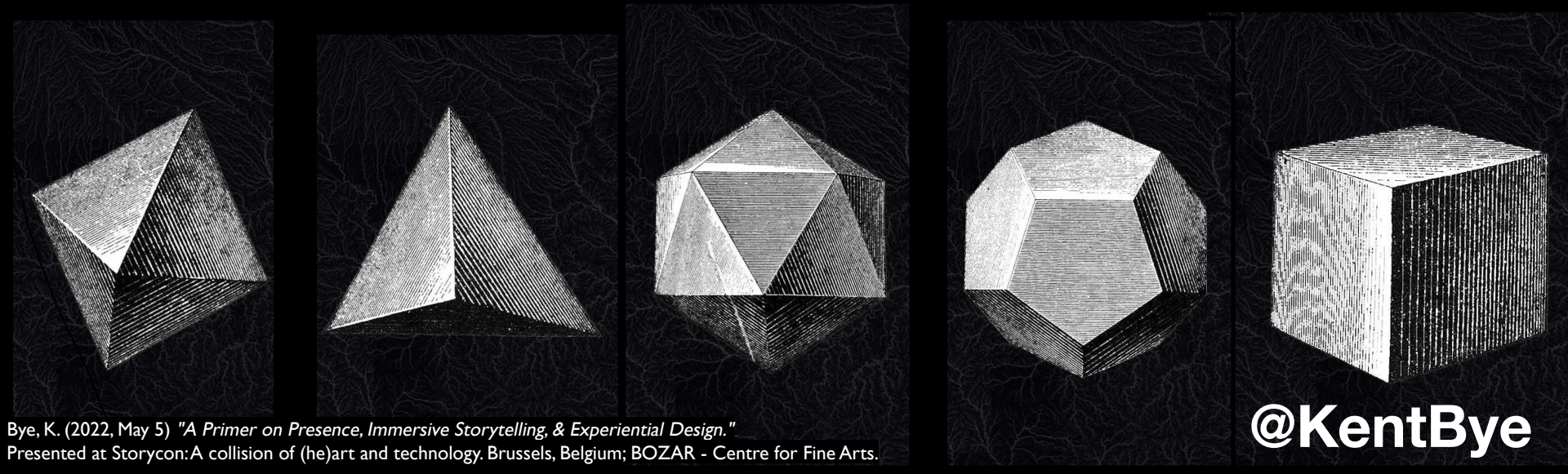
A Primer on Presence, Immersive Storytelling, & Experiential Design



Bye, K. (2022, May 5) *"A Primer on Presence, Immersive Storytelling, & Experiential Design."*
Presented at Storycon: A collision of (he)art and technology. Brussels, Belgium; BOZAR - Centre for Fine Arts.

@KentBye


Voices of VR
Podcast

- Underlying Experiential Age Context
- My Elemental Theory of Presence
  - Connections to Experiential Marketing
  - Underlying Dialectics of Presence
  - Presence Theory Evolution & Synthesis
- My Immersive Storytelling & Experiential Design Framework
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As goods and services become commoditized, the customer experiences that companies create will matter most.

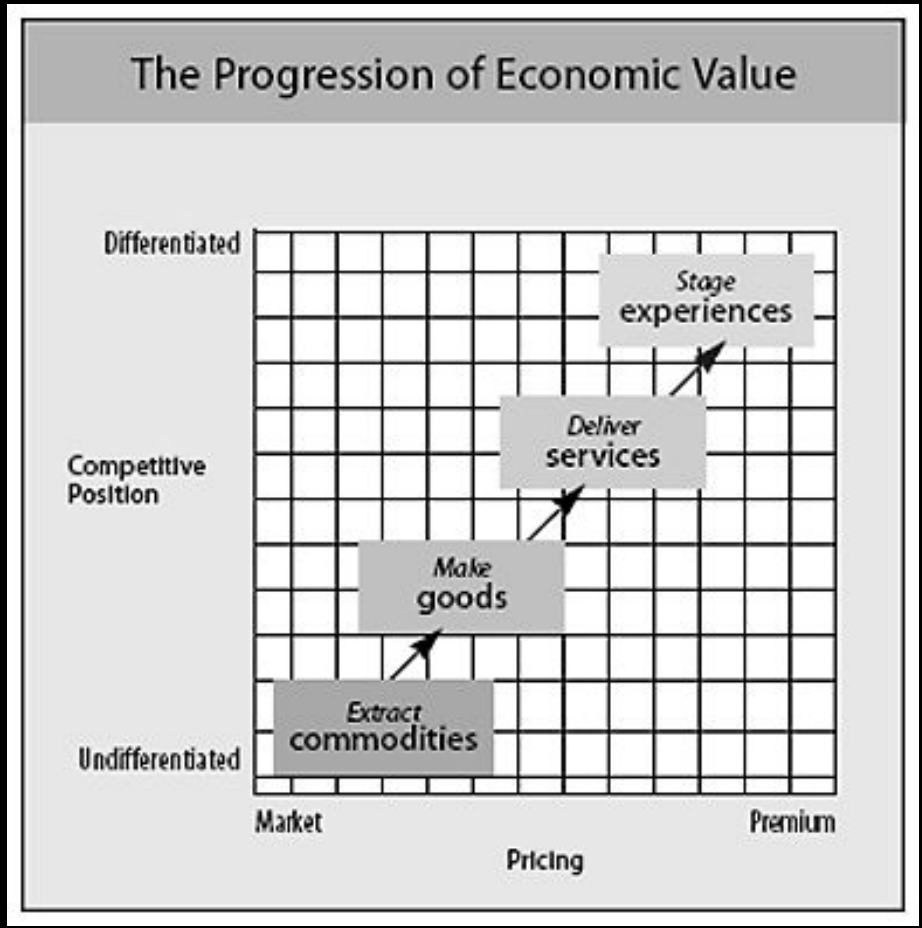
WELCOME TO THE EXPERIENCE ECONOMY

BY B. JOSEPH PINE II AND JAMES H. GILMORE

How do economies change? The entire history of economic progress can be recapitulated in the four-stage evolution of the birthday cake. As a vestige of the agrarian economy, mothers made birthday cakes from scratch, mixing farm commodities (flour, sugar, butter, and eggs) that together cost mere dimes. As the goods-based industrial economy advanced, moms paid a dollar or two to Betty Crocker for premixed ingredients. Later, when the service economy took hold, busy parents ordered cakes from the bakery or grocery store, which, at $10 or $15, cost ten times as much as the packaged ingredients. Now, in the time-starved 1990s, parents neither make the birthday cake nor even throw the party. Instead, they spend $100 or more to "outsource" the entire event to Chuck E. Cheese's, the Discovery Zone, the Mining Company, or some other business that stages a memorable event for the kids – and often throws in the cake for free. Welcome to the emerging *experience economy*.

Economists have typically lumped experiences in with services, but experiences are a distinct economic offering, as different from services as services are from goods. Today we can identify and describe this fourth economic offering because consumers unquestionably desire experiences, and more and more businesses are responding by explicitly designing and promoting them. As services, like goods before them, increasingly become commoditized – think of long-distance telephone services sold solely on price – experiences have emerged as the next step in what we call the *progression of economic value*. (See the exhibit "The Progression of Economic Value.") From now on, leading-edge companies – whether they sell to consumers or businesses – will find

B. Joseph Pine II *and* ***James H. Gilmore*** *are cofounders of Strategic Horizons LLP, based in Cleveland, Ohio. They are coauthors of* Every Business a Stage: Why Customers Now Want Experiences, *to be published by the Harvard Business School Press in January 1999. They are the authors of "The Four Faces of Mass Customization" (HBR January–February 1997) and can be reached at pine@gilmore@customization.com.*



Pine II, B. J., & Gilmore, J. H. (1998). *Welcome to the experience economy*. Harvard Business Review. Retrieved December 10, 2021, from https://hbr.org/1998/07/welcome-to-the-experience-economy.

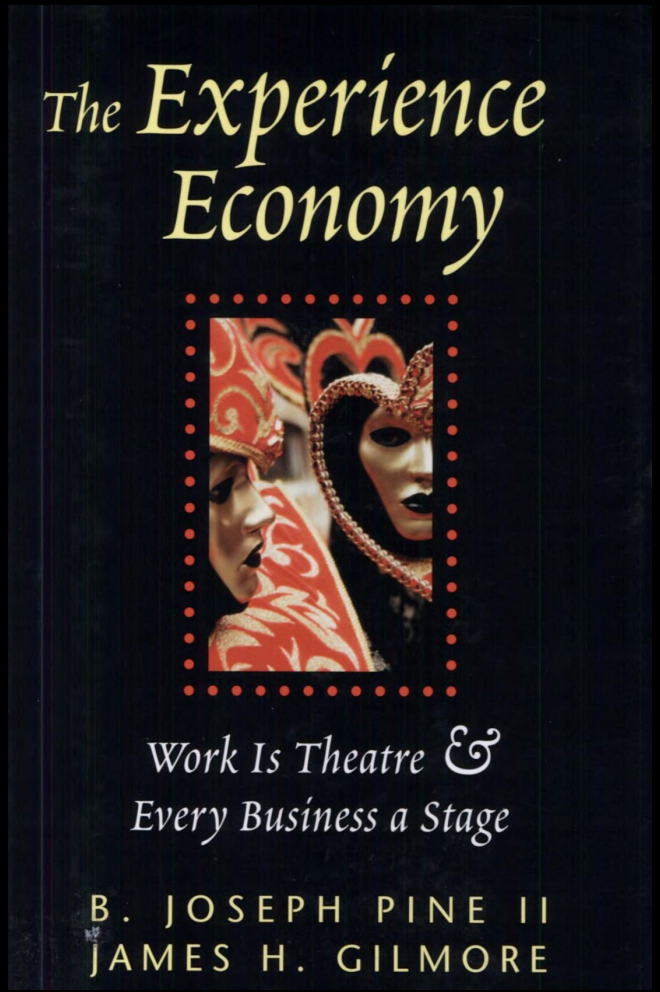
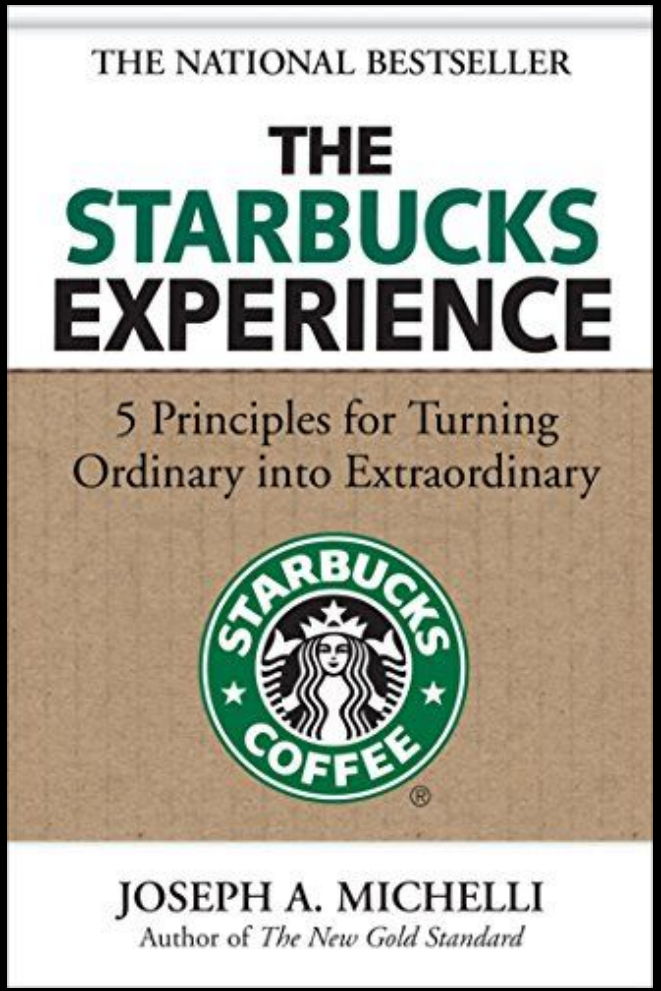


TABLE 1-1

Economic distinctions

Economic offering	Commodities	Goods	Services	Experiences
Economy	Agrarian	Industrial	Service	Experience
Economic function	Extract	Make	Deliver	Stage
Nature of offering	Fungible	Tangible	Intangible	Memorable
Key attribute	Natural	Standardized	Customized	Personal
Method of supply	Stored in bulk	Inventoried after production	Delivered on demand	Revealed over a duration
Seller	Trader	Manufacturer	Provider	Stager
Buyer	Market	User	Client	Guest
Factors of demand	Characteristics	Features	Benefits	Sensations

Pine II, B. J., & Gilmore, J. H. (1999). *Experience economy: Work is theatre & every business a stage*. Harvard Business School Press.



"...this whole notion of Third Place. It's about the in-store experience — all of it."

- Martin Coles, Starbucks Intl. President

- Michelli, J. A. (2007). *The starbucks experience: 5 principles for turning ordinary into extraordinary*. (pg. 22) McGraw-Hill.
- Image via Starbucks (2012, March 5) *Starbucks First European Concept Store to Open in Amsterdam*. Starbucks. Retrieved on April 25, 2022 from https://stories.starbucks.com/stories/2012/starbucks-first-european-concept-store-to-open-in-amsterdam/

Experiential Marketing (1999) & Brand Experience (2009)

Journal of Marketing Management, 1999, 15, 53-67

Bernd Schmitt[1]

Director, Centre of Global Brand Management Columbia Business School

Experiential Marketing

In this article, I contrast traditional marketing with a new approach to marketing called Experiential Marketing and provide a strategic framework for Experiential Marketing. Traditional marketing views consumers as rational decision-makers who care about functional features and benefits. In contrast, experiential marketers view consumers as rational and emotional human beings who are concerned with achieving pleasurable experiences. Five different types of experiences, or strategic experiential modules (SEMs), that marketers can create for customers are distinguished: sensory experiences (SENSE); affective experiences (FEEL); creative cognitive experiences (THINK); physical experiences, behaviours and lifestyles (ACT); and social-identity experiences that result from relating to a reference group or culture (RELATE). These experiences are implemented through so-called experience providers (ExPros) such as communications, visual and verbal identity, product presence, electronic media, etc. The ultimate goal of experiential marketing is to create holistic experiences that integrate individual experiences into a holistic Gestalt. The paper concludes with an examination of strategic issues and a discussion about how to create the experience-oriented organization.

J. Joško Brakus, Bernd H. Schmitt, & Lia Zarantonello

Brand Experience: What Is It? How Is It Measured? Does It Affect Loyalty?

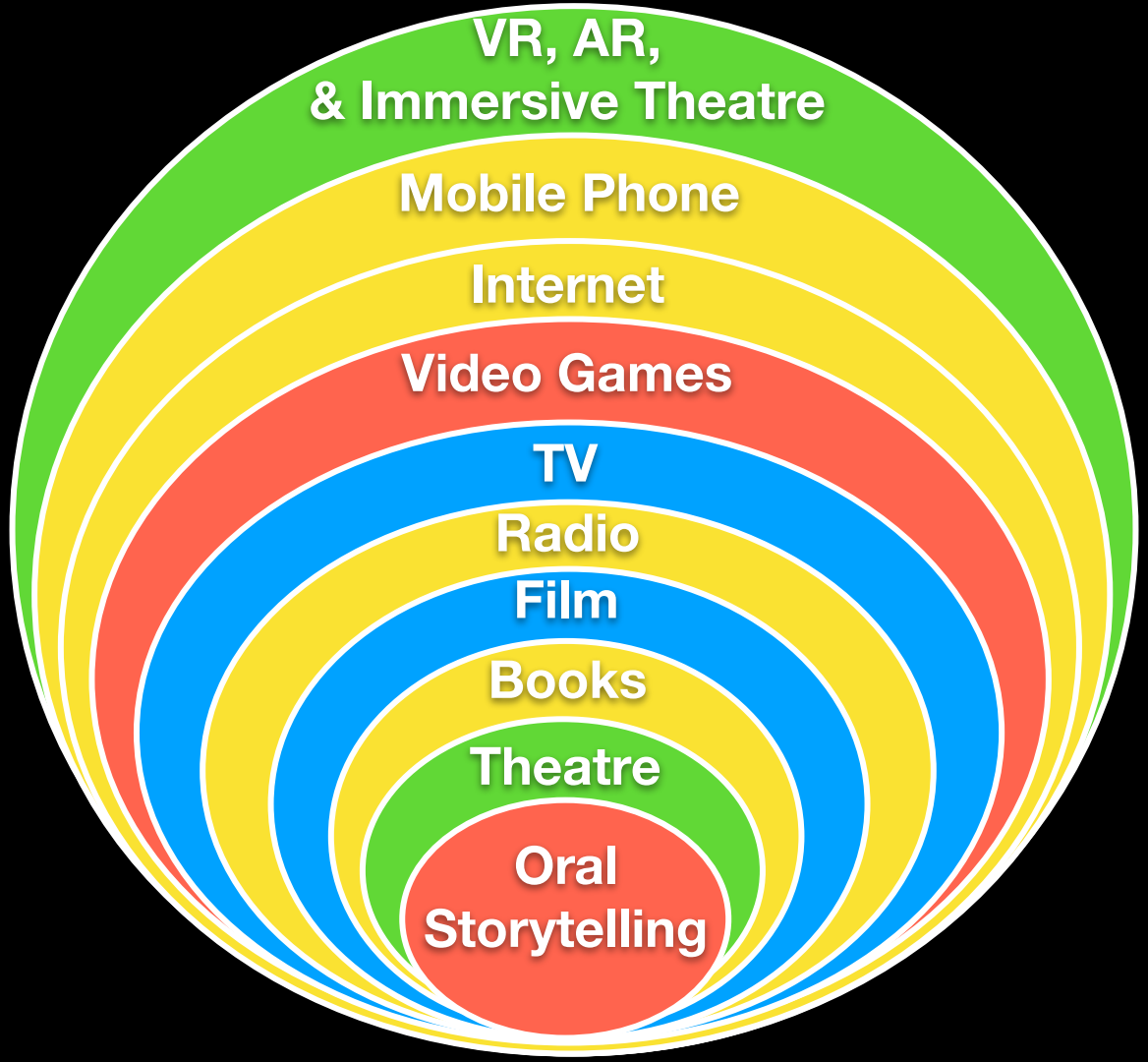
Brand experience is conceptualized as sensations, feelings, cognitions, and behavioral responses evoked by brand-related stimuli that are part of a brand's design and identity, packaging, communications, and environments. The authors distinguish several experience dimensions and construct a brand experience scale that includes four dimensions: sensory, affective, intellectual, and behavioral. In six studies, the authors show that the scale is reliable, valid, and distinct from other brand measures, including brand evaluations, brand involvement, brand attachment, customer delight, and brand personality. Moreover, brand experience affects consumer satisfaction and loyalty directly and indirectly through brand personality associations.

