in motion
2. Motion includes oscillating component (e.g. vibration)
3. Higher order derivatives of sinusoidal functions are sinusoidal

Paradox of Change from Zero Position

$f(x)=$	$\sin(x)$
$f'(x)=$	$\cos(x)$
$f''(x)=$	$-\sin(x)$
$f'''(x)=$	$-\cos(x)$
$f^{(4)}(x)=$	$\sin(x)$
$f^{(5)}(x)=$	$\cos(x)$
$f^{(6)}(x)=$	$-\sin(x)$
$f^{(7)}(x)=$	$-\cos(x)$
$f^{(8)}(x)=$	$\sin(x)$

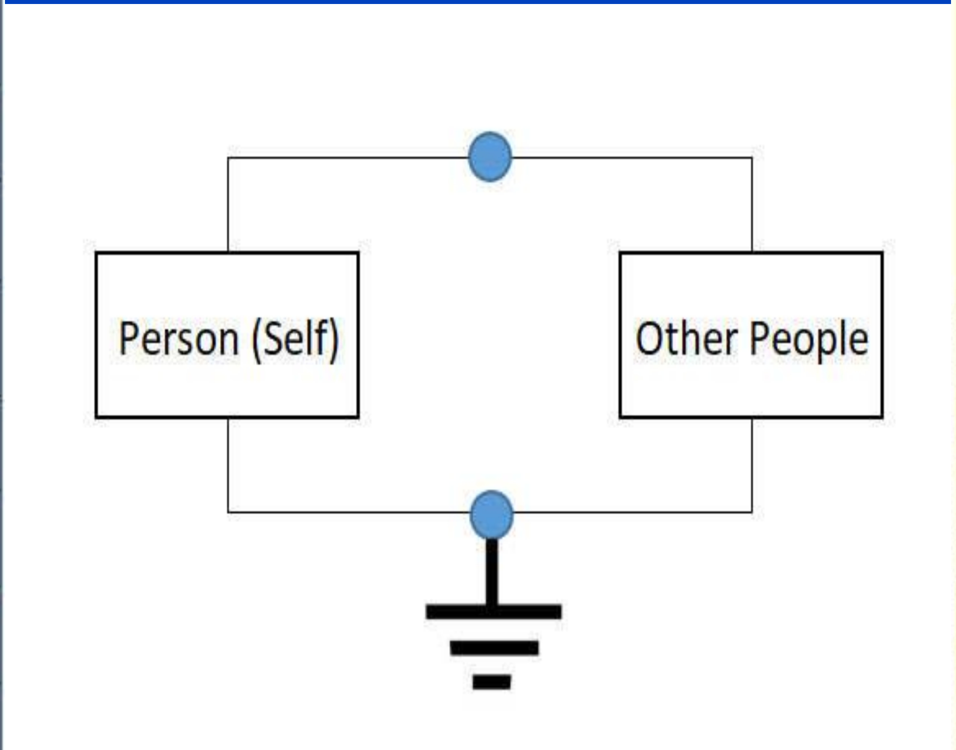


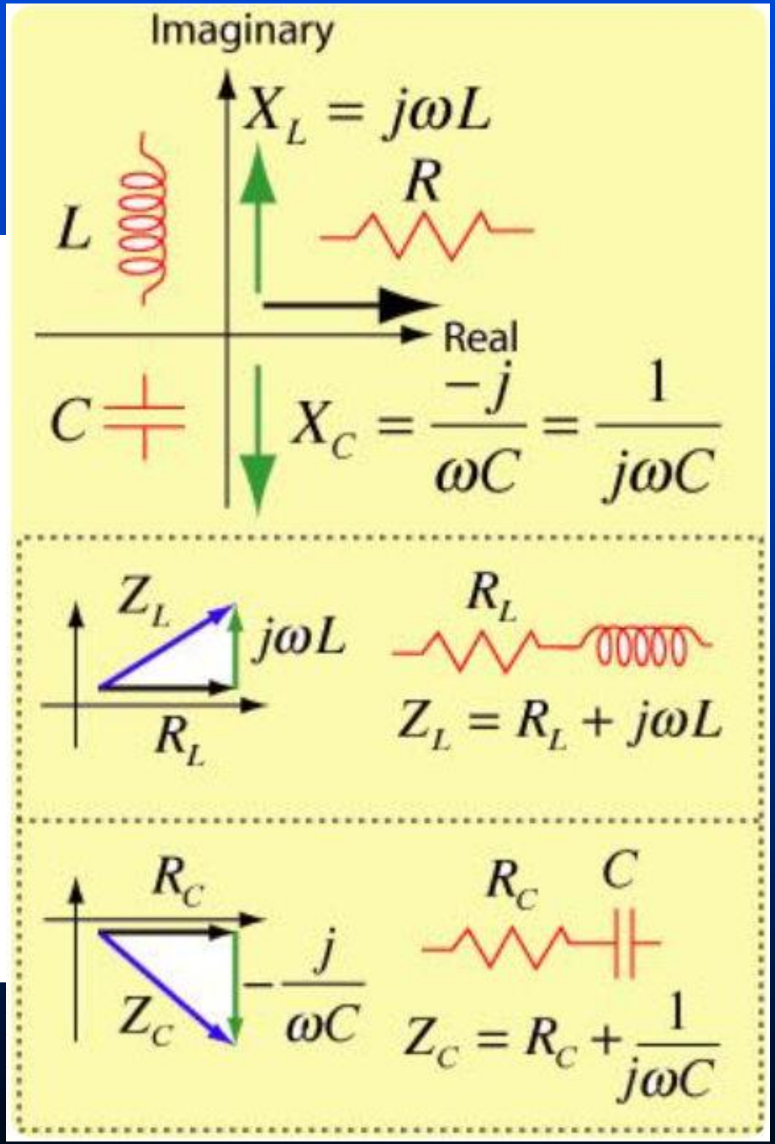
System Modeling



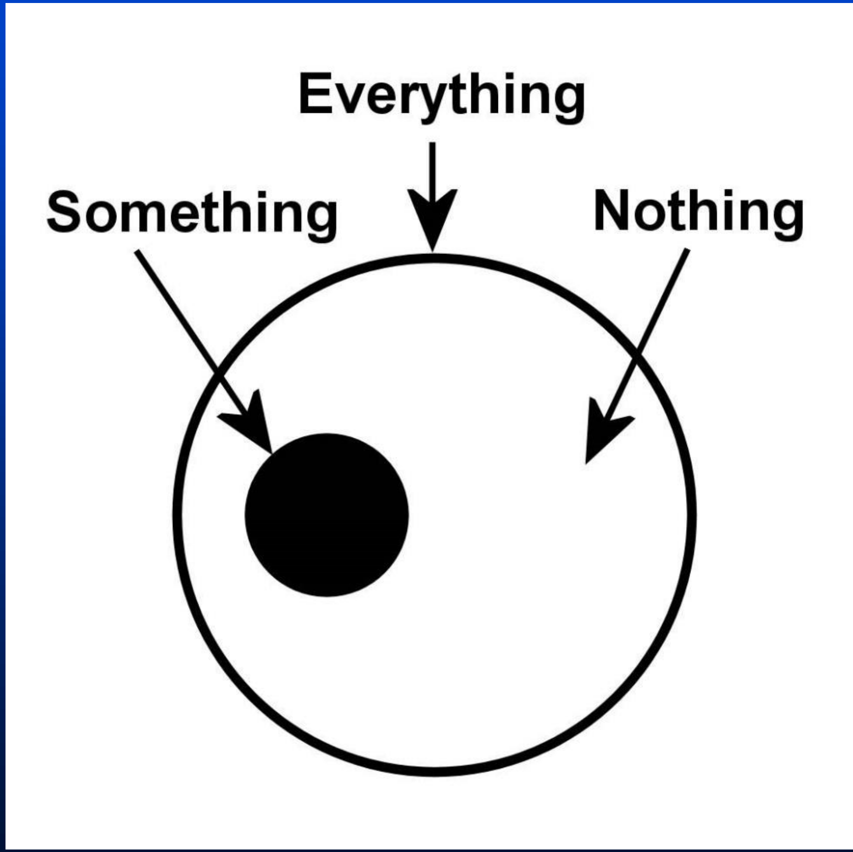
Divide Exponent by 4		Remainder	
i^5	$5 \div 4$	1	i^1
i^6	$6 \div 4$	2	i^2
i^7	$7 \div 4$	3	i^3
i^8	$8 \div 4$	0	i^0
i^9	$9 \div 4$	1	i^1
i^{10}	$10 \div 4$	2	i^2
i^{11}	$11 \div 4$	3	i^3
i^{12}	$12 \div 4$	0	i^0
i^k	$12 \div 4$	r	i^r