Keywords: experience marketing, brand experience, customer experience management, scale development, marketing communications

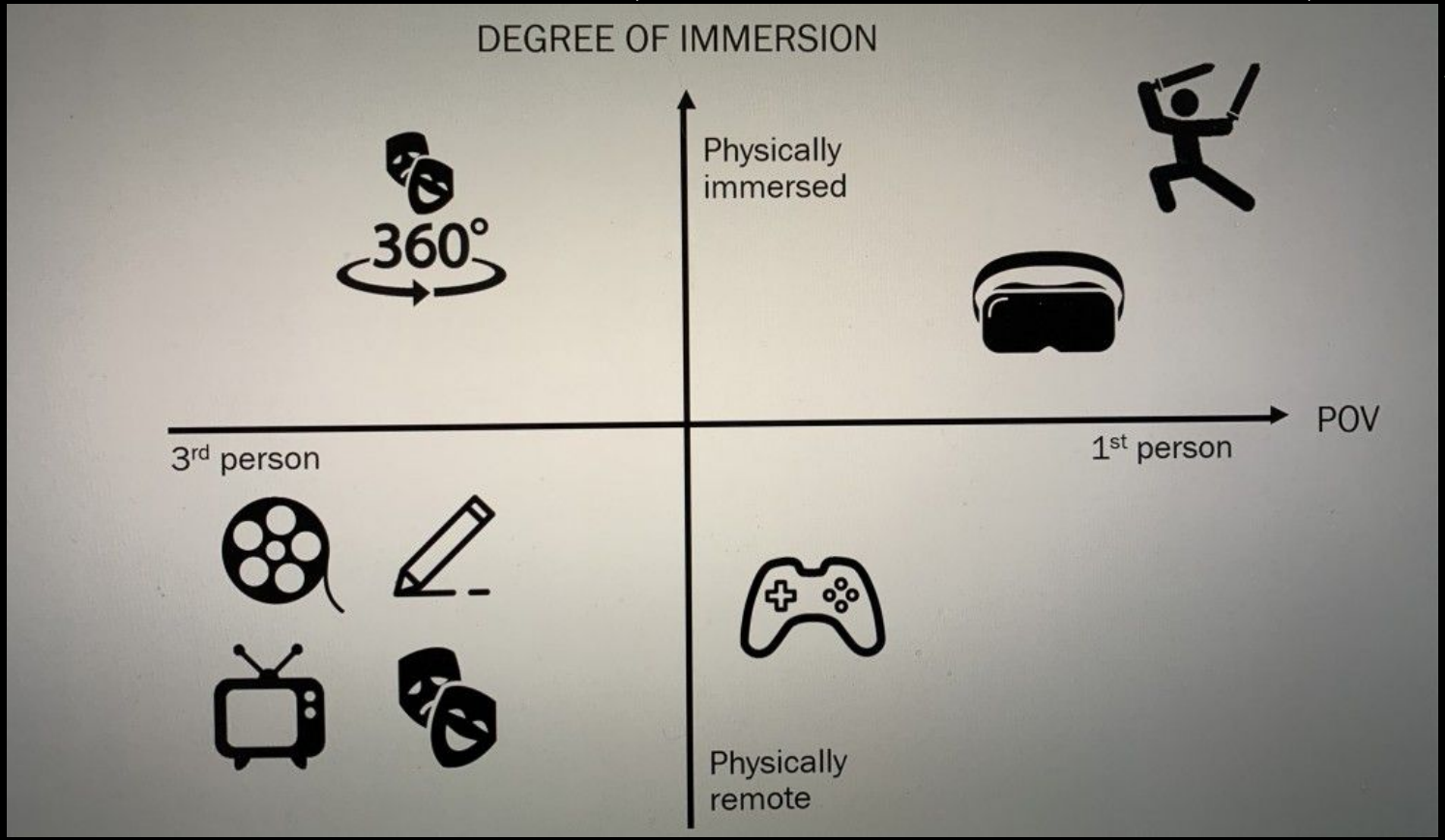
- Schmitt, B. (1999). *Experiential marketing*. Journal of marketing management, 15(1-3), 53-67.
- Brakus, J. J., Schmitt, B. H., & Zarantonello, L. (2009). *Brand experience: what is it? How is it measured? Does it affect loyalty?*. Journal of marketing, 73(3), 52-68.

Sleep No More (2011)

Bye, K., & Nightingale, C. (2018, January 10). *#611: "Sleep No More" Creative Producer on Blurring the Lines of Reality with Punchdrunk's Immersive Theater.* Voices of VR Podcast. Retrieved November 15, 2021 from https://voicesofvr.com/611-sleep-no-more-creative-producer-on-blurring-the-lines-of-reality-with-punchdrunks-immersive-theater/.


VR, AR,
& Immersive Theatre
Mobile Phone
Internet
Video Games
TV
Radio
Film
Books
Theatre
Oral
Storytelling

Céline Tricart's Degree of Immersion (2D Frame vs. 360°) vs POV (3rd person vs 1st person)

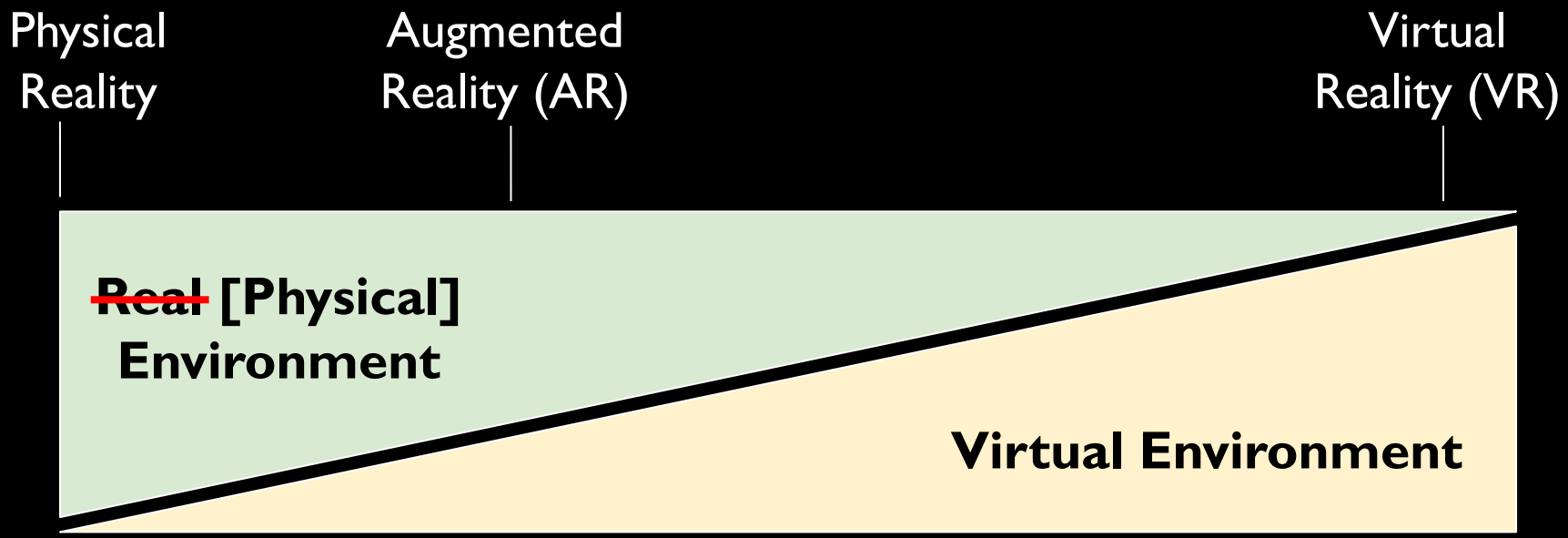


Illusion of Non-Mediated Presence within a 3D Spatial Context

Mediated through a 2D Frame

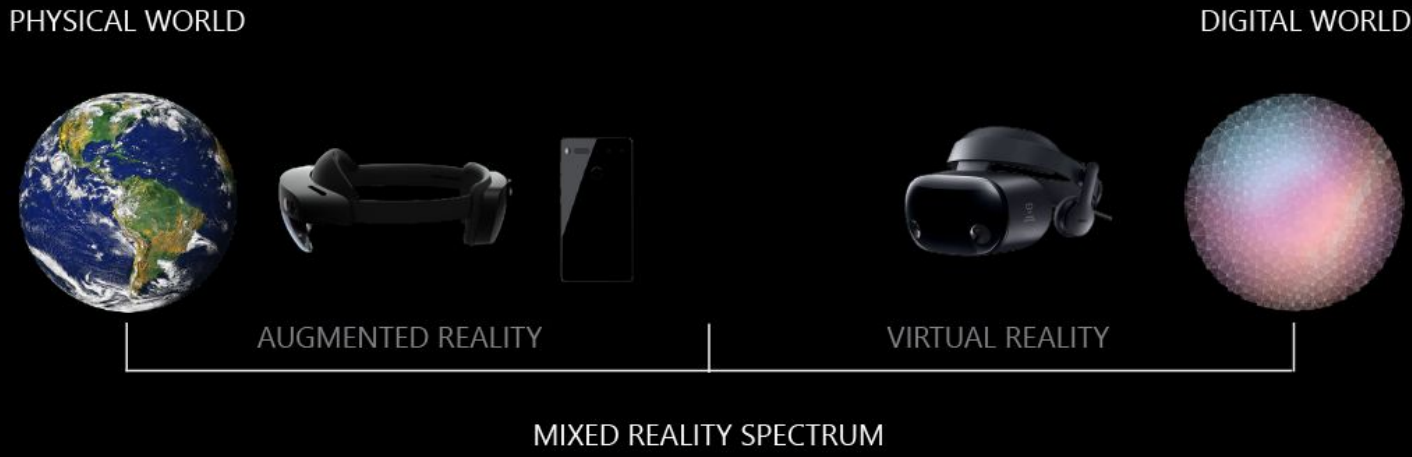
Tricart, C. (2022, March 14). *Immersive Storytelling. SXSW Film & Interactive Film Festival.* [Keynote presentation]. Austin, TX; Austin Convention Center. Retrieved on April 1, 2022 from https://voicesofvr.com/1074-celine-tricarts-sxsw-keynote-on-immersive-storytelling-live-action-role-play-emotional-bleed/

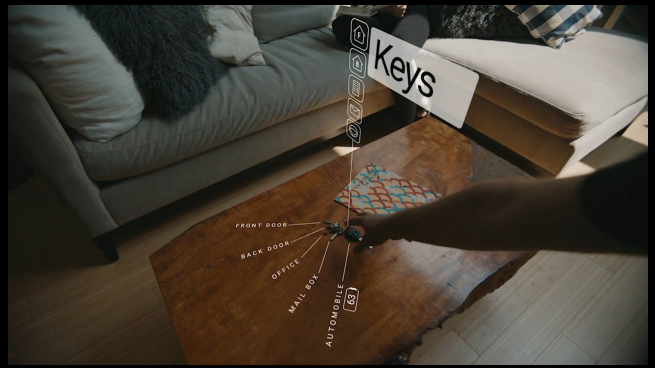
Mixed Reality Spectrum (aka "XR")
Inspired by Milgram & Kishino (1994)



Milgram, P. and Kishino, F. (1994) *A Taxonomy of Mixed Reality Visual Displays.* IEICE Transactions on Information and Systems, E77-D, 1321-1329. https://search.ieice.org/bin/summary.php?id=e77-d_12_1321
Modified with Clay Bavor (2017, May 18) Google IO 2017 Day 2 Keynote, https://twitter.com/kentbye/status/865244388057694208

Microsoft's Mixed Reality Spectrum





Microsoft (2020, August 26). *What is mixed reality?* Retrieved April 02, 2021, from https://docs.microsoft.com/en-us/windows/mixed-reality/discover/mixed-reality

Variety. (2014, February 6). *Oculus VR's Palmer Luckey - "Virtual Reality: The Road Ahead" - D.I.C.E. 2014 Summit* [Presented on February 6, 2014 at D.I.C.E. 2014 Summit at the Hard Rock Hotel, Las Vegas, NV]. YouTube. Retrieved April 21, 2022, from https://www.youtube.com/watch?v=cs58OrTG6LU

Meta Quest. (2014, October 1). *Oculus Connect Keynote: Brendan Iribe and Nate Mitchell*. [Presented on September 20, 2014 at Oculus Connect, Loews Hollywood Hotel, Los Angeles, CA]. YouTube. Retrieved April 21, 2022, from https://www.youtube.com/watch?v=1xeK8zUXAvQ

Slater's Place Illusion & Plausibility Illusion (2009)

Place Illusion

"It is the strong illusion of being in a place in spite of the sure knowledge that you are not there."

Plausibility Illusion

"the illusion that what is apparently happening is really happening (even though you know for sure that it is not)."

Slater, M. (2009, Dec 14). *Place illusion and plausibility can lead to realistic behaviour in immersive virtual environments*. Philosophical Transactions of the Royal Society B: Biological Sciences, 364(1535), 3549–3557. doi:10.1098/rstb.2009.0138.
Images via Toast (2019, July 21). *Richie's Plank Experience Oculus Quest Trailer*. YouTube Retrieved on April 25, 2022 from https://www.youtube.com/watch?v=faNsP7ExSt0.

Bystrom et al's Conceptual Model of the Sense of Presence (1999)

Objective
XR Hardware

Subjective
Experience
of Presence

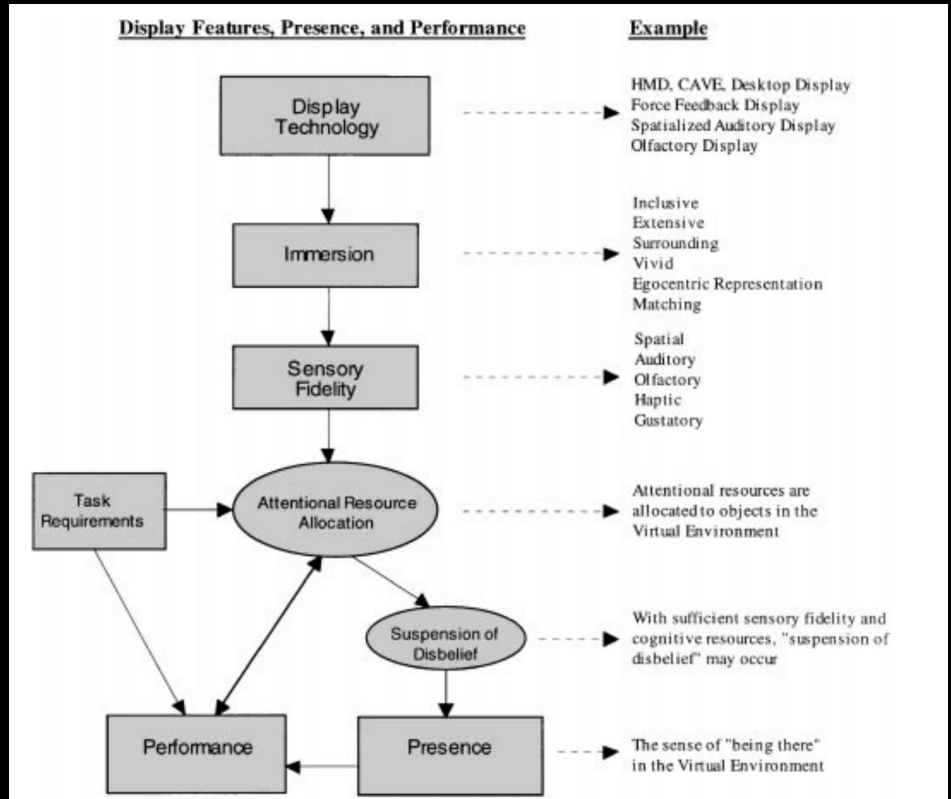
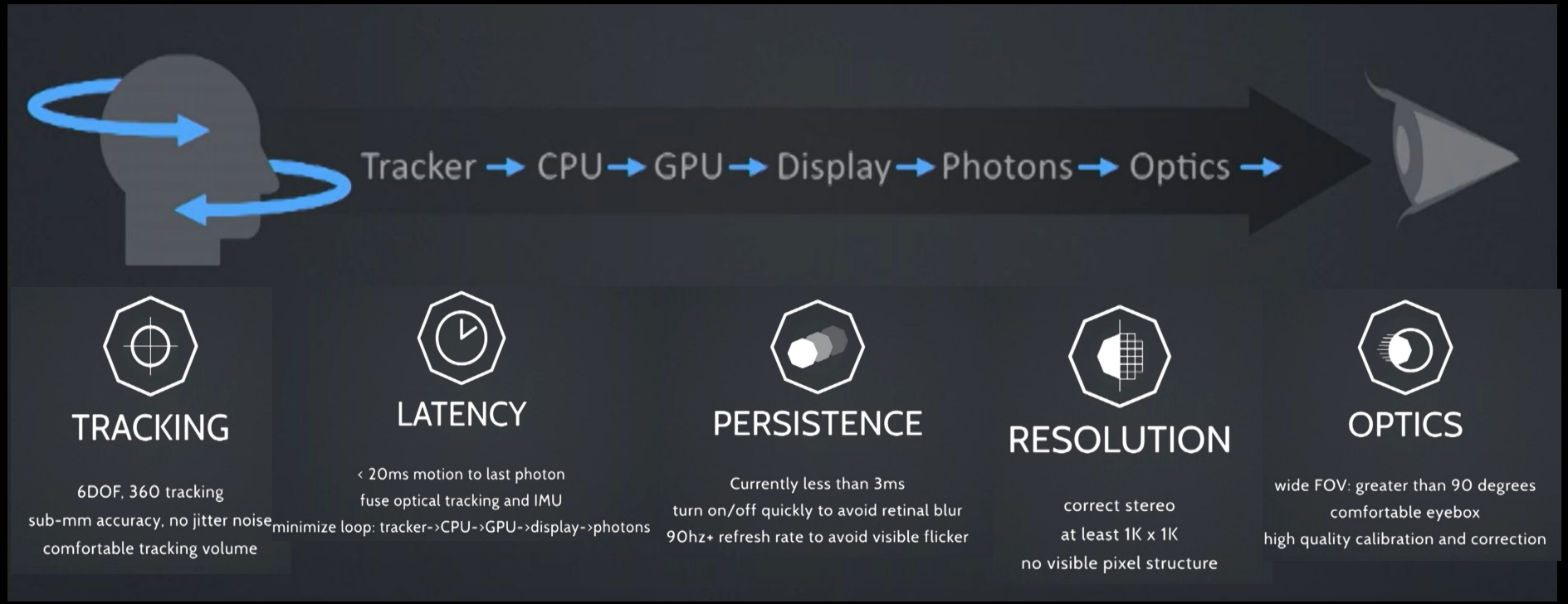


Figure 1. *Diagram of a model on immersion, presence, and performance.*

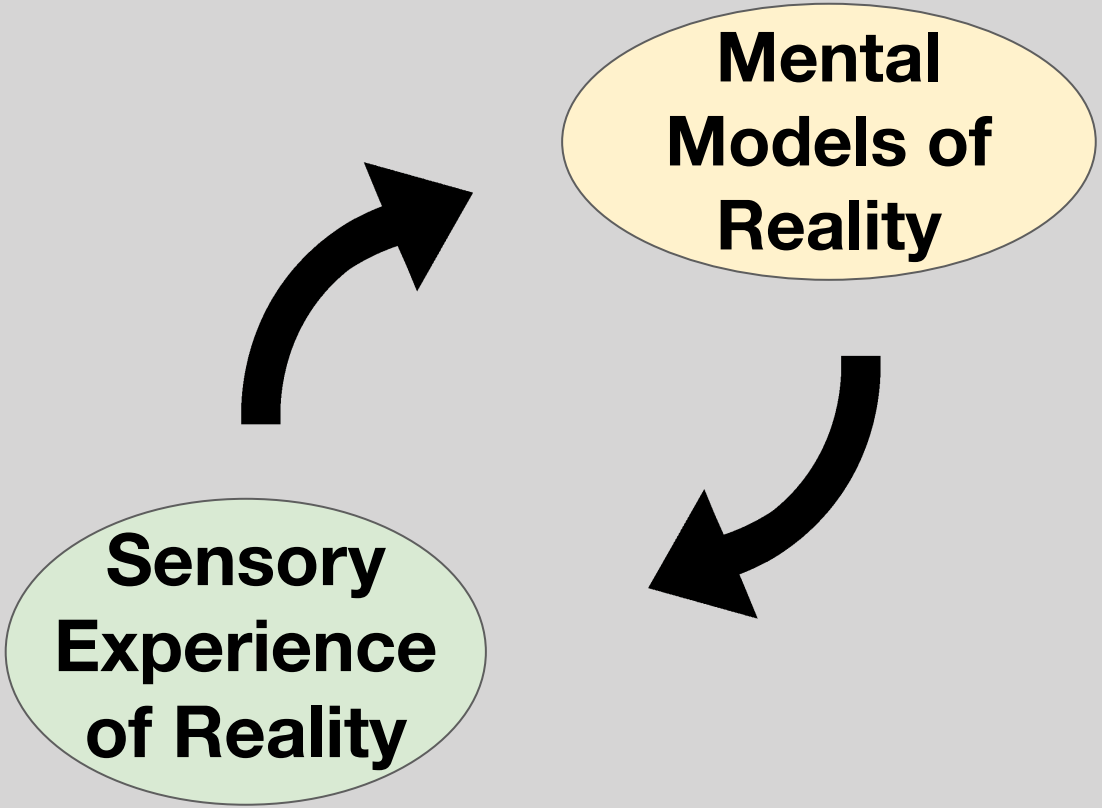
Bystrom, K.-E., Barfield, W., & Hendrix, C. (1999). *A Conceptual Model of the Sense of Presence in Virtual Environments*. Presence: Teleoperators and Virtual Environments, 8(2), 241–244. doi:10.1162/105474699566107

Some of the Objective Hardware Engineering Required for VR (2014)

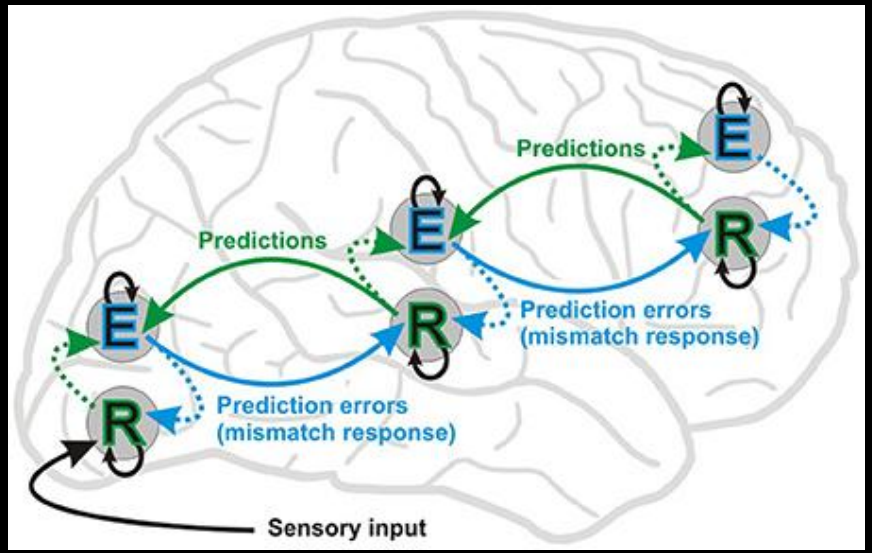


Meta Quest. (2014, October 1). *Oculus Connect Keynote: Brendan Iribe and Nate Mitchell*. [Presented on September 20, 2014 at Oculus Connect, Loews Hollywood Hotel, Los Angeles, CA]. YouTube. Retrieved April 21, 2022, from https://www.youtube.com/watch?v=1xeK8zUXAvQ

Some Models of Perception & Cognition Contributing to Subjective Experiences of Presence



Predictive Coding Theory of Neuroscience (aka Predictive Processing)



arXiv:2107.12979v2 [cs.AI] 14 Jan 2022

PREDICTIVE CODING: A THEORETICAL AND EXPERIMENTAL REVIEW

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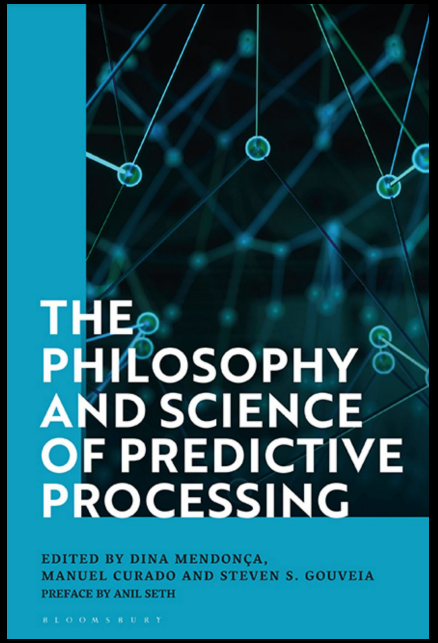
19th January, 2022

ABSTRACT

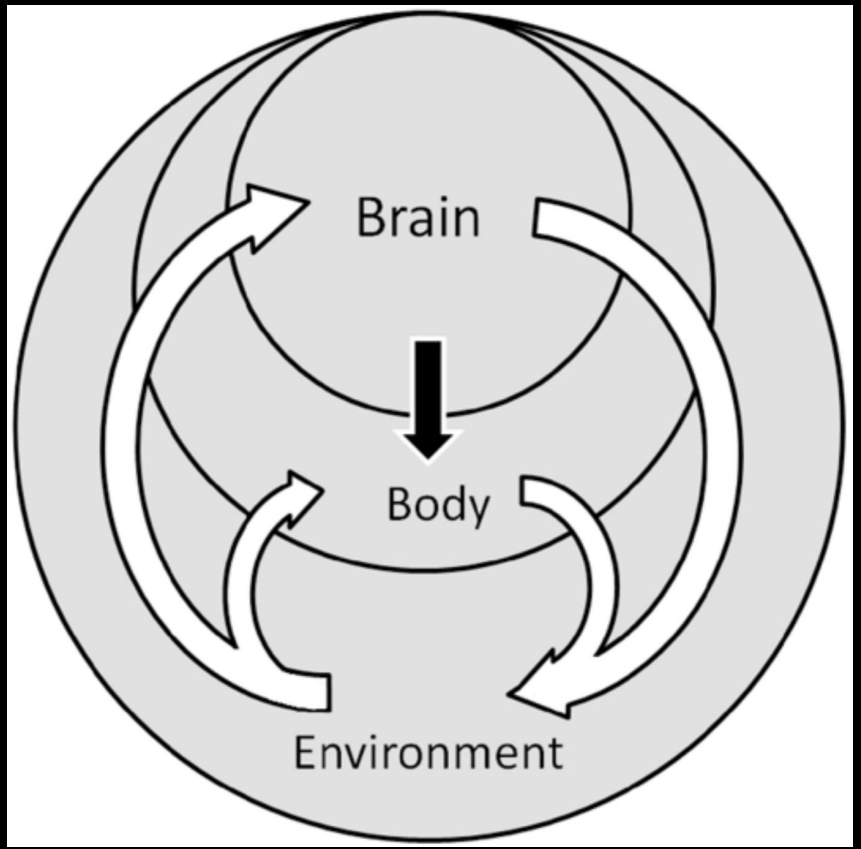
Predictive coding offers a potentially unifying account of cortical function – postulating that the core function of the brain is to minimize prediction errors with respect to a generative model of the world. The theory is closely related to the Bayesian brain framework and, over the last two decades, has gained substantial influence in the fields of theoretical and cognitive neuroscience. A large body of research has arisen based on both empirically testing improved and extended theoretical and mathematical models of predictive coding, as well as in evaluating their potential biological plausibility for implementation in the brain and the concrete neurophysiological and psychological predictions made by the theory. Despite this enduring popularity, however, no comprehensive review of predictive coding theory, and especially of recent developments in this field, exists. Here, we provide a comprehensive review both of the core mathematical structure and logic of predictive coding, thus complementing recent tutorials in the literature (Bogacz, 2017; Buckley, Kim, McGregor, & Seth, 2017). We also review a wide range of classic and recent work within the framework, ranging from the neurobiologically realistic microcircuits that could implement predictive coding, to the close relationship between predictive coding and the widely-used backpropagation of error algorithm, as well as surveying the close relationships between predictive coding and modern machine learning techniques.

Contents



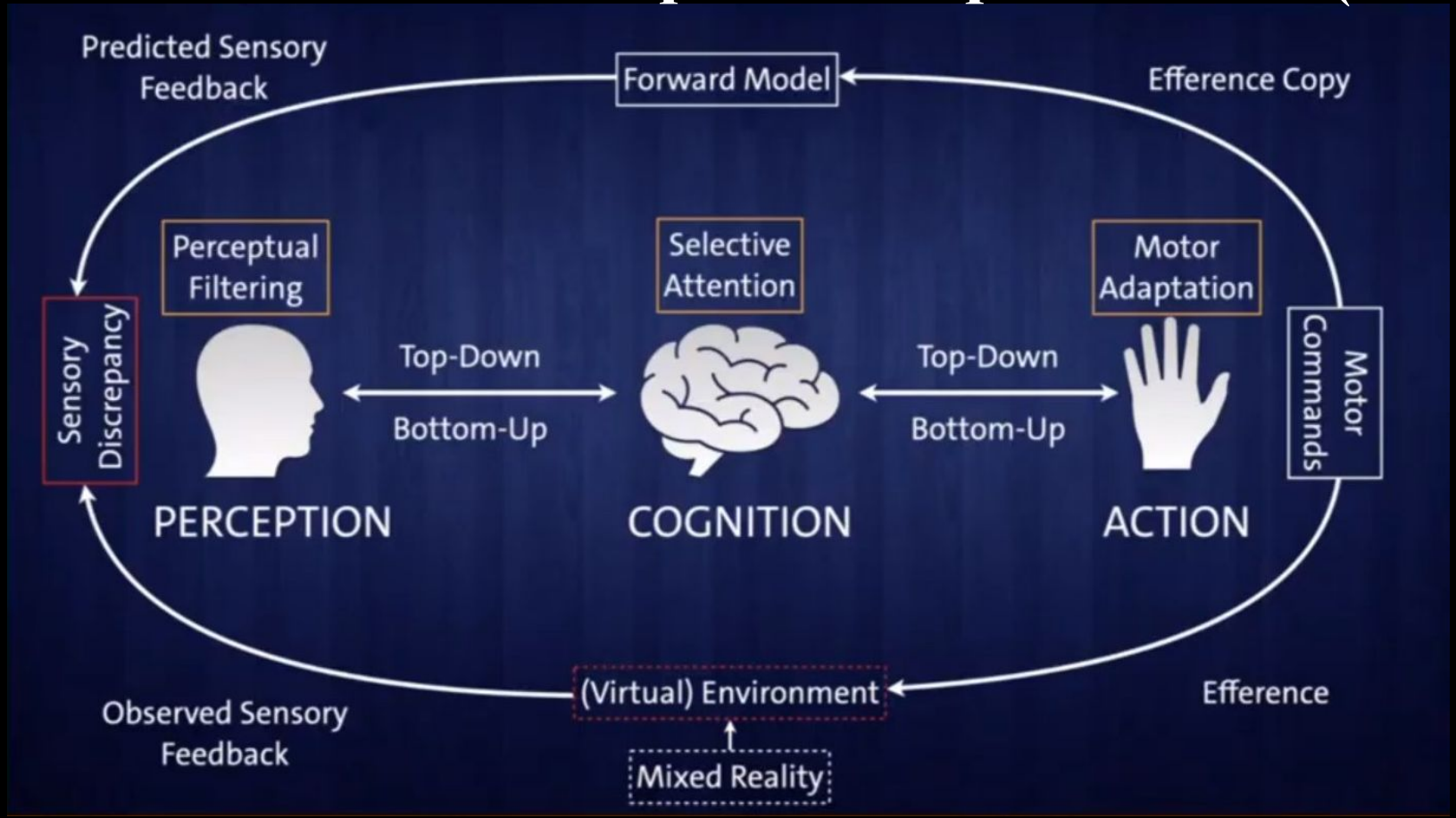
- Stefanics, G., Kremlácek, J., & Czigler, I. (2014). *Visual mismatch negativity: a predictive coding view.* Frontiers in Human Neuroscience, 8. doi:10.3389/fnhum.2014.00666 Retrieved Feb 20, 2020 from: https://www.researchgate.net/figure/Simplified-scheme-of-the-hierarchical-predictive-coding-framework-Friston-2005-2008_fig1_266401430.
- Millidge, B., Seth, A., & Buckley, C. L. (2022, January 22). *Predictive coding: a theoretical and experimental review*. arXiv preprint arXiv:2107.12979. Retrieved on April 23, 2022 from https://arxiv.org/abs/2107.12979
- Mendonça, D., Curado, M., & Gouveia, S. S. (Eds.). (2021). *Philosophy and Science of Predictive Processing*. Bloomsbury Academic.