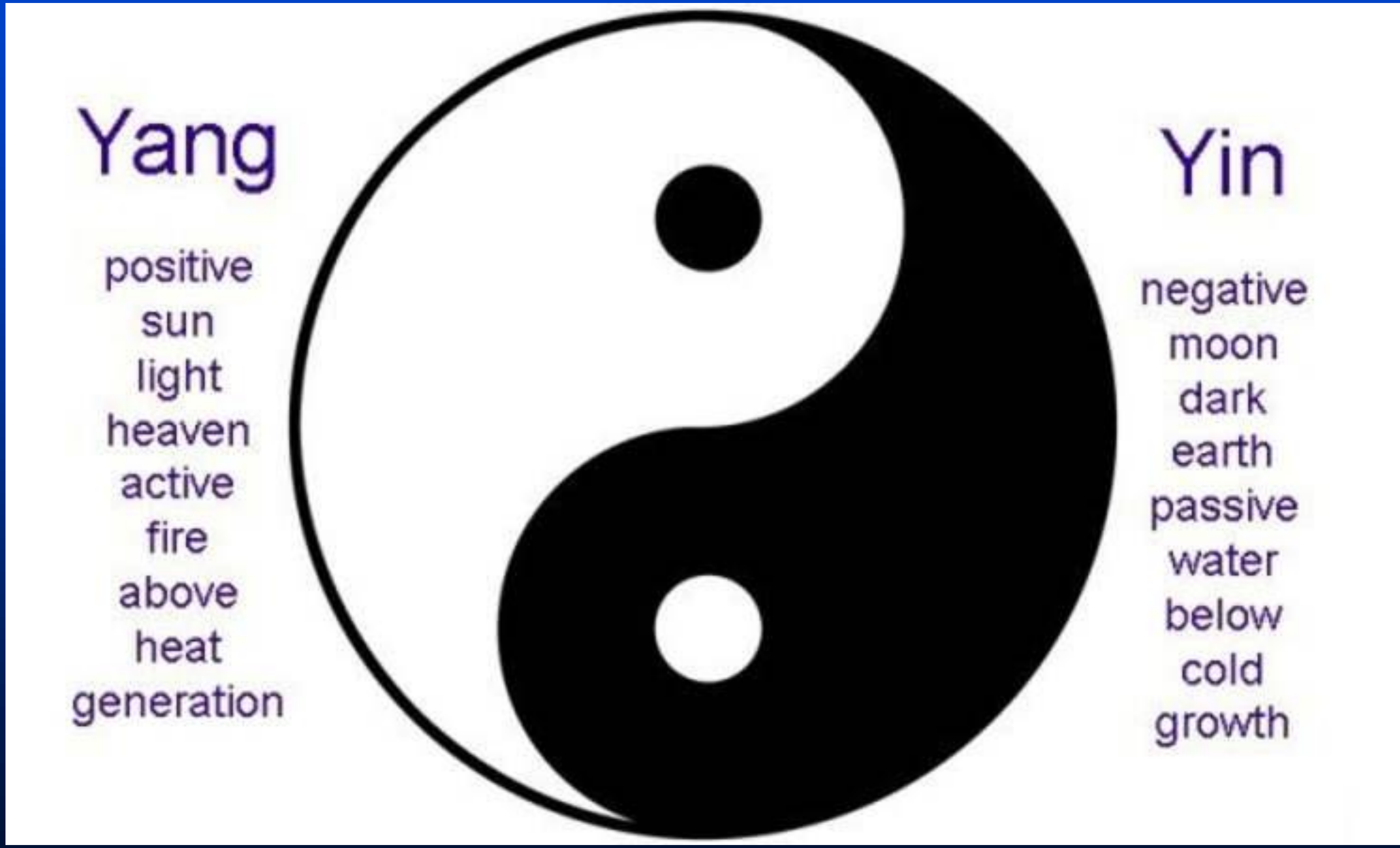
www.mathwarehouse.com



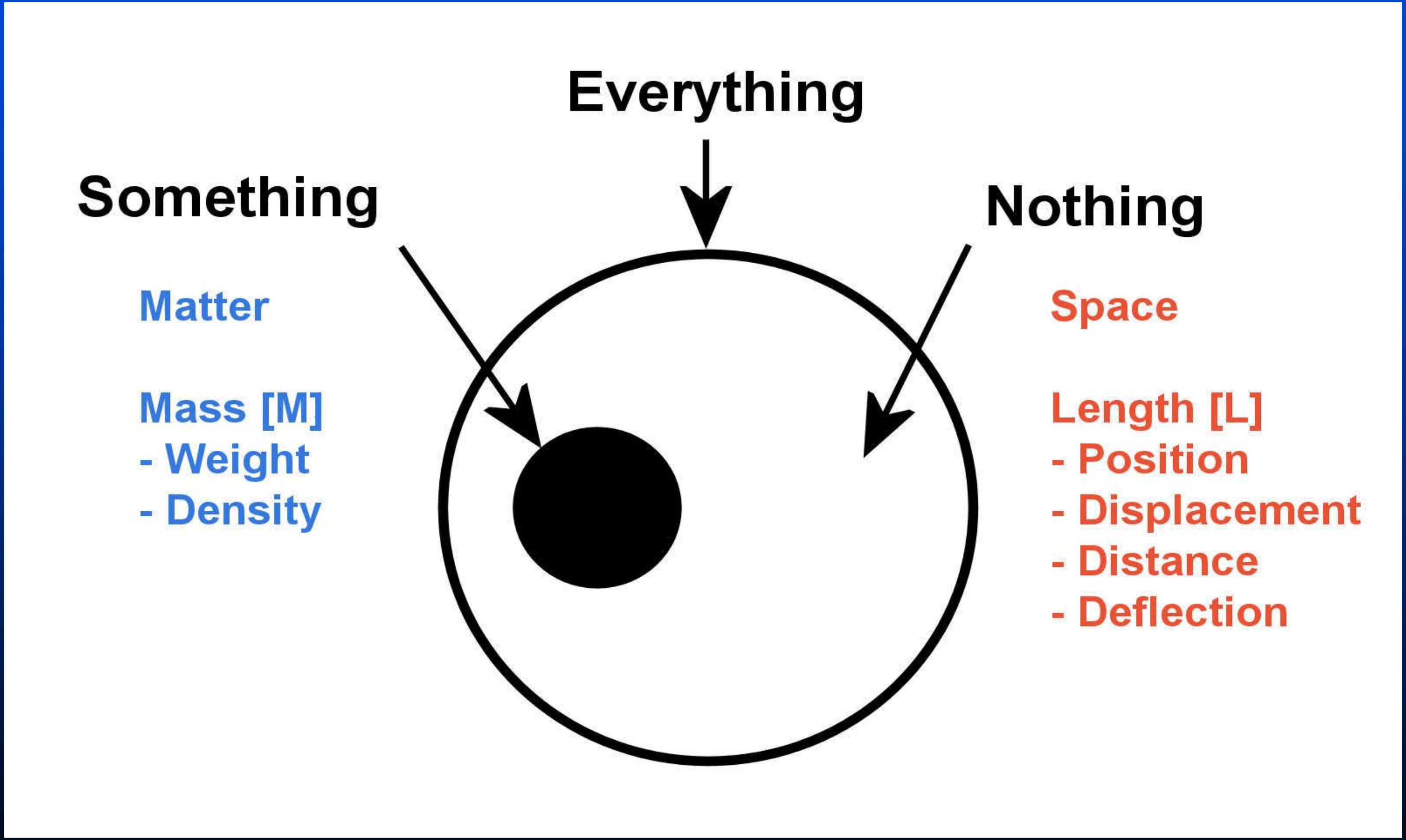


Duality


Everything
Something
Nothing


Yang
positive
sun
light
heaven
active
fire
above
heat
generation
Yin
negative
moon
dark
earth
passive
water
below
cold
growth

Duality



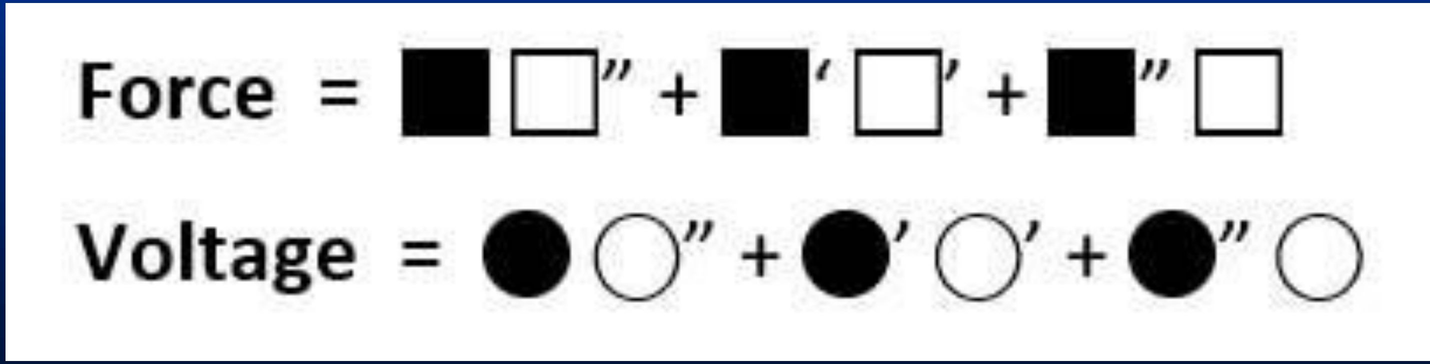
Everything
Something
Nothing
Matter
Mass [M]
- Weight
- Density
Space
Length [L]
- Position
- Displacement
- Distance
- Deflection

Duality – Space/Time

Position		**Motion**	
Location	[L]	**Translation**	[L/T]
Locus		Velocity	
Distance, Length, Displacement		Placement	
Orientation	[A]	**Rotation**	[A/T]
Cycle, Frequency		Cycle, Revolutions	
Phase, Aspect, Angular Displacement		Oscillation, Spin, Vibration	
Form		**Process**	
Structure	[X]	**Procedure**	[X/T]
Arrangement		Rearrangement	
Assembly		Join/Split, Attach/Detach	
Shape	[S]	**Transform**	[S/T]
Boundary Curvature		Deflection	
Boundary Texture		Stretch/Squeeze	

Analogy in Physical Action

- Based on constitutive equations in the form of ordinary second-order differential equations of dynamics
- Mathematical isomorphism is found at all levels of energetic transfer



Action Level

Rotational
$T = J\alpha + D_r\omega + K_r\theta$

Mechanical
$F = Ma + Dv + Kx$

Solid-Mechanical
$\tau = \rho\varepsilon'' + \mu_p\varepsilon' + E\varepsilon$

Hydraulic
$p = \rho q' + R_f q + A_f/C_f$

Acoustic
$p = I\xi'' + R_a\xi' + s\xi$

Electrical
$E = Li' + Ri + q/C$

Magnetic
$\mathcal{F} = \mathcal{J}\phi' + \mathcal{R}\phi + \int \phi\, dt / \mathcal{C}$

Thermal
$\tau = I_T q_T' + R_T q_T + w_T/C_p$

Analogy in Physical Action: The Constitutive Equations of Motion

F = ■□″ + ■′□′ + ■″□

F = Force

■	= Mass	□	= Displacement
■′	= Friction	□′	= Velocity
■″	= Compliance	□″	= Acceleration

The prototype constitutive formula. A second-order ordinary linear differential equation as a model for energetic transfer. This example uses variables from the mechanical level.

Impedance, as the triple [■, ■′, ■″] can be represented as its inverse, admittance, with the inverse of resistance (the real component of impedance) as conductance, and the inverse of reactance (both inductive and capacitive) as susceptance.