Embodied Cognition as Nested Contexts (2012)



Klein, T. J., & Lewis, M. A. (2012). *A physical model of sensorimotor interactions during locomotion.* Journal of Neural Engineering, 9(4), 046011. doi:10.1088/1741-2560/9/4/046011

Steinicke on Perceptual Loops with VR (2021)



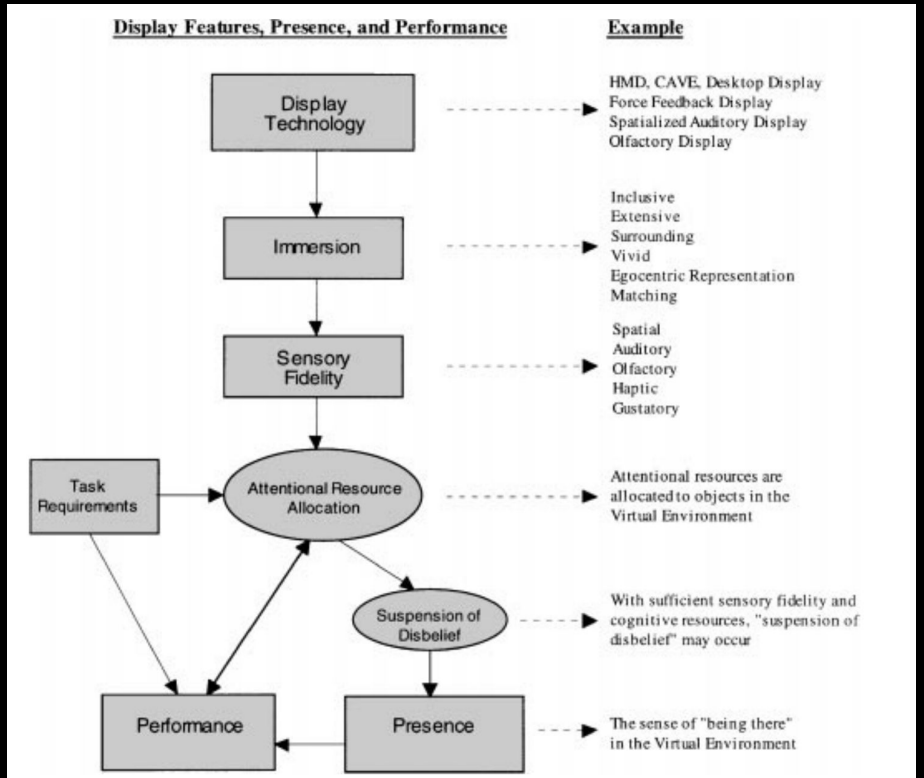
Steinicke, F. (2021, March 31). *B(l)ending Realities*. Keynote lecture presented at The IEEE Conference on Virtual Reality and 3D User Interfaces in Spain (virtual), Libson. Retrieved from https://www.youtube.com/watch?v=Ds-h1J4MFMI&t=13496s

Many Open Questions on Consciousness & Presence

Objective
XR Hardware

Subjective
Experience
of Presence

OPEN QUESTION



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Survey of Presence Concepts (Skarbez et al, 2017)

Table 2. List of Presence/Telepresence Models and Their Components

Source	Model components (order as listed in source)				
Akin et al., 1983 [2]	Ability to act in remote environment	Ability to sense in local environment			
Heeter, 1992 [60]	Subjective personal presence	Social presence	Environmental presence		
Sheridan, 1992 [113]	Extent of sensory information	Control of sensors	Ability to modify physical environment	Task dependent characteristics	
Held and Durlach, 1992 [61]	Sensory factors	Motor factors	Correlation between feedback and actions	Identification with the robot	Familiarity with the system
Kim and Biocca, 1997 [71]	Arrival	Departure			
Draper et al., 1998 [44]	Attention to mediated environment	Attention to ignoring distractors			
Witmer and Singer, 1998 [157]	Control	Sensory	Distraction	Realism	
Baños et al., 2000 [8]	Reality judgment	Presence	Emotional involvement	Interaction	Control
	Attention/Flow	Realism	Congruence/Continuity	Expectations	
IJsselsteijn et al., 2000 [68]	Extent and fidelity of sensory information	Match between sensors and display	Content factors	User characteristics	
Lombard et al., 2000 [81]	Social Richness	Realism (Social)	Realism (Perceptual)	Transportation	Immersion
	Social Actor in a Medium	Medium as Social Actor			
Sas and O'Hare, 2003 [105]	General cognitive factors	Task-specific cognitive factors	Technological factors	Media content	
Takatalo et al. 2008 [142]	Spatial	Action	Attention	Real[ness]	Arousal
Vorderer et al., 2004 [149]	Attention allocation	Spatial situation model	Spatial presence: self-location	Spatial presence: possible actions	Higher cognitive involvement
	Suspension of disbelief	Domain-specific interest	Visual/Spatial imagery	Absorption	
Chertoff et al., 2010 [36]	Affective	Cognitive	Sensory	Active	Relational

Skarbez, R., Brooks, Jr., F. P., & Whitton, M. C. (2017). *A Survey of Presence and Related Concepts*. ACM Computing Surveys, 50(6), 1–39. doi:10.1145/3134301

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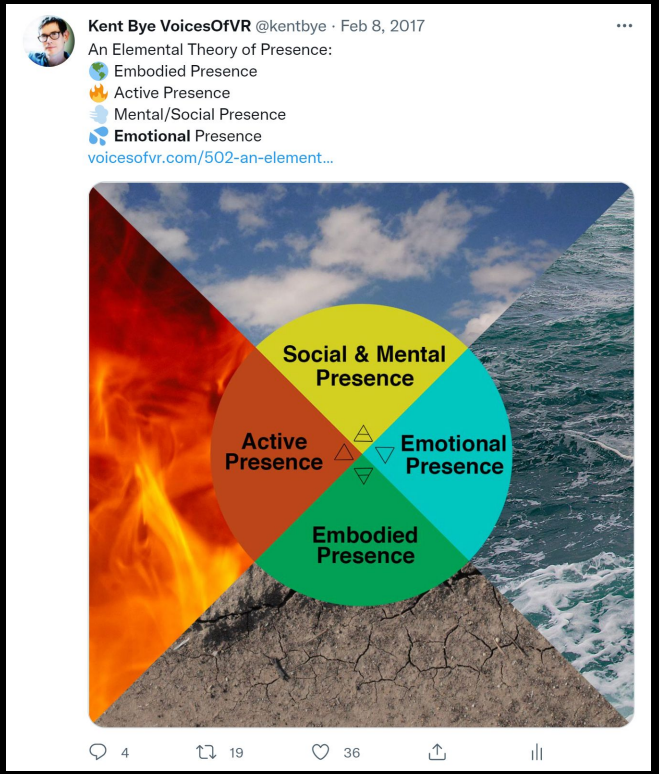
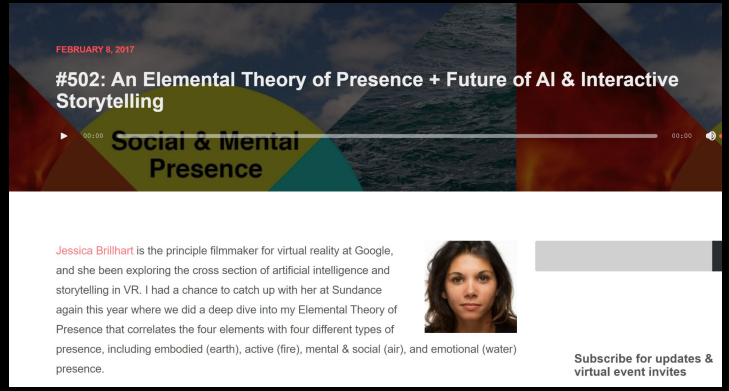
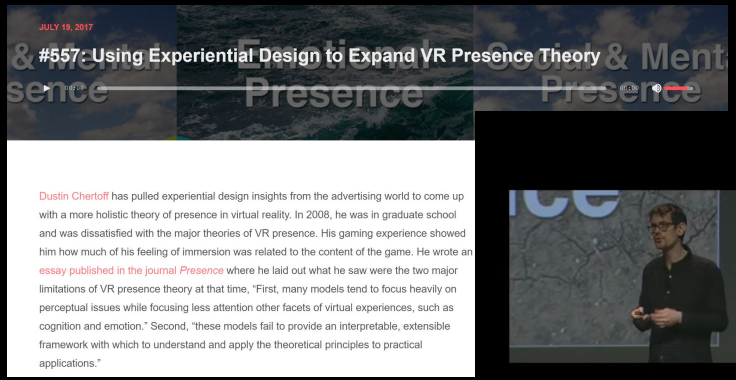
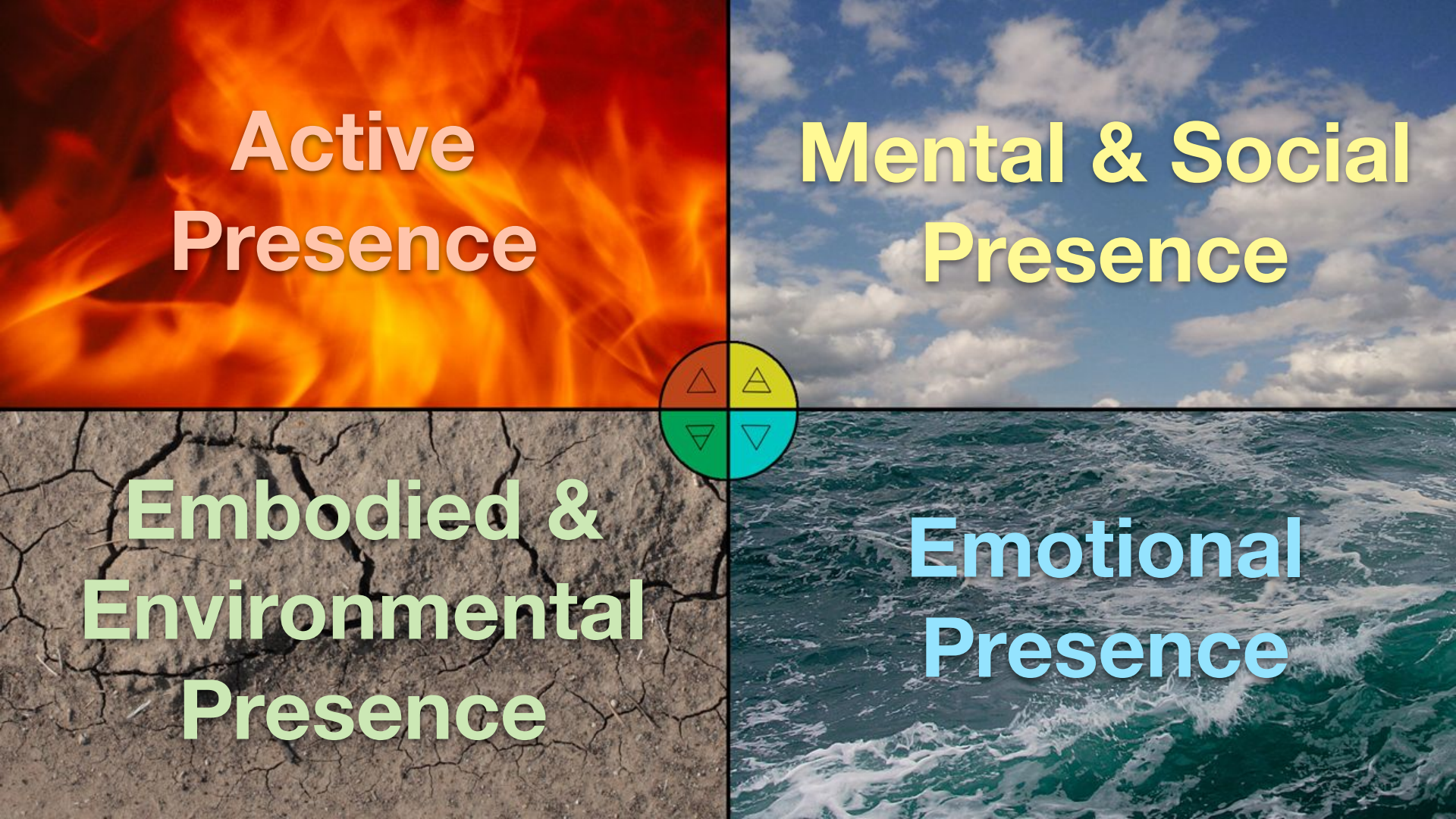
First Presented Elemental Theory of Presence in Feb & March 2017



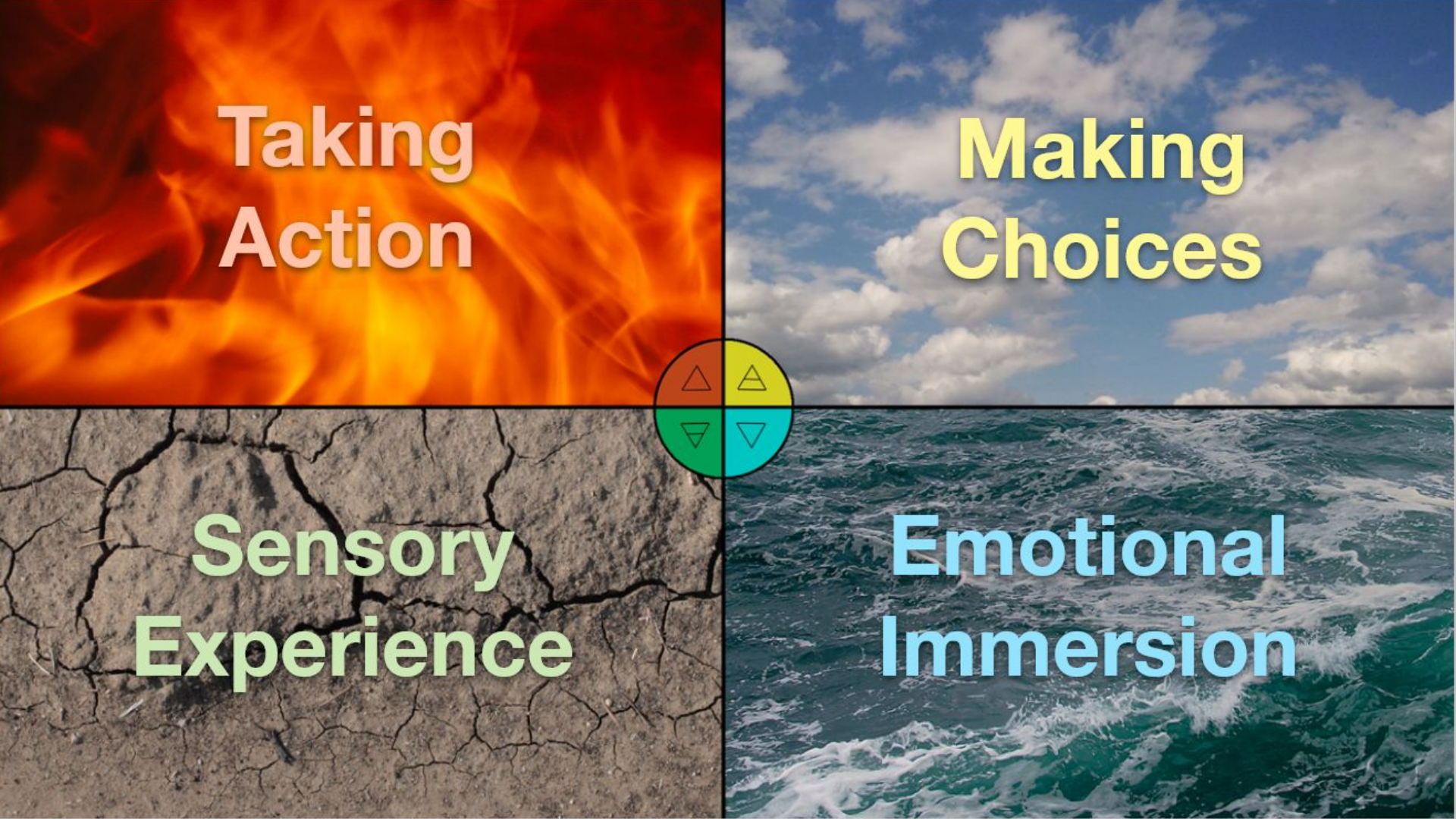


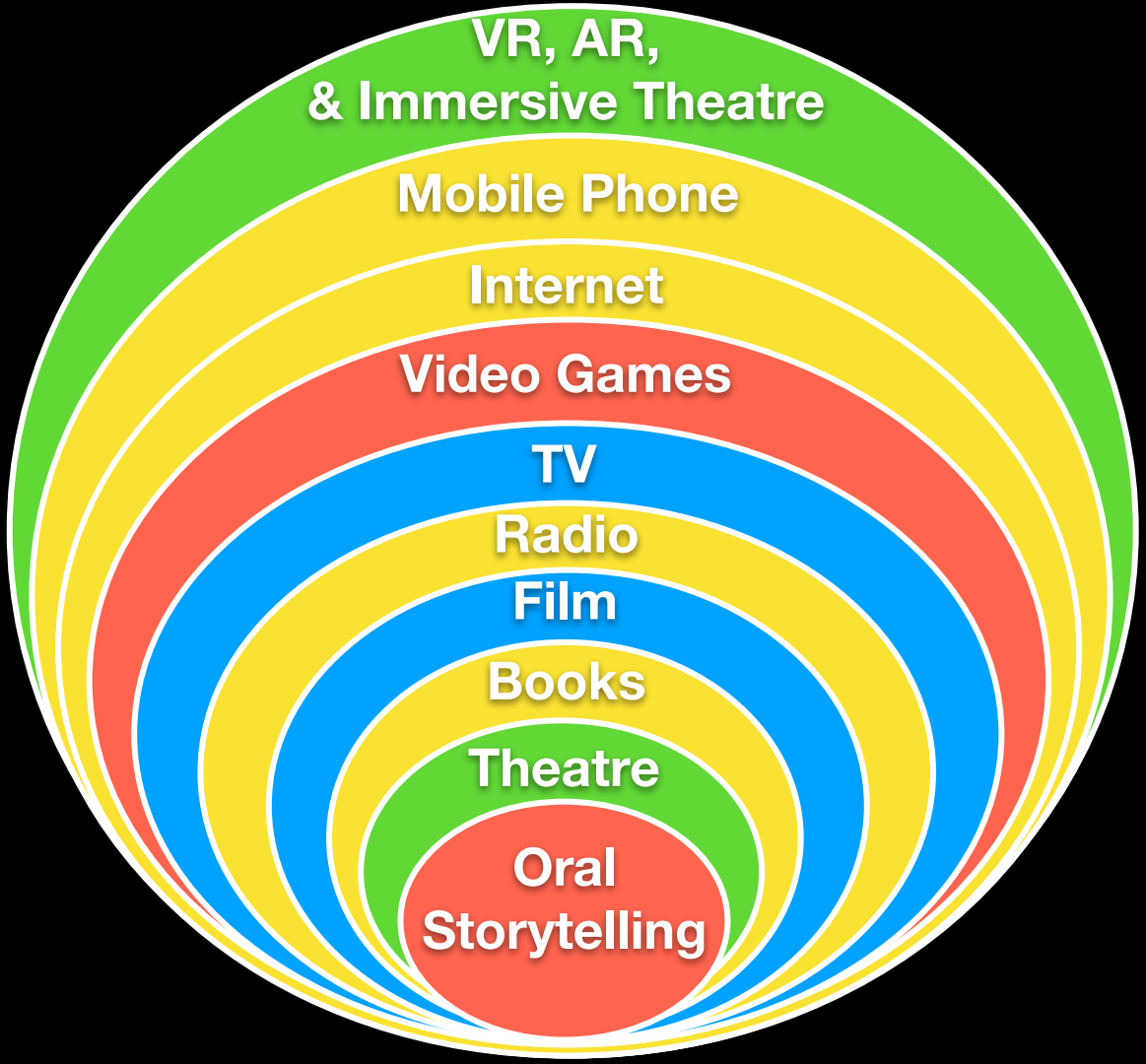


- Bye, K. & Brillhart, J. (2017, February 8) *#502: An Elemental Theory of Presence + Future of AI & Interactive Storytelling.* Voices of VR Podcast. Retrieved on April 22, 2022 from https://voicesofvr.com/502-an-elemental-theory-of-presence-future-of-ai-interactive-storytelling/
- Bye, K. & Chertoff, D. (2017, July 19). *#557: Using Experiential Design to Expand VR Presence Theory*. Voices of VR Podcast. Retrieved on April 22, 2022 from https://voicesofvr.com/557-using-experiential-design-to-expand-vr-presence-theory/
- Bye, K. (Recorded 2017, March 30, Published on 2017, March 31). *Historical Context of Virtual Reality. Silicon Valley Virtual Reality Conference & Expo.* [Keynote presentation]. San Jose, CA; San Jose Convention Center.


Active Presence
Mental & Social Presence
Embodied & Environmental Presence
Emotional Presence


Nintendo
ENTERTAINMENT SYSTEM
disk II
disk II
apple II


Taking Action
Making Choices
Sensory Experience
Emotional Immersion


VR, AR,
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Mobile Phone
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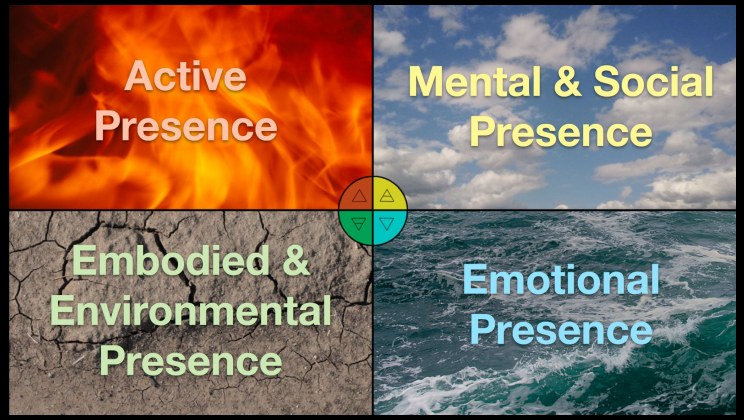
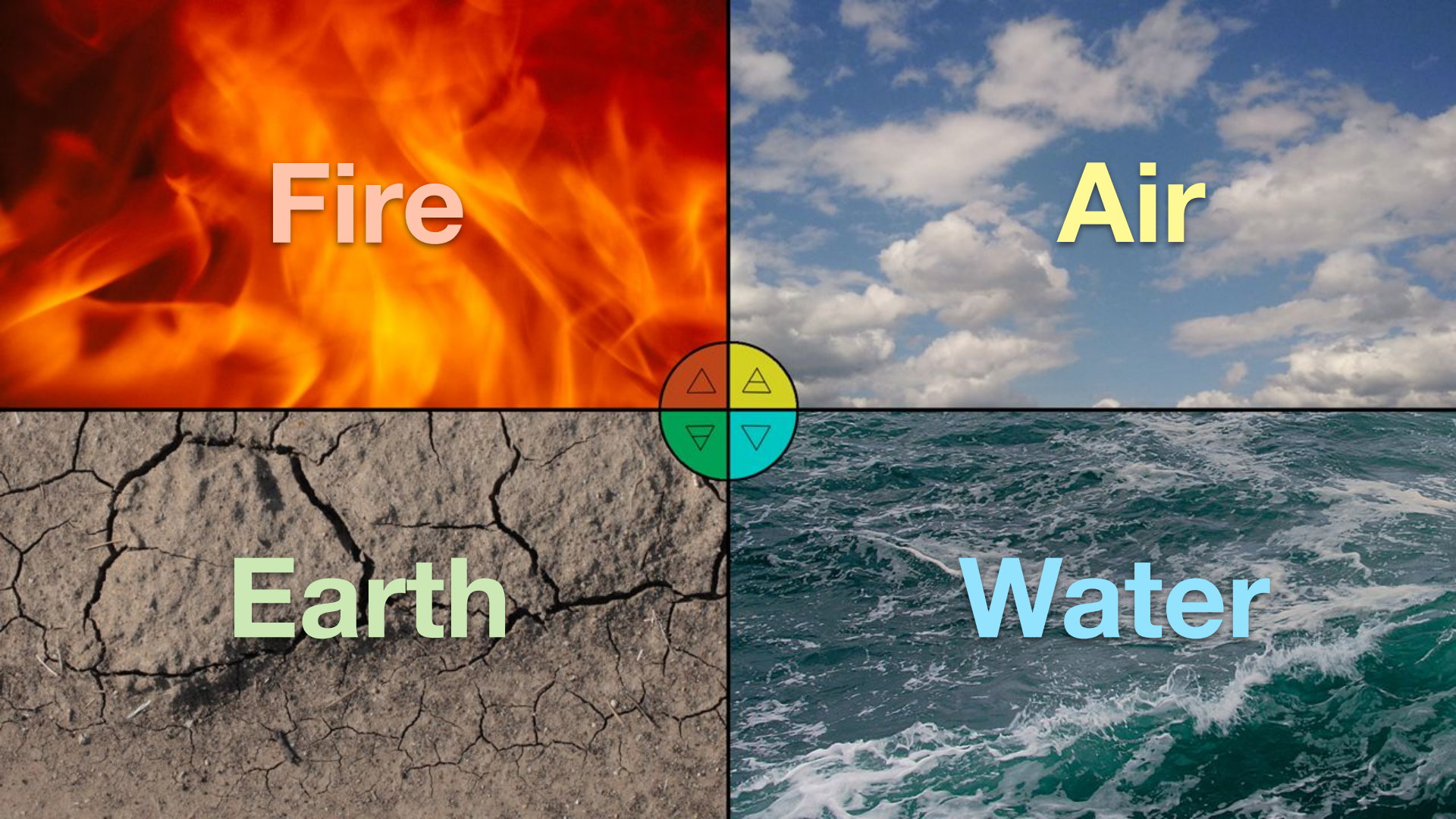
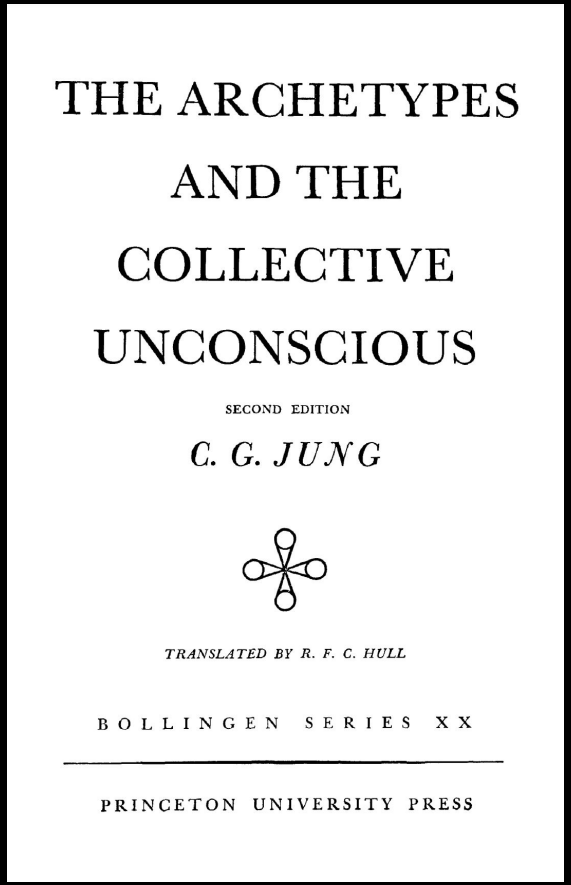

Active
Presence
Mental & Social
Presence
Embodied &
Environmental
Presence
Emotional
Presence


Fire
Air
Earth
Water

Jung on Archetypes: Can't be "reduced to a simple formula"


THE ARCHETYPES
AND THE
COLLECTIVE
UNCONSCIOUS

SECOND EDITION

C. G. JUNG

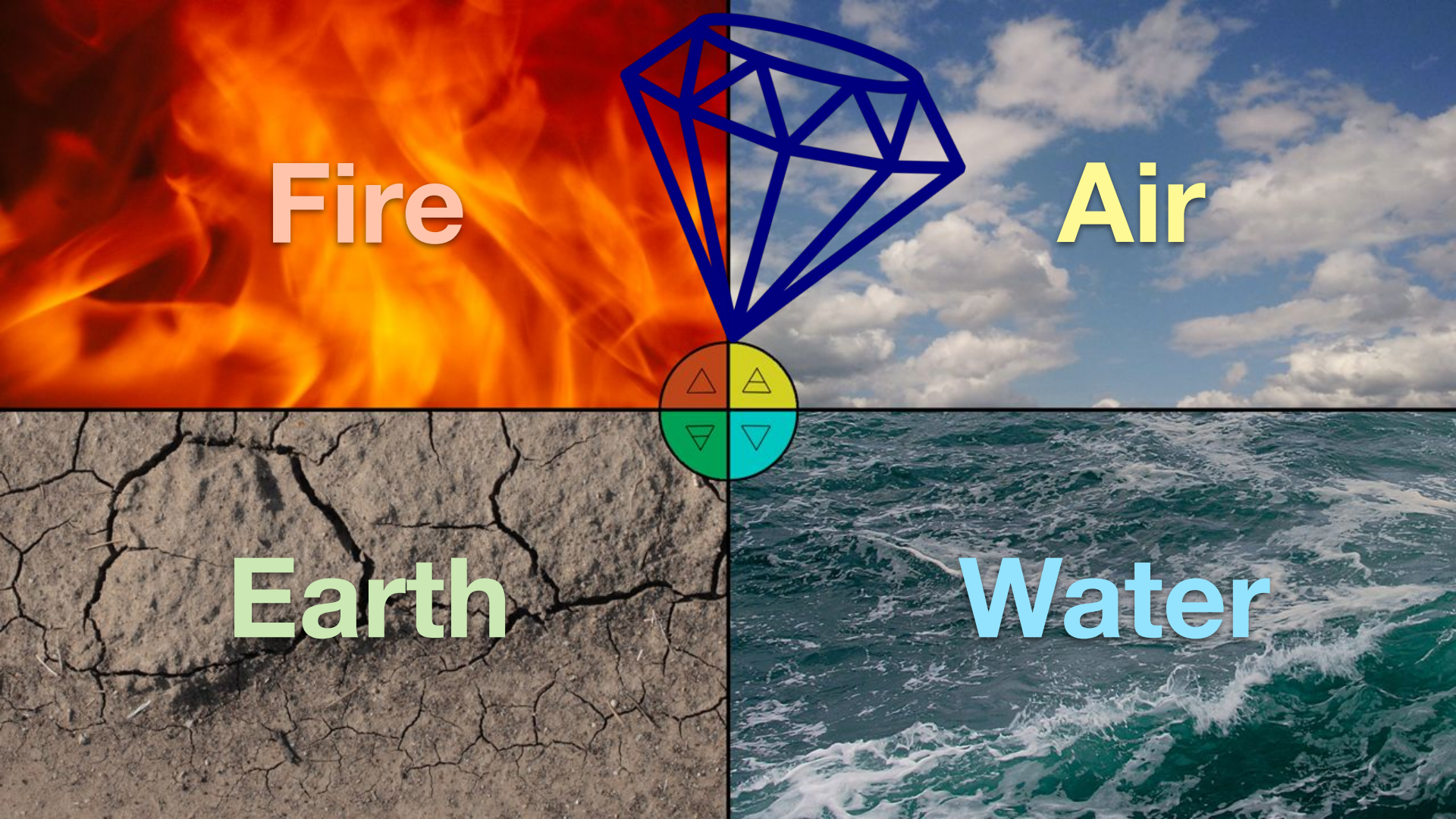
TRANSLATED BY R. F. C. HULL

BOLLINGEN SERIES XX

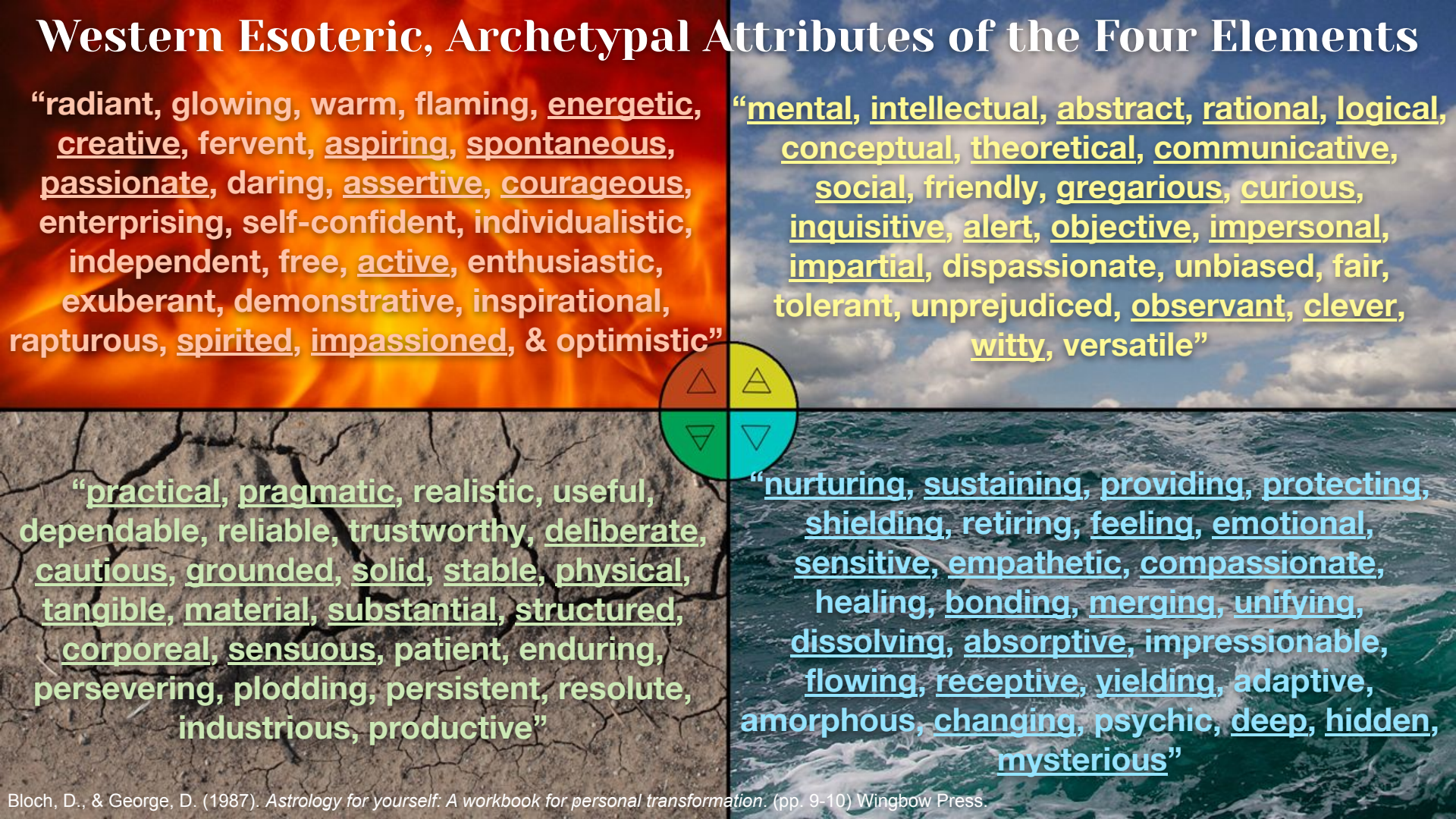
PRINCETON UNIVERSITY PRESS

"Clear-cut distinctions and strict formulations are quite impossible in this field, seeing that a kind of fluid interpenetration belongs to the very nature of all archetypes. They can only be roughly circumscribed at best. Their living meaning comes out more from their presentation as a whole than from a single formulation. Every attempt to focus them more sharply is immediately punished by the intangible core of meaning losing its luminosity. No archetype can be reduced to a simple formula. It is a vessel which we can never empty, and never fill. It has a potential existence only, and when it takes shape in matter it is no longer what it was. It persists throughout the ages and requires interpreting ever anew. The archetypes are the imperishable elements of the unconscious, but they change their shape continually."

Jung, C. G. (1968). The Psychology of the Child Archetype. In R. F. C. Hull (Trans.), The Collected Works of C. G Jung | Complete Digital Edition (Vol. 9: Part 4 of The Archetypes and the Collective Unconscious, 2nd Edition, pg. 179, paragraph 301). Princeton, NJ: Princeton University Press. (Original work published 1940).