$Z = X_L + R + X_C$ $\qquad$ $Y = B_L + G + B_C$

The complex terms (reactance) are sometimes combined and expressed as:

$Z = R + jX$

with:

$X_L = \omega L = 2\pi f L$ $\qquad$ $X_C = 1/\omega C = 1/2\pi f C$ $\qquad$ $X = X_L - X_C$

Symbol Conventions

Symbol Convention:

□ = [L]

■ = [M]

○ = [Q]

● = Electrical Inductance (L)

● = ■ x □²/ ○² = [ML²/Q²]

Motion (L/Tᵖ) = □ □′ □″

Electrical Current (I = [Q/Tᵖ]) = ○ ○′ ○″

Mechanical Impedance (Z = [M/Tᵖ]) = ■ ■′ ■″

Electrical Impedance (Z = [ML²/Q²Tᵖ] = ● ●′ ●″

Force = ■ □″ + ■′ □′ + ■″ □

Voltage = ● ○″ + ●′ ○′ + ●″ ○

Prior/Alternate Symbol Convention			
Dimension	**Early**	**Recent**	**Current**
[L]	□	○	□
[M]	○	□	■
[Q]	□	○	○
[ML²/Q²]	○	□	●

Analogy – Mathematical Isomorphism

Analogy in Physical Action

	Force		= Motion		X		Impedance			
Action Level	**Pressure**		**Flow** □'		**Inductance** ■		**Resistance** ■'		**Capacitance** ■"	
Rotational $T=J\alpha+D_r\omega+K_r\theta$	Torque **T**	$[ML^2A/T^2]$	Angular Velocity **ω**	[A/T]	Rotational Inertia **J**	$[ML^2]$	Rotational Drag $\mathbf{D_r}$	$[ML^2/T]$	Torque Constant $\mathbf{K_r}$	$[ML^2/T^2]$
Mechanical F=Ma+Dv+Kx	Force **F**	$[ML/T^2]$	Velocity **v**	[L/T]	Mass **M**	[M]	Friction **D**	[M/T]	Spring Constant **K**	$[M/T^2]$
Solid-Mechanical $\tau=\rho\varepsilon''+\mu_p\varepsilon'+E\varepsilon$	Stress **τ**	$[M/LT^2]$	Strain Rate **ε'**	[1/T]	Density **ρ**	[M/L]	Rigidity $\mathbf{\mu_p}$	[M/LT]	Modulus of Elasticity **E**	$[M/LT^2]$
Hydraulic $p=\rho q'+R_f q+A_f/C_f$	Pressure **p**	$[M/LT^2]$	Flow **q**	$[L^2/T]$	Density **ρ**	$[M/L^3]$	Fluid Resistance $\mathbf{R_f}$	[M/T]	1/Fluid Capacitance $\mathbf{1/C_f}$	$[M/L^3T^2]$
Acoustic $p=I\xi''+R_a\xi'+s\xi$	Acoustic Pressure **p**	$[M/L^3T^2]$	Diaphragm Velocity **ξ'**	[L/T]	Acoustic Inertance **I**	$[M/L^4]$	Acoustic Resistance $\mathbf{R_a}$	$[M/L^4T]$	Stiffness **s**	$[M/L^4T^2]$
Electrical E=Li'+Ri+q/C	Voltage **E**	$[ML^2/QT^2]$	Current **i**	[Q/T]	Inductance **L**	$[ML^2/Q^2]$	Resistance **R**	$[ML^2/Q^2T]$	1/Capacitance **1/C**	$[ML^2/Q^2T^2]$
Magnetic $\mathcal{F}=\mathcal{I}\phi'+\mathcal{R}\phi+\int\phi\,dt/\mathcal{C}$	Magnetomotive Force $\mathcal{F}$	[Q/T]	Flux **ϕ**	$[ML^2/QT]$	Magnetic Inductance $\mathcal{I}$	$[Q^2T/ML^2]$	Reluctance $\mathcal{R}$	$[Q^2/ML^2]$	1/Magnetic Capacitance $1/\mathcal{C}$	$[Q^2/ML^2T]$
Thermal $\tau=I_Tq_T'+R_Tq_T+w_T/C_p$	Temperature Difference **τ**	$[ML^2/T^2]=[K]$	Heat Flow $\mathbf{q_T}$	[H/T]	Thermal Inductance $\mathbf{I_T}$	$[KT^2/H]$	Thermal Resistance $\mathbf{R_T}$	[KT/H]	1/Thermal Capacitance $\mathbf{1/C_p}$	[K/H]

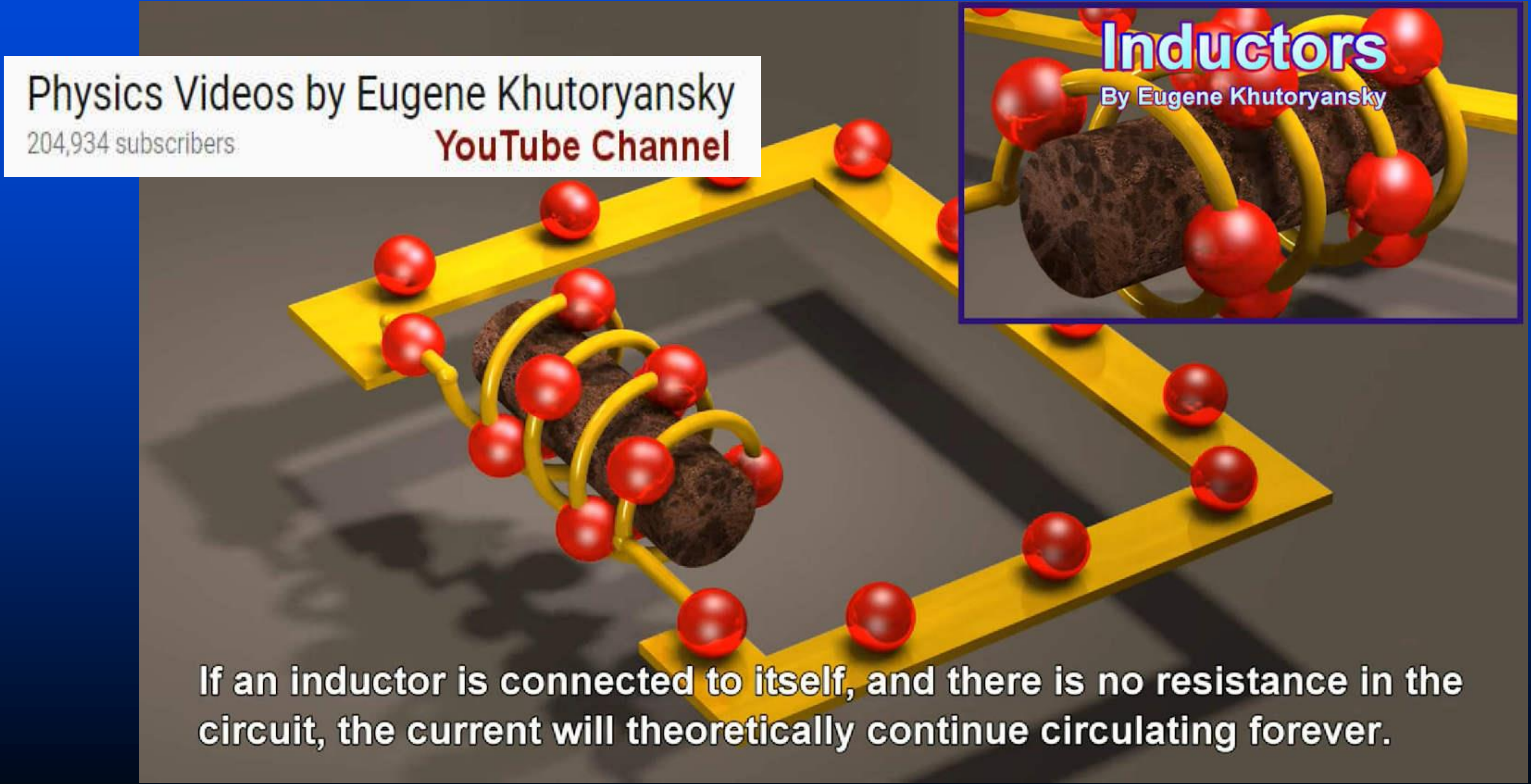
The Rosetta Stone for Physics

Action Level	Pressure		Flow	
Rotational $T=J\alpha+D_r\omega+K_r\theta$	Torque **T**	$[ML^2A/T^2]$	Angular Velocity **ω**	$[A/T]$
Mechanical $F=Ma+Dv+Kx$	Force **F**	$[ML/T^2]$	Velocity **v**	$[L/T]$
Solid-Mechanical $\tau=\rho\varepsilon''+\mu_p\varepsilon'+E\varepsilon$	Stress **τ**	$[M/LT^2]$	Strain Rate **ε'**	$[1/T]$
Hydraulic $p=\rho q'+R_f q+A_f/C_f$	Pressure **p**	$[M/LT^2]$	Flow **q**	$[L^2/T]$
Acoustic $p=I\xi''+R_a\xi'+s\xi$	Acoustic Pressure **p**	$[M/L^3T^2]$	Diaphragm Velocity **ξ'**	$[L/T]$
Electrical $E=Li'+Ri+q/C$	Voltage **E**	$[ML^2/QT^2]$	Current **i**	$[Q/T]$
Magnetic $\mathcal{F}=\mathcal{I}\phi'+\mathcal{R}\phi+\int\phi dt/\mathcal{C}$	Magnetomotive Force **$\mathcal{F}$**	$[Q/T]$	Flux **φ**	$[ML^2/QT]$
Thermal $\tau=I_T q_T'+R_T q_T+w_T/C_p$	Temperature Difference **τ**	$[ML^2/T^2]=[K]$	Heat Flow **q_T**	$[H/T]$