Fire
Air
Earth
Water

Western Esoteric, Archetypal Attributes of the Four Elements



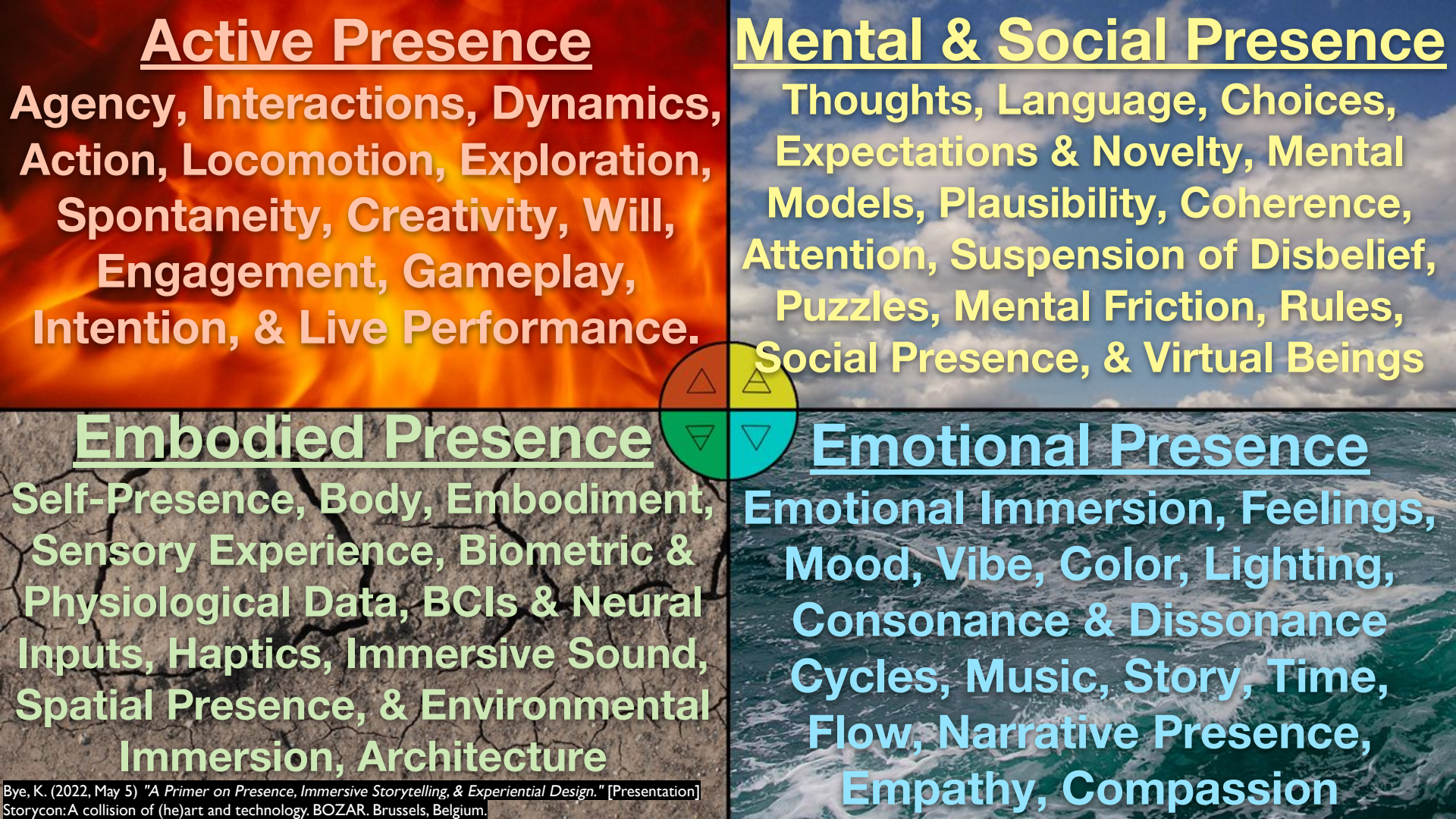
"radiant, glowing, warm, flaming, energetic, creative, fervent, aspiring, spontaneous, passionate, daring, assertive, courageous, enterprising, self-confident, individualistic, independent, free, active, enthusiastic, exuberant, demonstrative, inspirational, rapturous, spirited, impassioned, & optimistic"

"mental, intellectual, abstract, rational, logical, conceptual, theoretical, communicative, social, friendly, gregarious, curious, inquisitive, alert, objective, impersonal, impartial, dispassionate, unbiased, fair, tolerant, unprejudiced, observant, clever, witty, versatile"

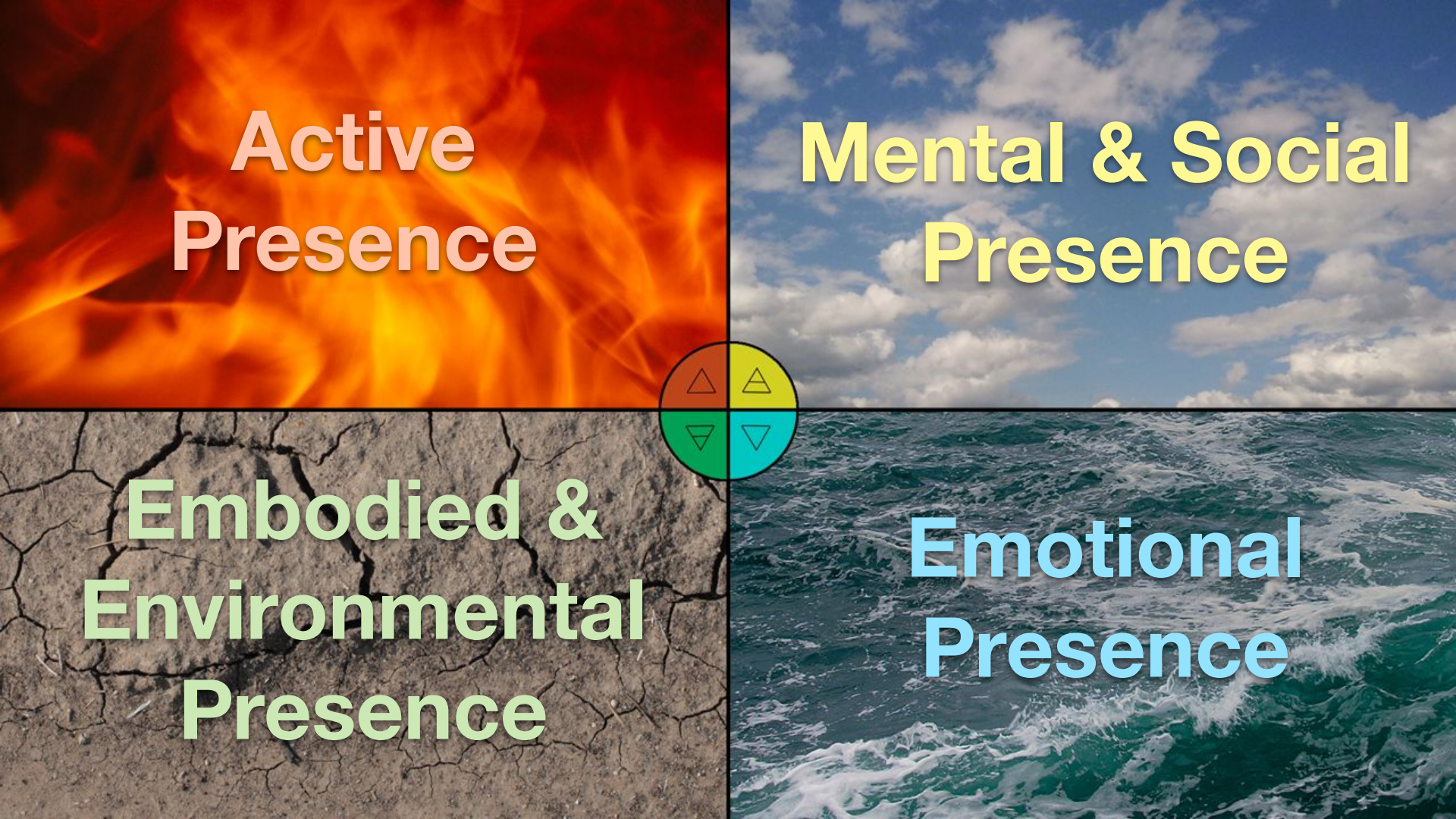
"practical, pragmatic, realistic, useful, dependable, reliable, trustworthy, deliberate, cautious, grounded, solid, stable, physical, tangible, material, substantial, structured, corporeal, sensuous, patient, enduring, persevering, plodding, persistent, resolute, industrious, productive"

"nurturing, sustaining, providing, protecting, shielding, retiring, feeling, emotional, sensitive, empathetic, compassionate, healing, bonding, merging, unifying, dissolving, absorptive, impressionable, flowing, receptive, yielding, adaptive, amorphous, changing, psychic, deep, hidden, mysterious"

Bloch, D., & George, D. (1987). *Astrology for yourself: A workbook for personal transformation*. (pp. 9-10) Wingbow Press.



Bye, K. (2022, May 5) *"A Primer on Presence, Immersive Storytelling, & Experiential Design."* [Presentation] Storycon: A collision of (he)art and technology. BOZAR. Brussels, Belgium.


Active Presence
Mental & Social Presence
Embodied & Environmental Presence
Emotional Presence


Nintendo
ENTERTAINMENT SYSTEM
disk II
disk II
apple II

- Underlying Experiential Age Context
- My Elemental Theory of Presence
  - Connections to Experiential Marketing
  - Underlying Dialectics of Presence
  - Presence Theory Evolution & Synthesis
- My Immersive Storytelling & Experiential Design Framework
- Experiential Design & Immersive Story Breakdowns

Skarbez tips me off to Chertoff's Presence Work (2016, Dec 4)

Rick Skarbez
to me

Sun, Dec 4, 2016, 5:34 AM

A couple of comments:
- This has some commonalities with experiential design. Dustin Chertoff et al. wrote a paper a couple years ago, "Virtual Experience Test: A Virtual Environment Evaluation Questionnaire"' where they developed a questionnaire based on ED. Their five categories are Sensory, Cognitive, Affective, Active, and Relational. I know nothing more about experiential design than that article, but it may be worth looking into, if you haven't already.

I got a brief mention in Skarbez et al's 2017 survey

Kent Bye proposed a theory of presence with a metaphor inspired by the four elements of natural philosophy: earth (embodied presence), fire (active presence), air (social and mental presence), and water (emotional presence) [32]. The similarity of these elements to the dimensions of experiential design used by Chertoff et al. is notable, as the two models were developed independently [36].

- Skarbez, R. (2016, December 4). *Thank you! From a Voices of VR alum*. Personal Communication to Bye, K.
- Skarbez, R., Brooks, Jr., F. P., & Whitton, M. C. (2017). *A Survey of Presence and Related Concepts*. ACM Computing Surveys, 50(6), 1–39. doi:10.1145/3134301

Chertoff's Experiential Design & Presence Work (2008–2010) via Skarbez

Dustin B. Chertoff*
Institute for Simulation and Training
University of Central Florida
3280 Progress Drive
Orlando, FL 32826

Sae Lynne Schatz
Rudy McDaniel
Clint A. Bowers
Department of Digital Media
University of Central Florida
Orlando, FL 32826

Improving Presence Theory Through Experiential Design

Abstract

Despite ongoing research over the last 15 years, the presence construct remains somewhat limited in its ability to be applied beyond the sensory domain. In order to increase its usefulness for applied challenges (e.g., using presence theory to enhance simulators' effectiveness), a discussion about a new conceptualization of presence is introduced. This novel perspective on presence is rooted in the notion of "experiential design," an approach businesses use to create strategically compelling and memorable experiences. The paper begins with a brief review of presence and then a description of the concepts of experimental design. Following this, a theoretical model of presence, based upon experimental design, is offered. Using this model, an exploration on the mitigation of breaks in presence is offered (a break in presence occurs when presence fails to be maintained). These ideas are presented in order to improve the likelihood of presence emerging for simulation participants and to enhance interdisciplinary researchers' shared conceptualizations of presence.

Chertoff, D. B., Schatz, S. L., McDaniel, R., & Bowers, C. A. (2008). *Improving Presence Theory Through Experiential Design*. Presence: Teleoperators and Virtual Environments, 17(4), 405–413. doi:10.1162/pres.17.4.405

Chertoff's Review of Presence Theory Components (2009)

EXPLORING ADDITIONAL FACTORS OF PRESENCE

by

DUSTIN CHERTOFF
B.S. University of Maryland, 2003
M.S. University of Central Florida, 2005

A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
in the Department of Industrial Engineering and Management Systems
in the College of Engineering and Computer Science
at the University of Central Florida,
Orlando, Florida

Summer Term 2009

Major Professors:
Brian Goldiez

Table 1 - Review of presence theory components

Author(s)	Components of Presence
Sheridan (1992)	**Sensory Information** – amount and fidelity of sensations provided to user **Control** – amount of control user has over the sensor mechanisms **Environment Modification** – amount of modification the user can make to the environment
Heeter (1992)	**Environmental** – amount the environment appears to respond to the user's existence within the world **Social** – amount of support received by a user from other users that they are in a virtual environment **Personal** – various perceptual factors relating to how and why the user might feel that they are in the environment.
Lombard and Ditton (1997)	**Physical** –user's sense of being physically at some location **Social** – the user's feeling of being together or communicating with another person
Zahoric and Jenison (1998)	**Environment Support** – Presence emerges based on successful support of user action by the environment
Mantovani and Riva (1999)	**Social Construction** – View presence as the relationship between actors and their environments. User interaction towards the environment is important as well.
Witmer and Singer (1998)	**Control** – extent a user can interact with and manipulate the virtual environment **Sensory** – the number, types, richness and consistency of sensations a user will feel **Distraction** – amount the hardware and surrounding external environment affect the user's ability to focus on the virtual environment **Realism** – how connected and consistent VE information is to the real world and how well the user relates to the information.
IJsselsteijn, de Ridder, Freeman, and Avons (2000)	**Sensory** – extent and fidelity of sensory information **Sensory-motor Contingencies –** how well a user's actions match the spatio-temporal effects of those actions **Content Factors –** contains ways in which the user can interact with and modify the environment **User Characteristics** – user perceptual, cognitive and motor abilities, previous experience, susceptibility to simulator sickness, and a willingness to suspend disbelief.
Lee and Nass (2001)	**Technology Factors** – objective quality of technology **User Factors** – individual differences **Social Factors** – social characteristics of technology

Chertoff, Dustin, "*Exploring Additional Factors Of Presence*" (2009). Electronic Theses and Dissertations. 3910.
https://stars.library.ucf.edu/etd/3910

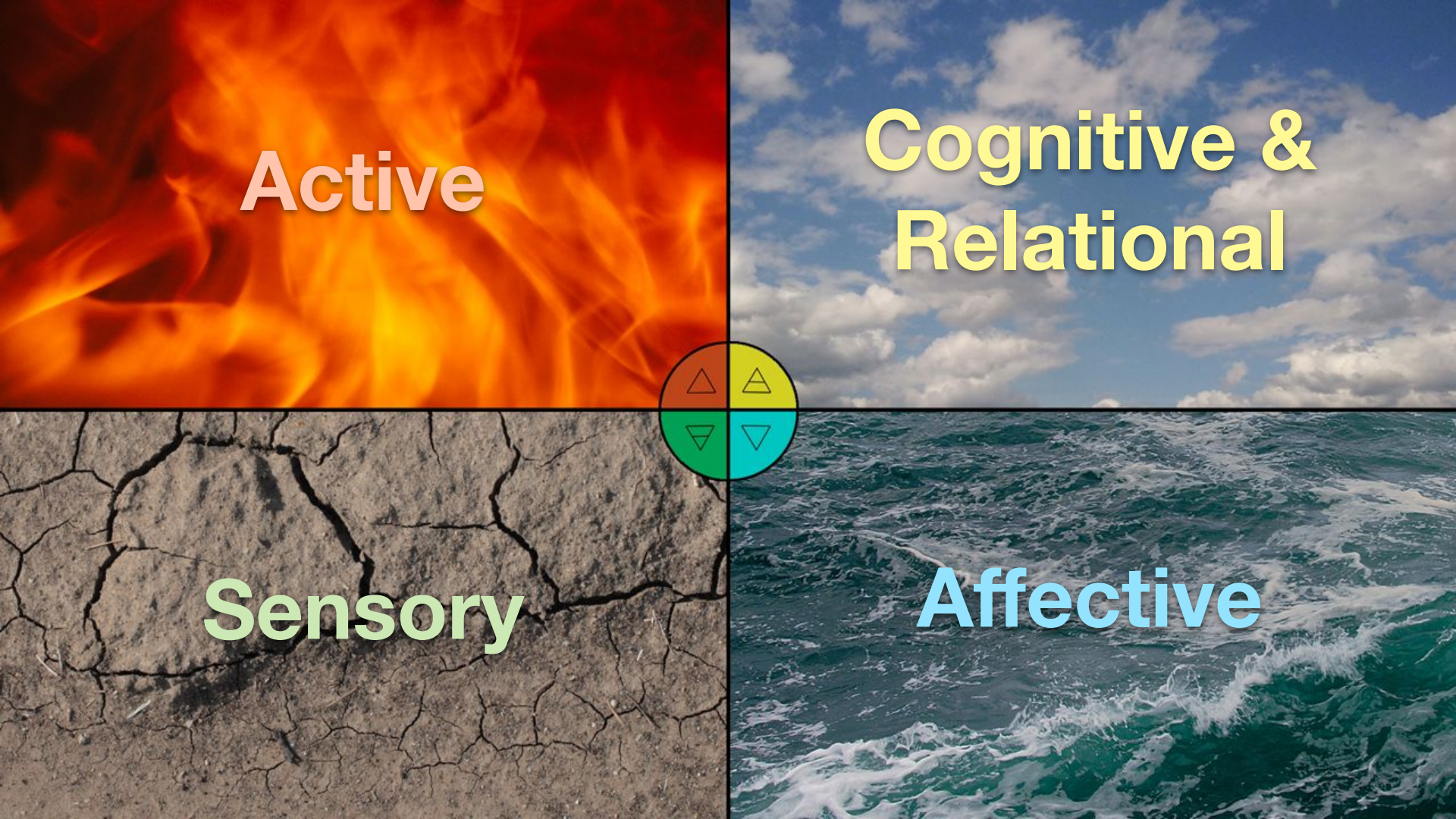
“The process of using these dimensions to create such an experience is known as experiential design” – Chertoff (2010)

Experiential Design "originated from the marketing field where it was used to encourage people to create meaningful emotional and social connections to a product."