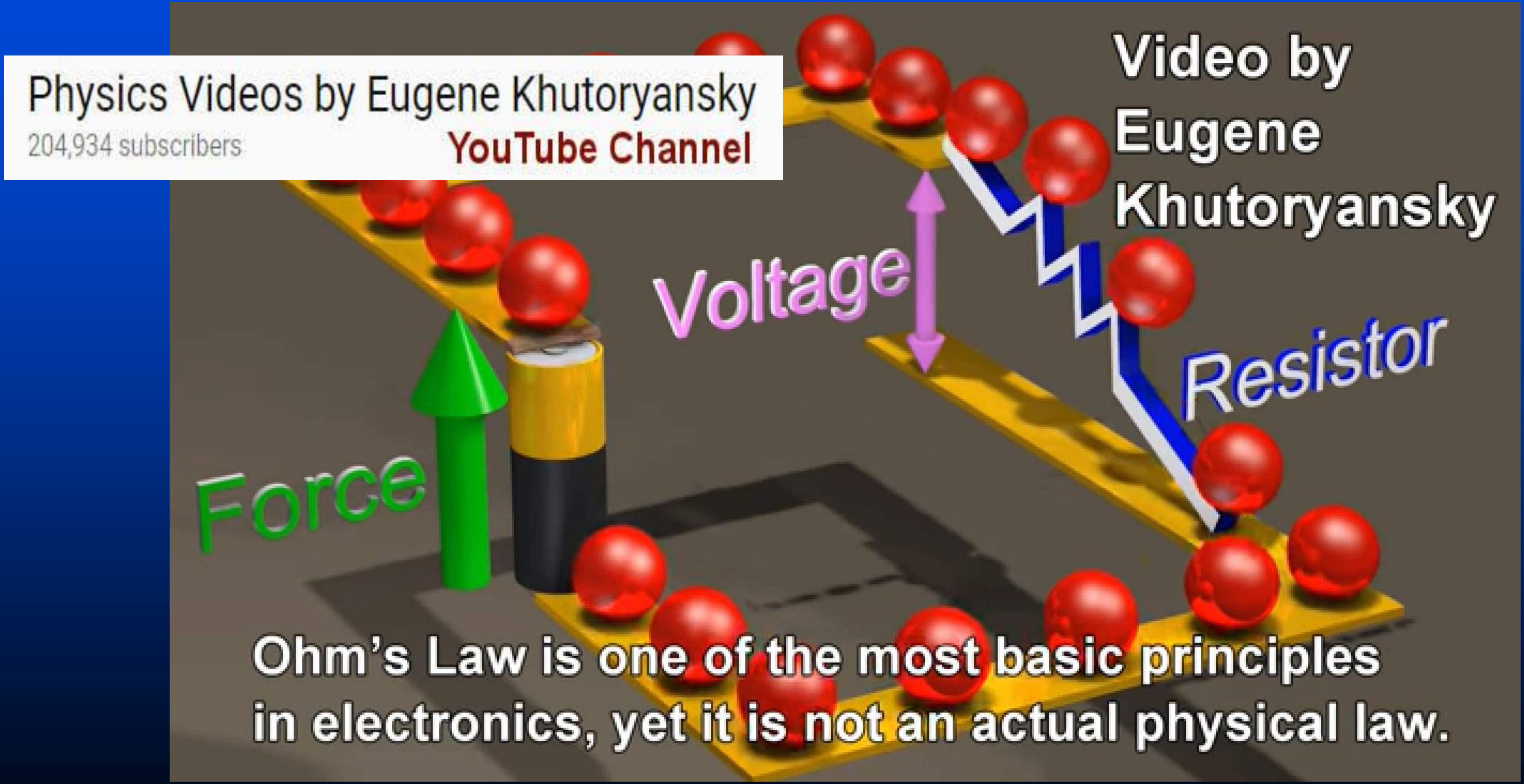
Impedance

Inductance [redacted]		Resistance [redacted]′		Capacitance [redacted]″	
Rotational Inertia **J**	$[ML^2]$	Rotational Drag **D_r**	$[ML^2/T]$	Torque Constant **K_r**	$[ML^2/T^2]$
Mass **M**	$[M]$	Friction **D**	$[M/T]$	Spring Constant **K**	$[M/T^2]$
Density **ρ**	$[M/L]$	Rigidity **μ_p**	$[M/LT]$	Modulus of Elasticity **E**	$[M/LT^2]$
Density **ρ**	$[M/L^3]$	Fluid Resistance **R_f**	$[M/T]$	1/Fluid Capacitance **$1/C_f$**	$[M/L^3T^2]$
Acoustic Inertance **I**	$[M/L^4]$	Acoustic Resistance **R_a**	$[M/L^4T]$	Stiffness **s**	$[M/L^4T^2]$
Inductance **L**	$[ML^2/Q^2]$	Resistance **R**	$[ML^2/Q^2T]$	1/Capacitance **1/C**	$[ML^2/Q^2T^2]$ ε_0
Magnetic Inductance $\mathcal{I}$	$[Q^2T/ML^2]$	Reluctance $\mathcal{R}$	$[Q^2/ML^2]$	1/Magnetic Capacitance $1/\mathcal{C}$	$[Q^2/ML^2T]$
Thermal Inductance **I_T**	$[KT^2/H]$	Thermal Resistance **R_T**	$[KT/H]$	1/Thermal Capacitance **$1/C_p$**	$[K/H]$

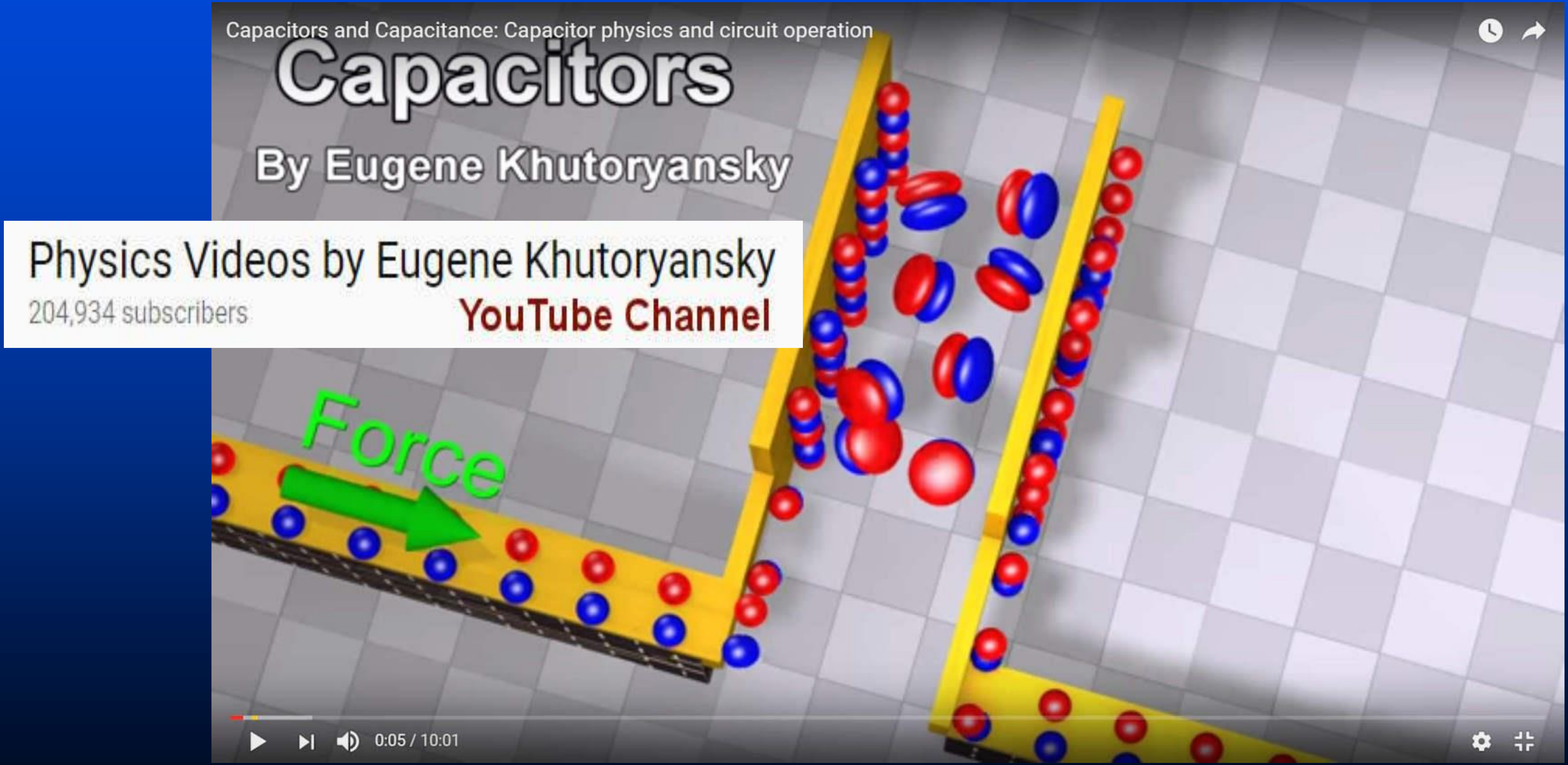
Excellent Illustration of Electronics



Excellent Illustration of Electronics



Excellent Illustration of Electronics



Analogy in Physical Action

Action Level	Force Pressure		Motion Flow	
Rotational $T=J\alpha+D_r\omega+K_r\theta$	Torque **T**	$[ML^2A/T^2]$	Angular Velocity $\boldsymbol{\omega}$	$[A/T]$
Mechanical $F=Ma+Dv+Kx$	Force **F**	$[ML/T^2]$	Velocity **v**	$[L/T]$
Solid-Mechanical $\tau=\rho\varepsilon''+\mu_p\varepsilon'+E\varepsilon$	Stress $\boldsymbol{\tau}$	$[M/LT^2]$	Strain Rate $\boldsymbol{\varepsilon'}$	$[1/T]$
Hydraulic $p=\rho q'+R_f q+A_f/C_f$	Pressure **p**	$[M/LT^2]$	Flow **q**	$[L^2/T]$
Acoustic $p=I\xi''+R_a\xi'+s\xi$	Acoustic Pressure **p**	$[M/L^3T^2]$	Diaphragm Velocity $\boldsymbol{\xi'}$	$[L/T]$
Electrical $E=Li'+Ri+q/C$	Voltage **E**	$[ML^2/QT^2]$	Current **i**	$[Q/T]$
Magnetic $\mathcal{F}=\mathcal{I}\phi'+\mathcal{R}\phi+\int\phi\,dt/\mathcal{C}$	Magnetomotive Force $\boldsymbol{\mathcal{F}}$	$[Q/T]$	Flux $\boldsymbol{\phi}$	$[ML^2/QT]$
Thermal $\tau=I_T q_T'+R_T q_T+w_T/C_p$	Temperature Difference $\boldsymbol{\tau}$	$[ML^2/T^2]=[K]$	Heat Flow $\mathbf{q_T}$	$[H/T]$

Analogy in Physical Action

Action Level	Force Pressure		Motion Flow	
Rotational $T=J\alpha+D_r\omega+K_r\theta$	Torque **T**	$[ML^2A/T^2]$	Angular Velocity $\boldsymbol{\omega}$	$[A/T]$
Mechanical $F=Ma+Dv+Kx$	Force **F**	$[ML/T^2]$	Velocity **v**	$[L/T]$
Solid-Mechanical $\tau=\rho\varepsilon''+\mu_p\varepsilon'+E\varepsilon$	Stress $\boldsymbol{\tau}$	$[M/LT^2]$	Strain Rate $\boldsymbol{\varepsilon'}$	$[1/T]$
Hydraulic $p=\rho q'+R_f q+A_f/C_f$	Pressure **p**	$[M/LT^2]$	Flow **q**	$[L^2/T]$
Acoustic $p=I\xi''+R_a\xi'+s\xi$	Acoustic Pressure **p**	$[M/L^3T^2]$	Diaphragm Velocity $\boldsymbol{\xi'}$	$[L/T]$
Electrical $E=Li'+Ri+q/C$	Voltage **E**	$[ML^2/QT^2]$	Current **i**	$[Q/T]$
Magnetic $\mathcal{F}=\mathcal{I}\phi'+\mathcal{R}\phi+\int\phi\,dt/\mathcal{C}$	Magnetomotive Force $\boldsymbol{\mathcal{F}}$	$[Q/T]$	Flux $\boldsymbol{\phi}$	$[ML^2/QT]$
Thermal $\tau=I_T q_T'+R_T q_T+w_T/C_p$	Temperature Difference $\boldsymbol{\tau}$	$[ML^2/T^2]=[K]$	Heat Flow $\mathbf{q_T}$	$[H/T]$

Analogy in Physical Action

Action Level	Force / Pressure		Motion / Flow	
Rotational $T=J\alpha+D_r\omega+K_r\theta$	Torque **T**	$[ML^2A/T^2]$	Angular Velocity **ω**	[A/T]
Mechanical F=Ma+Dv+Kx	Force **F**	$[ML/T^2]$	Velocity **v**	[L/T]
Solid-Mechanical $\tau=\rho\varepsilon''+\mu_p\varepsilon'+E\varepsilon$	Stress **τ**	$[M/LT^2]$	Strain Rate **ε'**	[1/T]
Hydraulic $p=\rho q'+R_f q+A_f/C_f$	Pressure **p**	$[M/LT^2]$	Flow **q**	$[L^2/T]$
Acoustic $p=I\xi''+R_a\xi'+s\xi$	Acoustic Pressure **p**	$[M/L^3T^2]$	Diaphragm Velocity **ξ'**	[L/T]
Electrical E=Li'+Ri+q/C	Voltage **E**	$[ML^2/QT^2]$	Current **i**	[Q/T]
Magnetic $\mathcal{F}=\mathcal{J}\phi'+\mathcal{R}\phi+\int\phi\,dt/\mathcal{C}$	Magnetomotive Force **$\mathcal{F}$**	[Q/T]	Flux **ϕ**	$[ML^2/QT]$
Thermal $\tau=I_T q_T'+R_T q_T+w_T/C_p$	Temperature Difference **τ**	$[ML^2/T^2]=[K]$	Heat Flow **q_T**	[H/T]

Analogy in Physical Action

Action Level	Force / Pressure		Motion / Flow	
Rotational $T=J\alpha+D_r\omega+K_r\theta$	Torque $\mathbf{T}$	$[ML^2A/T^2]$	Angular Velocity $\boldsymbol{\omega}$	$[A/T]$
Mechanical $F=Ma+Dv+Kx$	Force $\mathbf{F}$	$[ML/T^2]$	Velocity $\mathbf{v}$	$[L/T]$
Solid-Mechanical $\tau=\rho\varepsilon''+\mu_p\varepsilon'+E\varepsilon$	Stress $\boldsymbol{\tau}$	$[M/LT^2]$	Strain Rate $\boldsymbol{\varepsilon}'$	$[1/T]$
Hydraulic $p=\rho q'+R_f q+A_f/C_f$	Pressure $\mathbf{p}$	$[M/LT^2]$	Flow $\mathbf{q}$	$[L^2/T]$
Acoustic $p=I\xi''+R_a\xi'+s\xi$	Acoustic Pressure $\mathbf{p}$	$[M/L^3T^2]$	Diaphragm Velocity $\boldsymbol{\xi}'$	$[L/T]$
Electrical $E=Li'+Ri+q/C$	Voltage $\mathbf{E}$	$[ML^2/QT^2]$	Current $\mathbf{i}$	$[Q/T]$
Magnetic $\mathcal{F}=\mathcal{L}\phi'+\mathcal{R}\phi+\int\phi\,dt/\mathcal{C}$	Magnetomotive Force $\boldsymbol{\mathcal{F}}$	$[Q/T]$	Flux $\boldsymbol{\phi}$	$[ML^2/QT]$
Thermal $\tau=I_T q_T'+R_T q_T+w_T/C_p$	Temperature Difference $\boldsymbol{\tau}$	$[ML^2/T^2]=[K]$	Heat Flow $\mathbf{q_T}$	$[H/T]$

d(*)/dt

Electromagnetic Field Equations

Electromagnetic

Energy			Magnetic Force				Magnetic Flux	
ML^2/T^2	=	Q/T^2	Q/T	Q	x	ML^2/Q	ML^2/QT	ML^2/QT^2
ML^2/T^2		Q/LT^2	Q/LT	Q/L		ML/Q	ML/QT	ML/QT^2
ML^2/T^2		Q/L^2T^2	Q/L^2T	Q/L^2		M/Q	M/QT	M/QT^2
ML^2/T^2		Q/L^3T^2	Q/L^3T	Q/L^3		M/LQ	M/LQT	M/LQT^2

Maxwell Equations

Energy	=	i'	ℱ or i	q	x		= [ϕ]	=[Voltage]= [ϕ']
			= [H]					=[E]=[∇xV]
			= [∇xH]= [J+D']	= [D]			= [B]	=[∇xE]= [-B']
			$=[\nabla^2 H]$	= [∇D]=ρ				$=[\nabla^2 E]$

$$\nabla \cdot \mathbf{D} = \rho$$

$$\nabla \cdot \mathbf{B} = 0$$

$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$

$$\nabla \times \mathbf{H} = \mathbf{J} + \frac{\partial \mathbf{D}}{\partial t}$$

Extending the Analogy - Higher-Order Space

	Pressure		Motion				Impedance		
	ML/T^2	=	L/T^2	L/T	L	x	M	M/T	M/T^2
	ML/T^2		L^5/T^2	L^5/T	L^5		M/L^4	M/L^4T	M/L^4T^2
	ML/T^2		L^4/T^2	L^4/T	L^4		M/L^3	M/L^3T	M/L^3T^2
	ML/T^2		L^3/T^2	L^3/T	L^3		M/L^2	M/L^2T	M/L^2T^2
	ML/T^2		L^2/T^2	L^2/T	L^2		M/L	M/LT	M/LT^2
Mechanical Force	ML/T^2	=	L/T^2	L/T	L	x	M	M/T	M/T^2
	ML/T^2		$1/T^2$	$1/T$	1		ML	ML/T	ML/T^2
	ML/T^2		$1/LT^2$	$1/LT$	$1/L$		ML^2	ML^2/T	ML^2/T^2
	ML/T^2		$1/L^2T^2$	$1/L^2T$	$1/L^2$		ML^3	$ML^{3/}T$	ML^3/T^2
	ML/T^2		$1/L^3T^2$	$1/L^3T$	$1/L^3$		ML^4	ML^4/T	ML^4/T^2
Acoustic Pressure	M/L^3T^2		L/T^2	L/T	L		M/L^4	M/L^4T	M/L^4T^2
Hydraulic Pressure	M/LT^2		L^2/T^2	L^2/T	L^2		M/L^3	M/L^3T	M/L^3T^2
Solid-Mechanical Stress	M/LT^2		$1/T^2$	$1/T$	1		M/L	M/LT	M/LT^2
Rotational Torque	ML^2A/T^2		A/T^2	A/T	A		ML^2	ML^2/T	ML^2/T^2

Extending the Analogy - 3rd-Order Derivatives

	Pressure		Motion						Impedance				
	ML/T^2	=	L/T^3	L/T^2	L/T	L	TL	x	MT	M	M/T	M/T^2	M/T^3
	ML/T^2		L^5/T^3	L^5/T^2	L^5/T	L^5	TL^5		MT/L^4	M/L^4	M/L^4T	M/L^4T^2	M/L^4T^3
	ML/T^2		L^4/T^3	L^4/T^2	L^4/T	L^4	TL^4		MT/L^3	M/L^3	M/L^3T	M/L^3T^2	M/L^3T^3
	ML/T^2		L^3/T^3	L^3/T^2	L^3/T	L^3	TL^3		MT/L^2	M/L^2	M/L^2T	M/L^2T^2	M/L^2T^3
Solid-Mechanical	ML/T^2		L^2/T^3	L^2/T^2	L^2/T	L^2	TL^2		MT/L	M/L	M/LT	M/LT^2	M/LT^3
Mechanical Force	ML/T^2	=	L/T^3	L/T^2	L/T	L	TL	x	MT	M	M/T	M/T^2	M/T^3
	ML/T^2		$1/T^3$	$1/T^2$	1/T	1	T		ML	ML	ML/T	ML/T^2	ML/T^3
	ML/T^2		$1/LT^3$	$1/LT^2$	1/LT	1/L	T/L		MTL^2	ML^2	ML^2/T	ML^2/T^2	ML^2/T^3
	ML/T^2		$1/L^2T^3$	$1/L^2T^2$	$1/L^2T$	$1/L^2$	T/L^2		MTL^3	ML^3	$ML^{3/}T$	ML^3/T^2	ML^3/T^3
	ML/T^2		$1/L^3T^3$	$1/L^3T^2$	$1/L^3T$	$1/L^3$	T/L^3		MTL^4	ML^4	ML^4/T	ML^4/T^2	ML^4/T^3
Acoustic Pressure	M/L^3T^2		L/T^3	L/T^2	L/T	L	TL		MT/L^4	M/L^4	M/L^4T	M/L^4T^2	M/L^4T^3
Hydraulic Pressure	M/LT^2		L^2/T^3	L^2/T^2	L^2/T	L^2	TL^2		MT/L^3	M/L^3	M/L^3T	M/L^3T^2	M/L^3T^3
Solid-Mechanical Stress	M/LT^2		$1/T^3$	$1/T^2$	1/T	1	T		MT/L	M/L	M/LT	M/LT^2	M/L^3T^3
Rotational Torque	ML^2A/T^2		A/T^3	A/T^2	A/T	A	AT		MTL^2	ML^2	ML^2/T	ML^2/T^2	ML^2/T^3