Table 1. Dimensions of experiential design applied towards virtual environments [7]

Experiential Design Dimension	Description
Sensory	Includes sensory input (visual, aural, haptic, etc.) as well as perception of those stimuli. Represented through sensory hardware and software that creates the sensations.
Cognitive	Mental engagement with an experience, such as anticipating outcomes and solving mysteries. Can be interpreted as task engagement.
Affective	Refers to the user’s emotional state. Related to the degree to which a person’s emotions in the simulated environment would accurately mimic his emotional state in a similar real-world situation.
Active	Relates to the degree of personal connection a person feels to an experience. Associated with the degree of empathy, identification, and personal relation a person feels to the virtual environment’s avatars, surroundings, and scenario.
Relational	Comprised of the social aspects of an experience. Operationalized as co-experience; creating and reinforcing meaning through collaborative experiences.

- Chertoff, Dustin, "*Exploring Additional Factors Of Presence*" (2009). Electronic Theses and Dissertations. 3910. https://stars.library.ucf.edu/etd/3910
- Chertoff, D. B., Goldiez, B., & LaViola, J. J. (2010). *Virtual Experience Test: A virtual environment evaluation questionnaire*. 2010 IEEE Virtual Reality Conference (VR). doi:10.1109/vr.2010.5444804


Active
Cognitive &
Relational
Sensory
Affective

Experiential Marketing: "Strategic Experiential Modules" (1999)

Journal of Marketing Management, 1999, 15, 53-67

Bernd Schmitt[1]

Director, Centre of Global Brand Management Columbia Business School

Experiential Marketing

In this article, I contrast traditional marketing with a new approach to marketing called Experiential Marketing and provide a strategic framework for Experiential Marketing. Traditional marketing views consumers as rational decision-makers who care about functional features and benefits. In contrast, experiential marketers view consumers as rational and emotional human beings who are concerned with achieving pleasurable experiences. Five different types of experiences, or strategic experiential modules (SEMs), that marketers can create for customers are distinguished: sensory experiences (SENSE); affective experiences (FEEL); creative cognitive experiences (THINK); physical experiences, behaviours and lifestyles (ACT); and social-identity experiences that result from relating to a reference group or culture (RELATE). These experiences are implemented through so-called experience providers (ExPros) such as communications, visual and verbal identity, product presence, electronic media, etc. The ultimate goal of experiential marketing is to create holistic experiences that integrate individual experiences into a holistic Gestalt. The paper concludes with an examination of strategic issues and a discussion about how to create the experience-oriented organization.

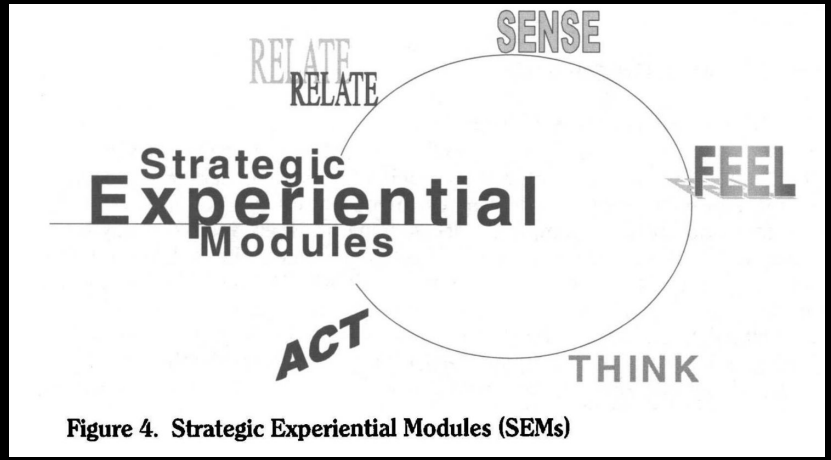
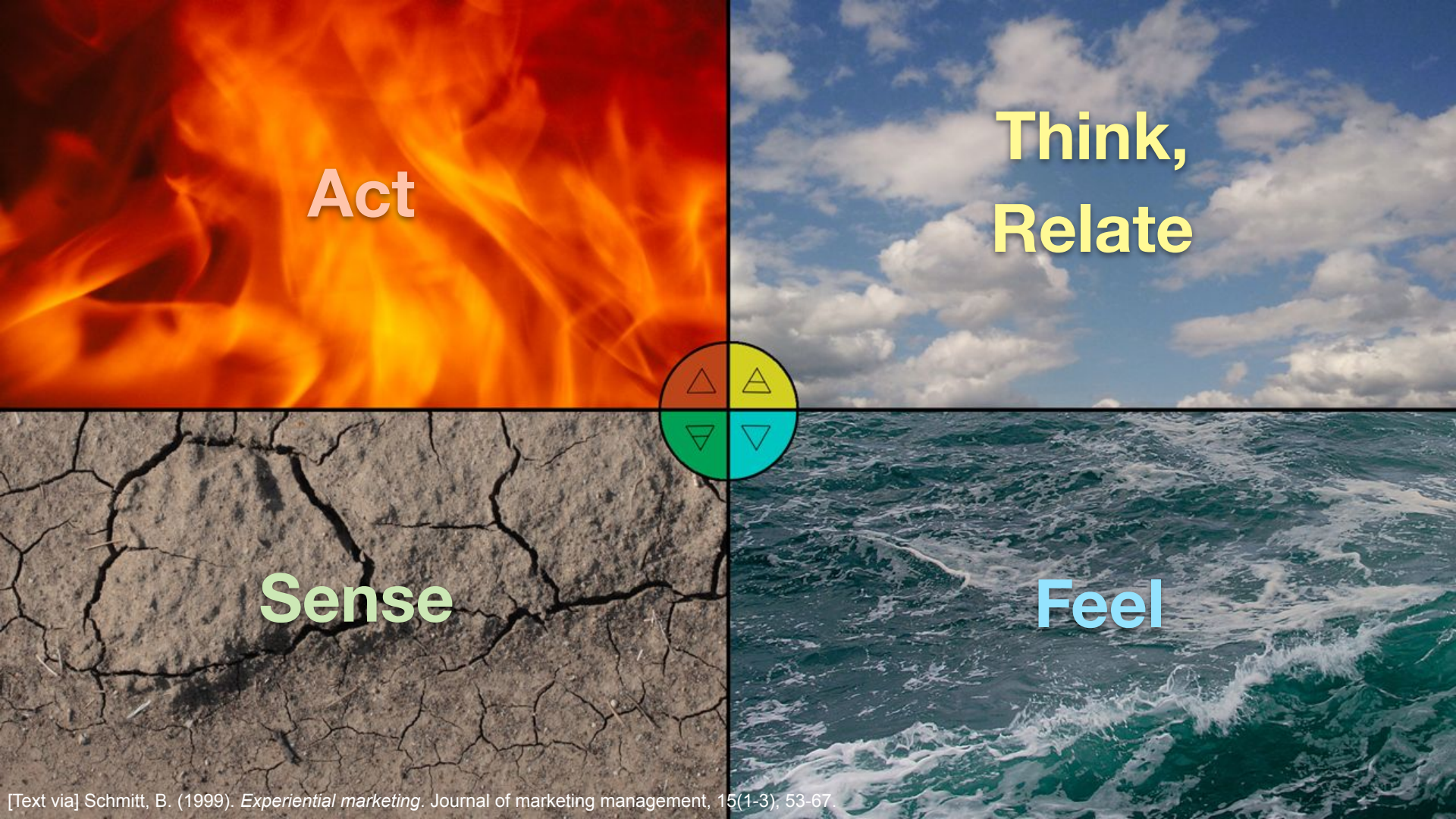


Figure 4. Strategic Experiential Modules (SEMs)

- Sense
- Feel
- Think
- Act
- Relate

Schmitt, B. (1999). *Experiential marketing*. Journal of marketing management, 15(1-3), 53-67.



[Text via] Schmitt, B. (1999). *Experiential marketing*. Journal of marketing management, 15(1-3), 53-67.

Act

“enriches customers' lives by targeting their physical experiences, showing them alternative ways of doing things..., alternative lifestyles and interactions.

Think

“appeals to the intellect with the objective of creating cognitive, problem-solving experiences that engage customers creatively.”

Relate

“expands beyond the individual's personal, private feelings... appeal to the need to be perceived positively by individual others... They relate the person to a broader social system.”

Sense

“appeals to the senses with the objective of creating sensory experiences, through sight sound, touch, taste and smell.”

Feel

“appeals to customers' inner feelings and emotions, with the objective of creating affective experiences that range from mildly positive moods... to strong emotions of joy and pride.”

[Text via] Schmitt, B. (1999). *Experiential marketing*. Journal of marketing management, 15(1-3), 53-67.

Measuring Brand Experience (2009)

J. Joško Brakus, Bernd H. Schmitt, & Lia Zarantonello

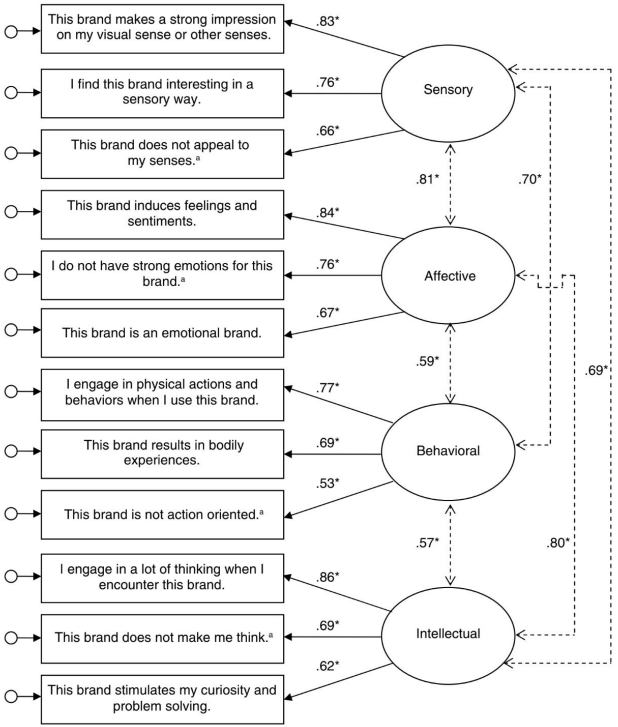
Brand Experience: What Is It? How Is It Measured? Does It Affect Loyalty?

Brand experience is conceptualized as sensations, feelings, cognitions, and behavioral responses evoked by brand-related stimuli that are part of a brand's design and identity, packaging, communications, and environments. The authors distinguish several experience dimensions and construct a brand experience scale that includes four dimensions: sensory, affective, intellectual, and behavioral. In six studies, the authors show that the scale is reliable, valid, and distinct from other brand measures, including brand evaluations, brand involvement, brand attachment, customer delight, and brand personality. Moreover, brand experience affects consumer satisfaction and loyalty directly and indirectly through brand personality associations.

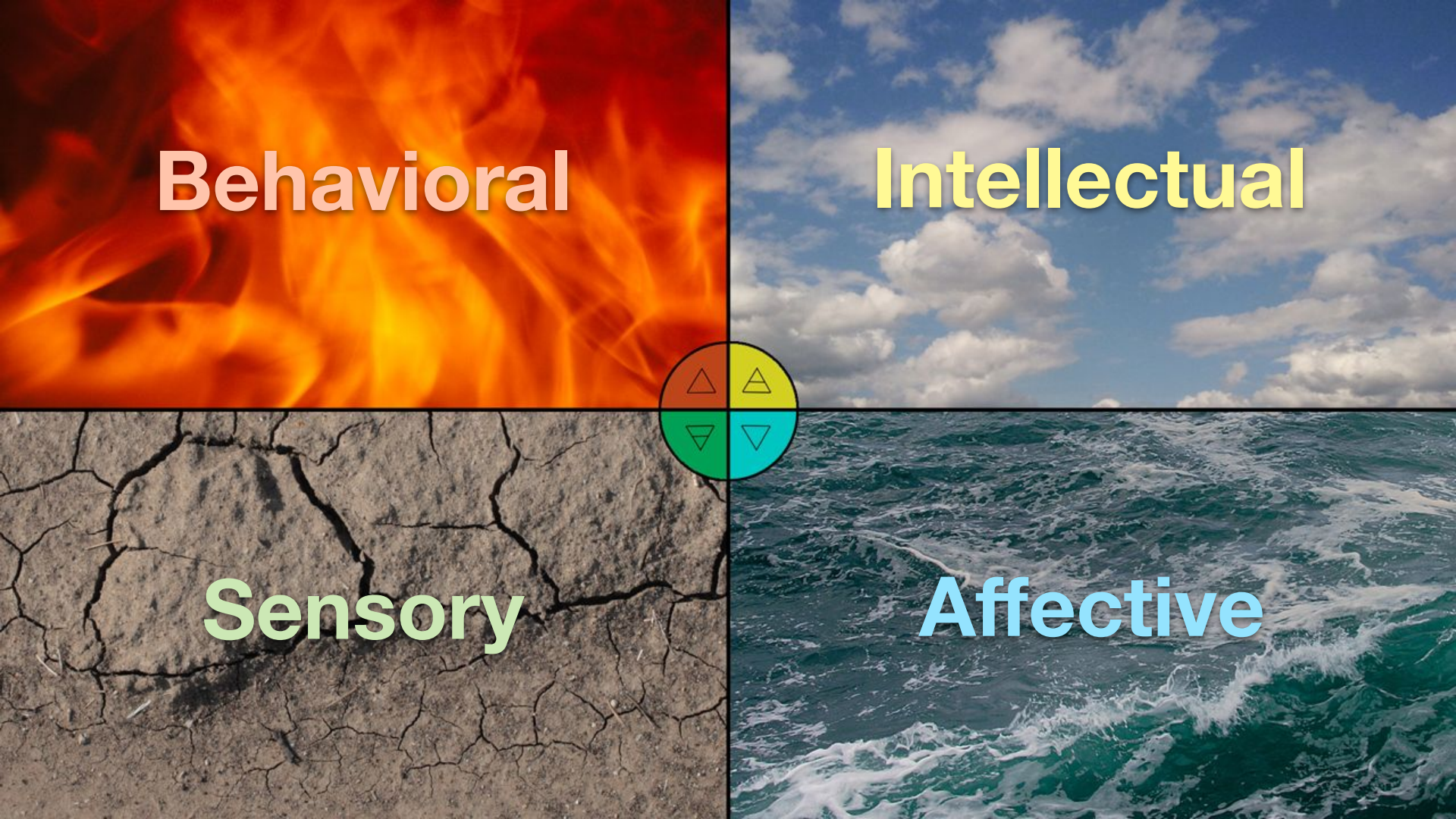
Keywords: experience marketing, brand experience, customer experience management, scale development, marketing communications

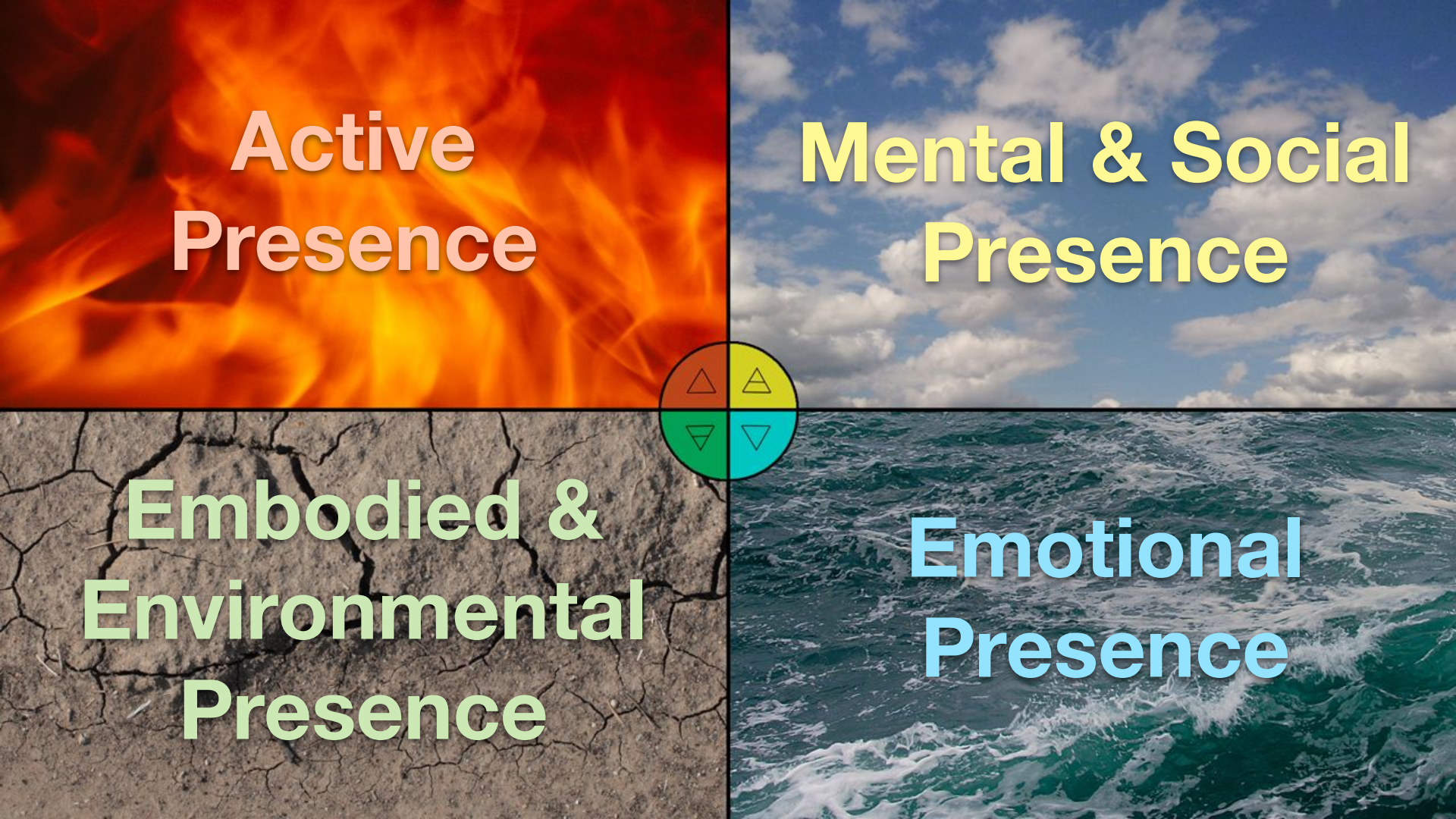
- Sensory
- Affective
- Behavioral
- Intellectual

FIGURE 1
Study 3: Confirmatory Factor Analysis: The Four-Factor Model



Brakus, J. J., Schmitt, B. H., & Zarantonello, L. (2009). *Brand experience: what is it? How is it measured? Does it affect loyalty?*. Journal of marketing, 73(3), 52-68.