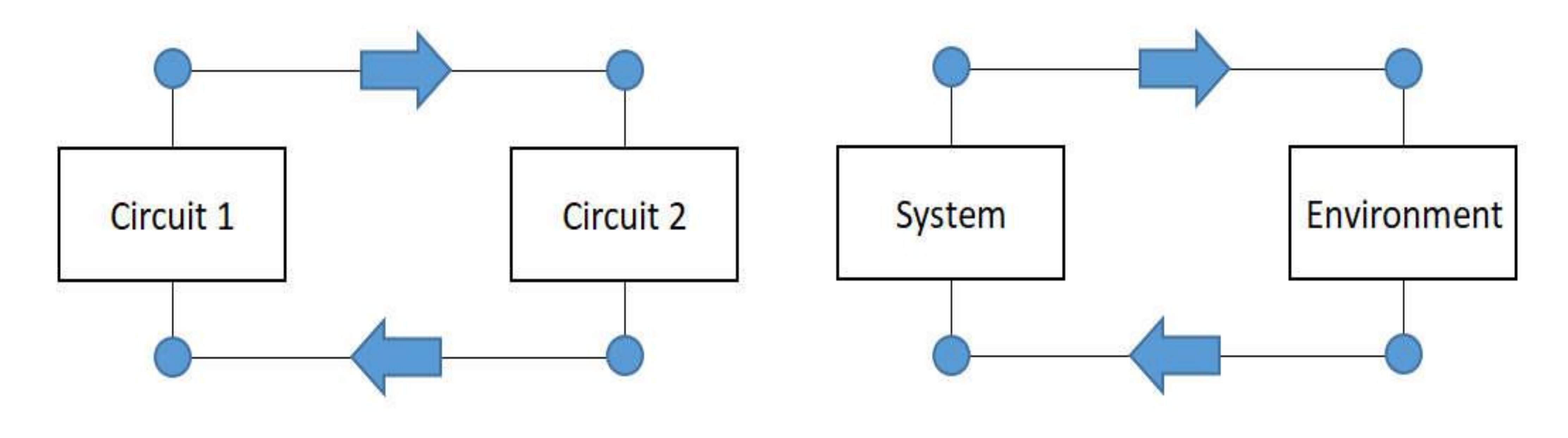
Physical/Logical Analogy

Mass Transfer		Data Transfer	
+ OUTPUT	- INPUT	+ OUTPUT	- INPUT
Material		**Information**	
Action	**Acquisition**	**Speak**	**Hear**
Put, Give	Get, Take	Verbal	Auditory
Transmission	Reception	Write	Read
DO	**GET**	**SAY**	**LISTEN**
Production	**Consumption**	**Show**	**See**
Assemble	Ingest	Graphic	Visual
Synthesis	Analysis	Present	Observe
MAKE	**EAT**	**EXPRESS**	**PERCEIVE**

Analogy in Logical Action

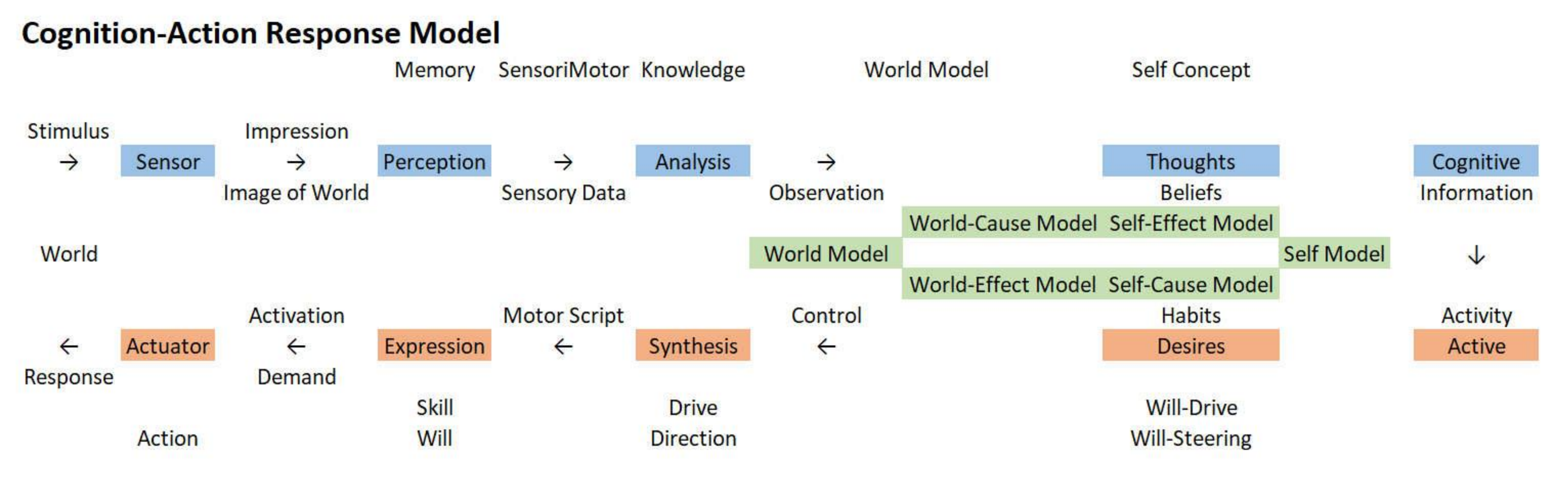
Using circuits to describe data transfer (information/influence)

Similar to data flow charts



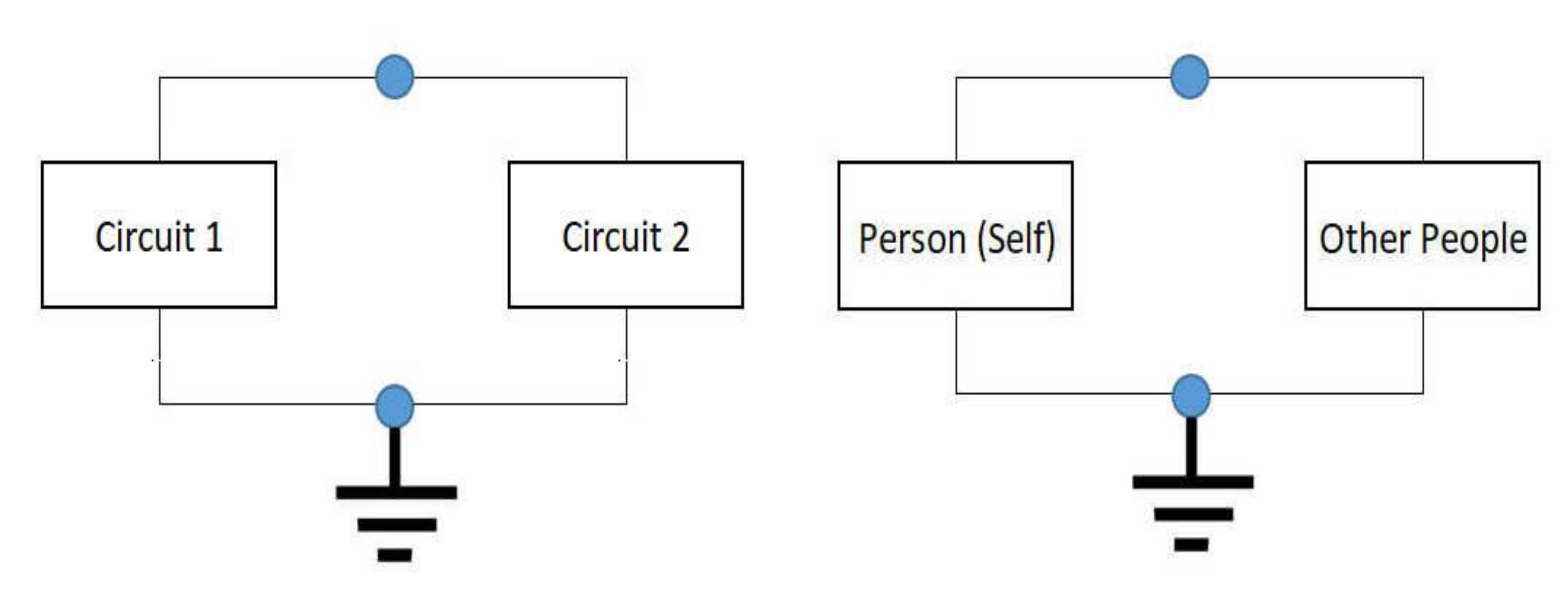
Analogy in Logical Action

Using circuits/flowcharts to describe consciousness as data transfer (transmission of information/influence)



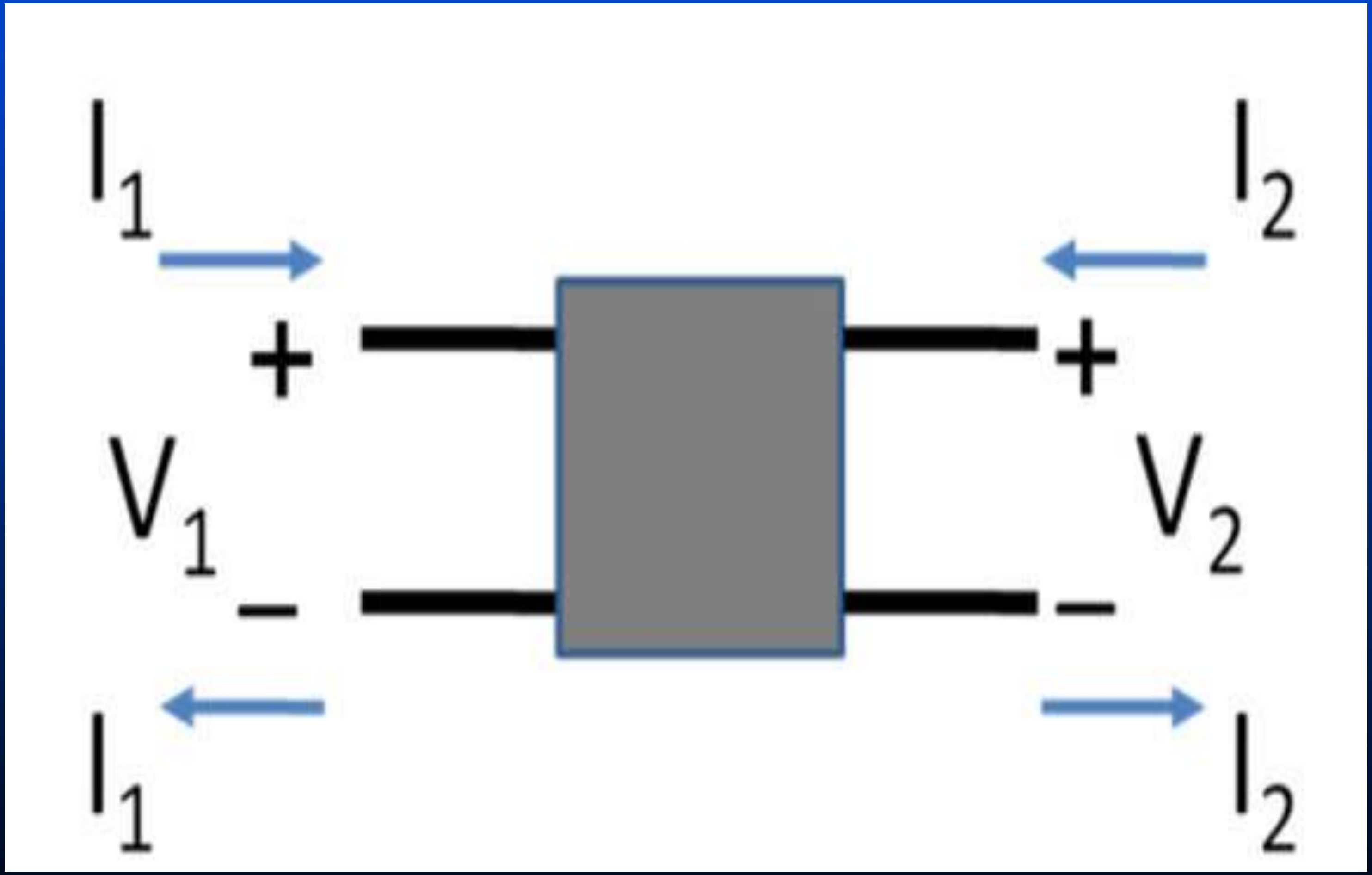
Analogy in Logical Action

Using circuits to describe data/emotion transfer (with common ground)



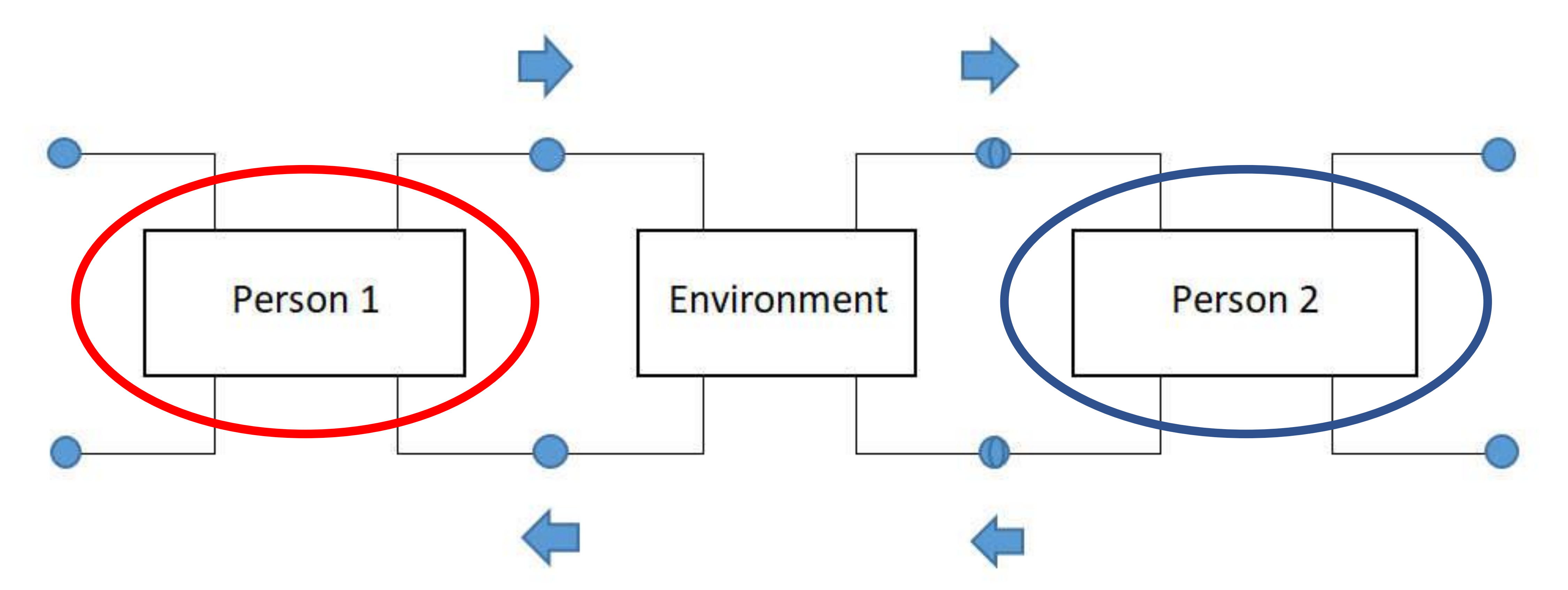
Analogy in Logical Action

Using a two-port network



Analogy in Logical Action

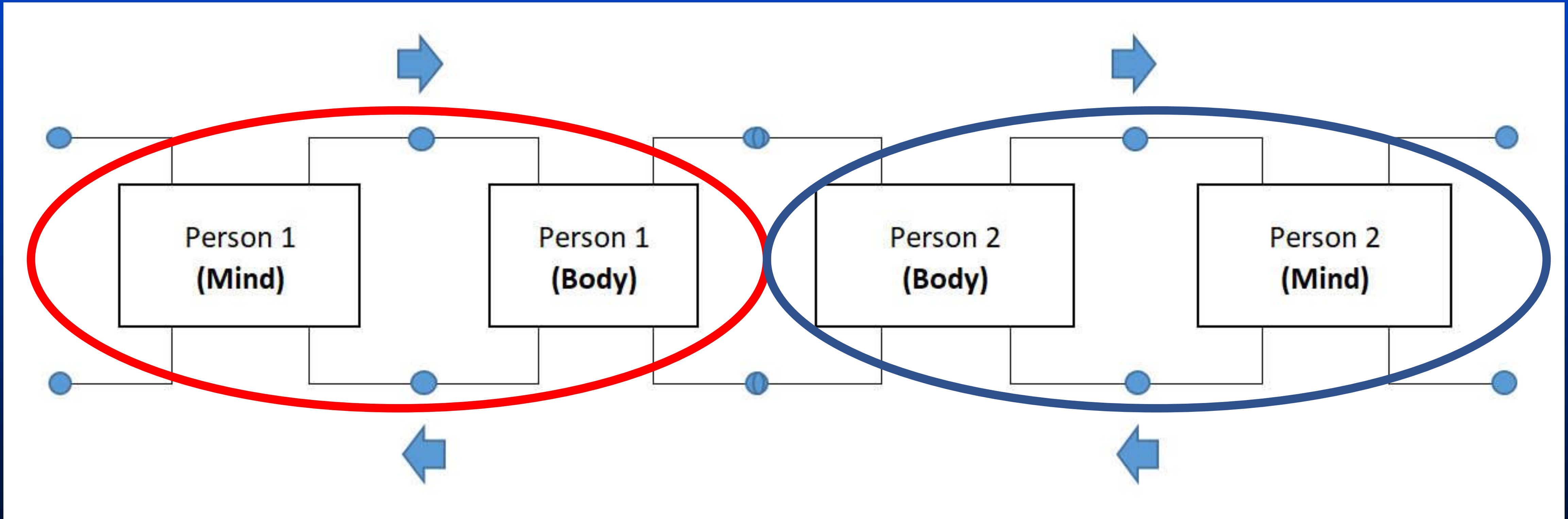
Using a circuit model to describe personal interactions



Emotive Circuits

Circuit model of consciousness

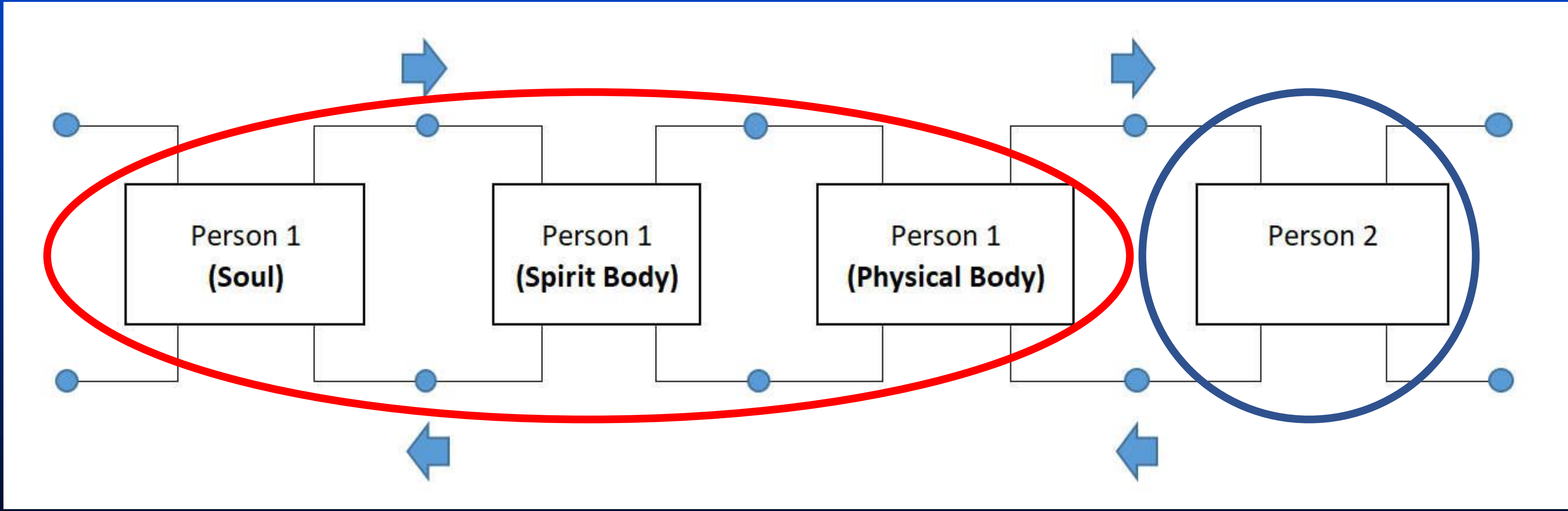
Modeling emotive force & emotive flux



Analogy in Logical Action

3-Level Model of consciousness

Soul – Spirit Body – Physical Body



Analogy in Emotion Dynamics

As with all common physical phenomena, Emotion Dynamics includes:

- **Flow** (of emotional energy)
- **Pressure** (will and desire)
- **Impedance** (blockage of flow)

Analogy in Emotion Dynamics

Emotional Analogs

Emotional charge (e): Electric charge (q)
Emotional flow (Φ): Electric current (i)
Emotional flow rate (Φ′): Electric charge acceleration (i′)

Will, Desire (E_e): Force, Voltage (E)

Emotive Impedance:

Emotive inductive reactance (L_e): **habit**, inertia, addiction
Emotive reluctance (R_e): **denial**, judgment, anger
Emotive capacitive reactance (C_e): **doubt**, fear, anxiety, avoidance

Emotive Impedance

Force = impedance x flow

Emotive Force = Desire, Will, Passion

Emotive Impedance = Resistance + Reactance

$$E_e = L_e * \Phi_e' + R_e * \Phi_e + e/C_e$$

L_e = Inductive emotive reactance - **Habit**

R_e = Emotional resistance (reluctance) - **Denial**

C_e = Capacitive emotive reactance - **Doubt**

e = emotional charge (emotion, *noun*)

Φ_e = emotional flow (emotion, *verb*)

Φ_e' = emotional flow rate (change in emotions)

Emotive Impedance

Emotive inductive reactance:

<u>Habit</u> Leads to: addiction, arrogance

Energy is ***stored in motion (repetition)***

Emotive reluctance (emotional resistance):

<u>Denial:</u> judgment, anger, disappointment

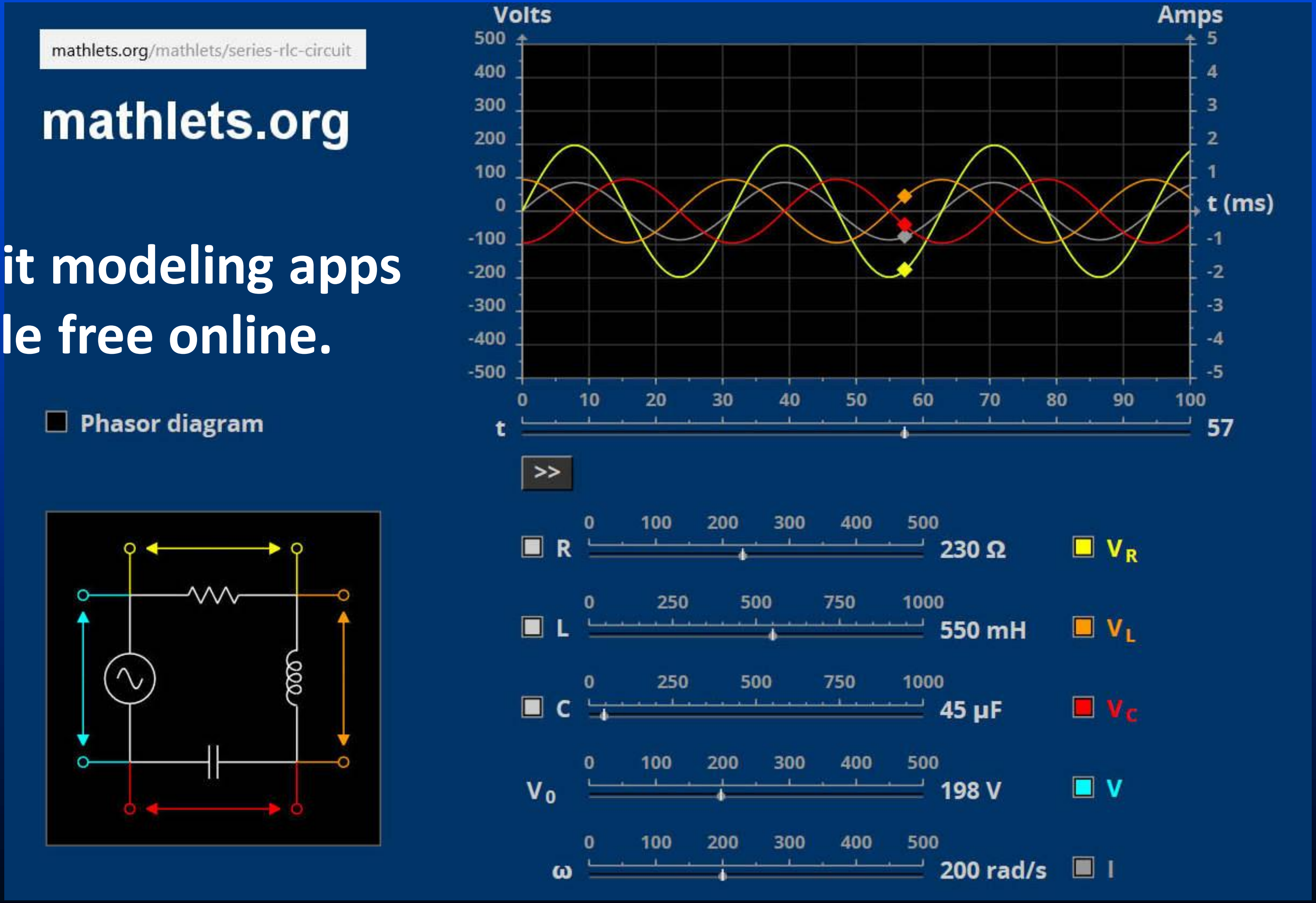
Energy is ***lost to dissipation (friction)***

Emotive capacitive reactance:

<u>Doubt:</u> fear, avoidance, anxiety, distance

Energy is ***stored in separation (holding)***

Emotive Impedance



Many circuit modeling apps are available free online.

Emotional Impedance

$$L_e\phi' + R_e\phi + e/C$$

Inductive Emotive Reactance	Emotive Resistance	Capacitive Emotive Reactance
L_e	R_e	$1/C_e$
□	□′	□″
KINEMATICS	**KINETICS**	**STATICS**
Yang	Damping	Yin
Craving	Anger	Attachment
Magnetic	Heat	Electric
Energy is stored in:	*Energy is lost:*	*Energy is stored in:*
moving quanta	*through dissipation*	*separated quanta*
Falling/Throwing	Conflict	Holding, Attaching
Inertia	Drag	Elasticity
Acquisition	Loss	Retention
Coercivity		Retentivity

Emotive Inertia	**Emotive Resistance**	**Emotive Elastance/Rigidity**
Inertance	Reluctance	1/Compliance
Need	Grief	Doubt
Habit	Pain	Fear/Terror
Repetition	Loss	Uncertainty
Mass/Inertia	Damping/Friction	Expansion/Compression

Analogy in Emotional Action

		Emotive Charge Dynamics				Emotive Charge Kinetics				Emotive Charge Statics		
Emotive Force	=	**Emotive Inertance**	×	ϕ'	+	**Emotive Resistance**		ϕ		**Emotive Capacitance**		e
Will	=	Inertance	×	**Emotive Flux Rate**	+	Reluctance	×	**Emotive Flux**	+	1/Compliance	×	**Emotive Charge**
Desire	=	Need	×		+	Grief	×		+	Doubt	×	
Intent	=	Habit	×		+	Pain	×		+	Fear/Terror	×	
Motive	=	Repetition	×		+	Loss	×		+	Uncertainty	×	
		Mass/Inertia	×		+	Damping/Friction	×		+	Expansion/Compression	×	

Emotive Impedance	□	□′	□″

Inductive Emotive Reactance		Emotive Resistance		Capacitive Emotive Reactance	
High Reactance	**Low Reactance**	**High Resistance**	**LowResistance**	**High Reactance**	**Low Reactance**
Arrogance	Humility	False Belief	Known Truth	Anxiety/Worry	Faith
Expectation	Allowance	Disappointment	Acceptance	Distrust	Trust
Habit/Addiction	Spontaneity	Judgment	Admittance	Avoidance	Engagement
Presumption	Non-Assumption	Criticism	Appreciation	Separation	Alignment
Prejudice	Openness	Anger	Conductance	Shame/Guilt	Innocence
Façade	Sincerity	Frustration	Grace	Distance	Proximity
NEED		**DENIAL**		**DOUBT**	
HABIT		ANGER		FEAR	

Emotional Dynamics

Emotive Force	=	Inductive Emotive Reactance	×	Emotive Flux Rate	+	Emotive Resistance	×	Emotive Flux	+	Capacitive Emotive Reactance	×	Emotive Charge
F_e	=	L_e	×	ϕ'	+	R_e	×	ϕ	+	$1/C_e$	×	e
		□	×	○″	+	□′	×	○′	+	□″	×	○

End of Part 1: Analogy and Duality

Next is Part 2: Emotion Dynamics

Special Note

This video (**Analogy and Duality**) is **Part 1** of a **2-part** presentation.

Part 2 is **"Emotion Dynamics"** and explores the application of the circuit impedance model to the study and practice of Emotion Dynamics.

Thank you!

For more info:

milesresearch.com/ggg999

If you have any comments or ideas, contact me:

Jon Miles

jon@milesresearch.com

www.milesresearch.com