Behavioral
Intellectual
Sensory
Affective


Active Presence
Mental & Social Presence
Embodied & Environmental Presence
Emotional Presence

- Underlying Experiential Age Context
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  - Connections to Experiential Marketing
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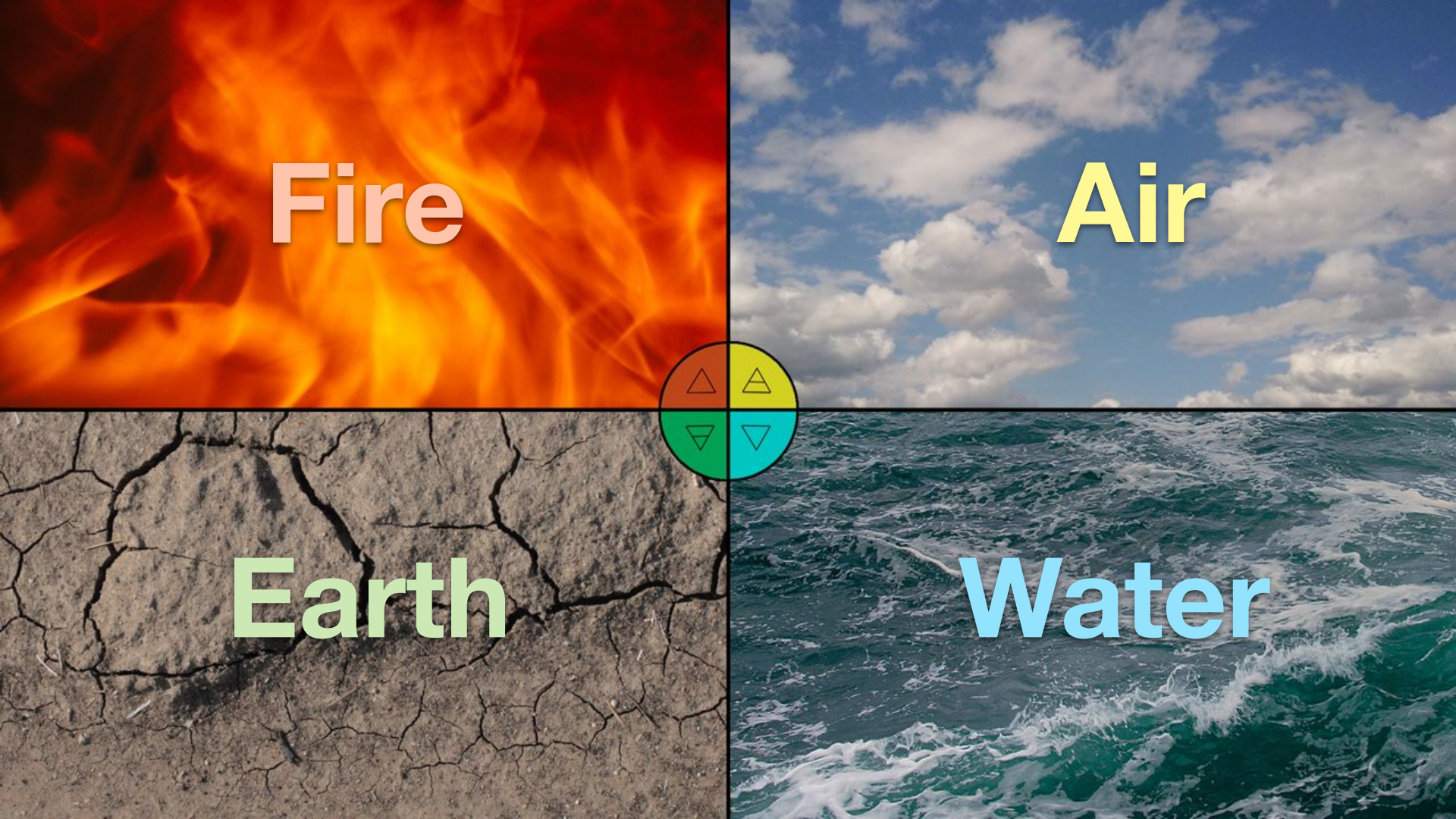
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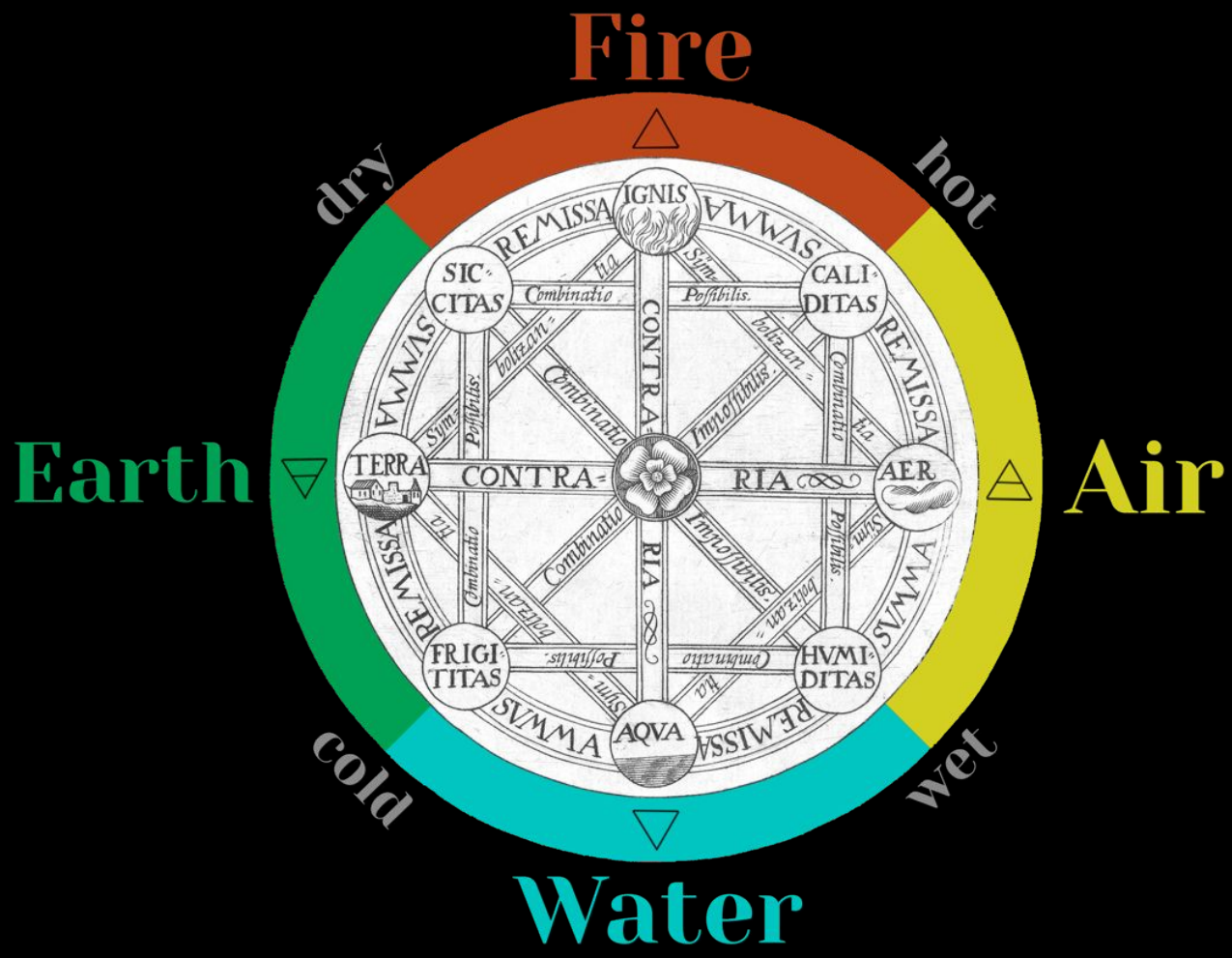
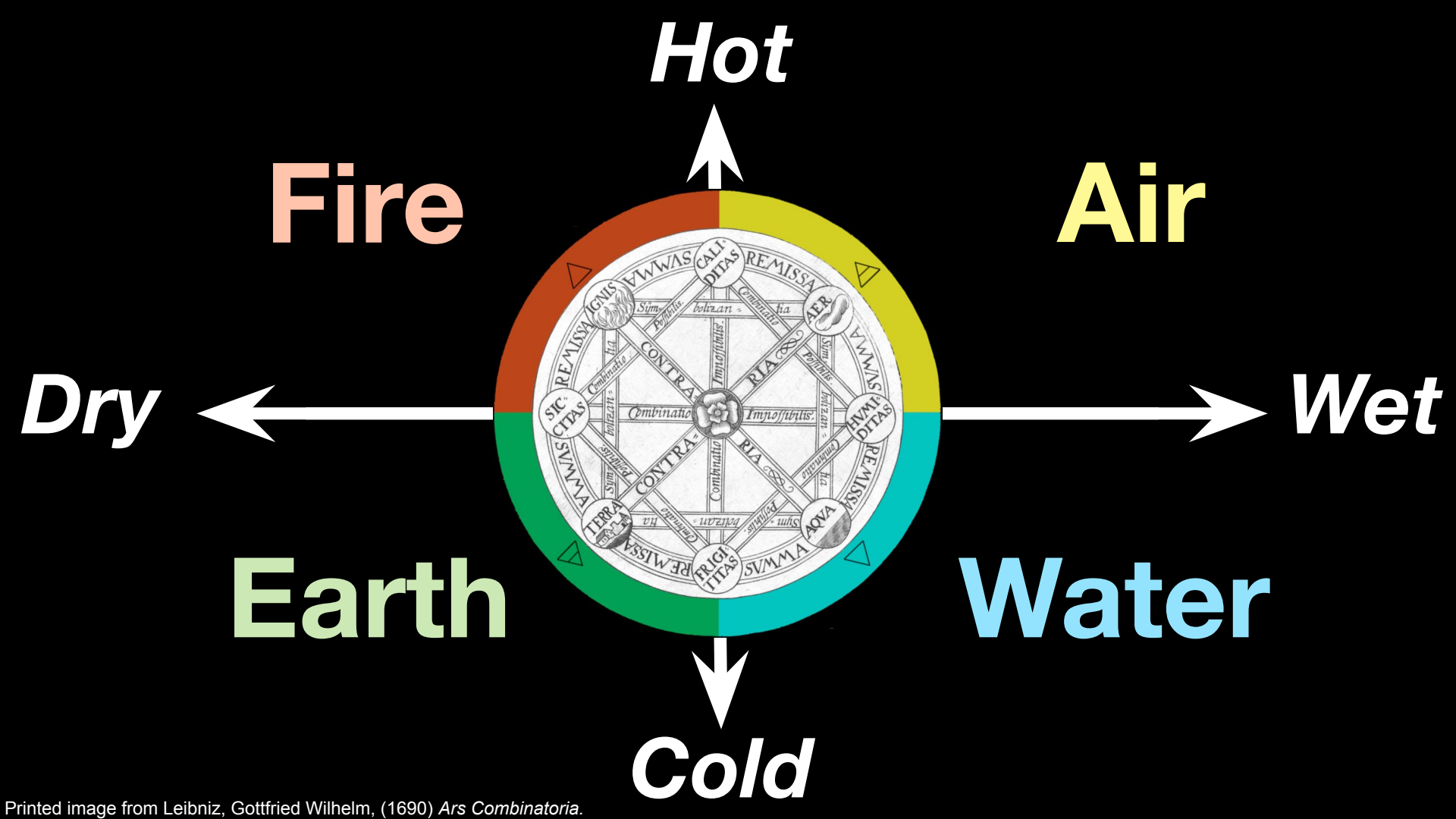
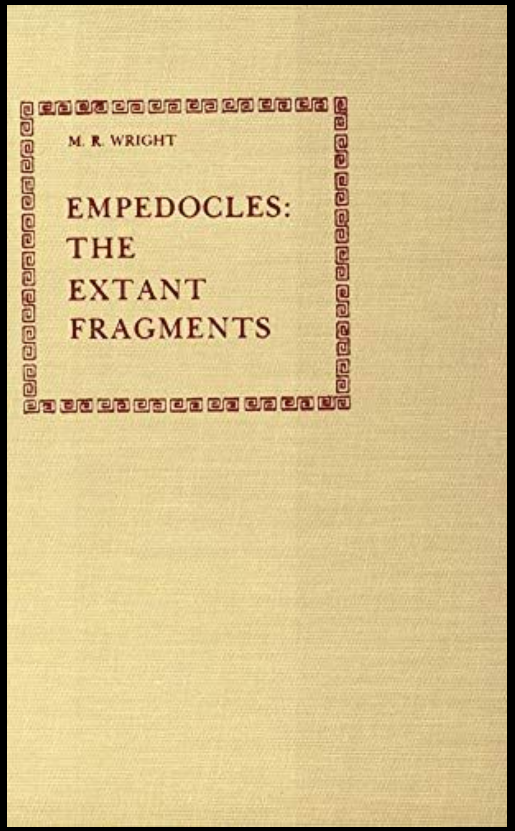


Printed image from Leibniz, Gottfried Wilhelm, (1690) *Ars Combinatoria.*



Printed image from Leibniz, Gottfried Wilhelm, (1690) *Ars Combinatoria.*

Medical Origins of Hot/Cold vs Wet/Dry



The limiting of basic opposites to four and their correlation to the roots is first found in medicine. Alcmaeon worked on the assumption of an indefinite number of opposites, but it was Empedocles' theory that the medical writers later took over and adapted to a fixed number of powers, and then of humors, in the body. Philistion in a simple way listed four *ideai* of the body, relating hot to fire, cold to air, dry to earth, and moist to water. In the Hippocratic *Nature of Man* the four opposites were brought into line with the humors, and with the seasons of the year, in the following scheme:

winter (cold and wet) : phlegm
spring (wet and hot) : blood
summer (hot and dry) : yellow bile
autumn (dry and cold) : black bile

Empedocles, & Wright, M. R. (1981). *Empedocles: The extant fragments*. (pp. 26-27) Yale University Press.

Hot

Choleric
Yellow Bile
Fire
Summer

Dry

Wet

Sanguine
Blood
Air
Spring

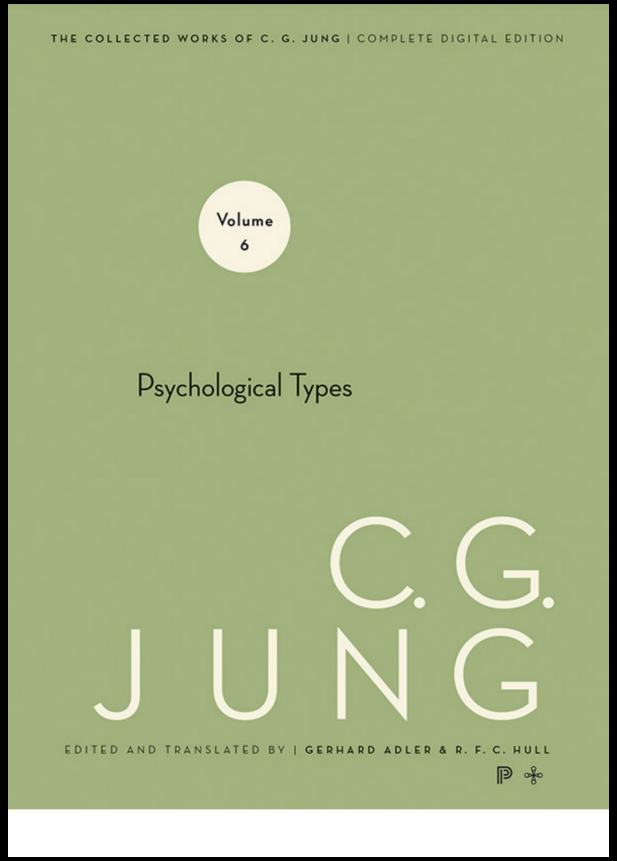
Melancholic
Black Bile
Earth
Autumn

Phlegmatic
Phlegm
Water
Winter

Cold

Solis, Virgil (1530-1562) Sanguine Temperament, From the Four Temperaments (Plate 1), Choleric... (Plate 2), Phlegmatic... (Plate 3), Melancholic (Plate 4). Minneapolis Institute of Art. Retrieved on April 26, 2022 from https://collections.artsmia.org/art/121403/sanguine-temperament-virgil-solis & https://collections.artsmia.org/search/virgil%20temperament.
Walkington, Thomas (1607) *Optick Glasse of Humor.* Retrieved on April 26, 2022 from https://becker.wustl.edu/news/humoralism-and-the-seasons/.

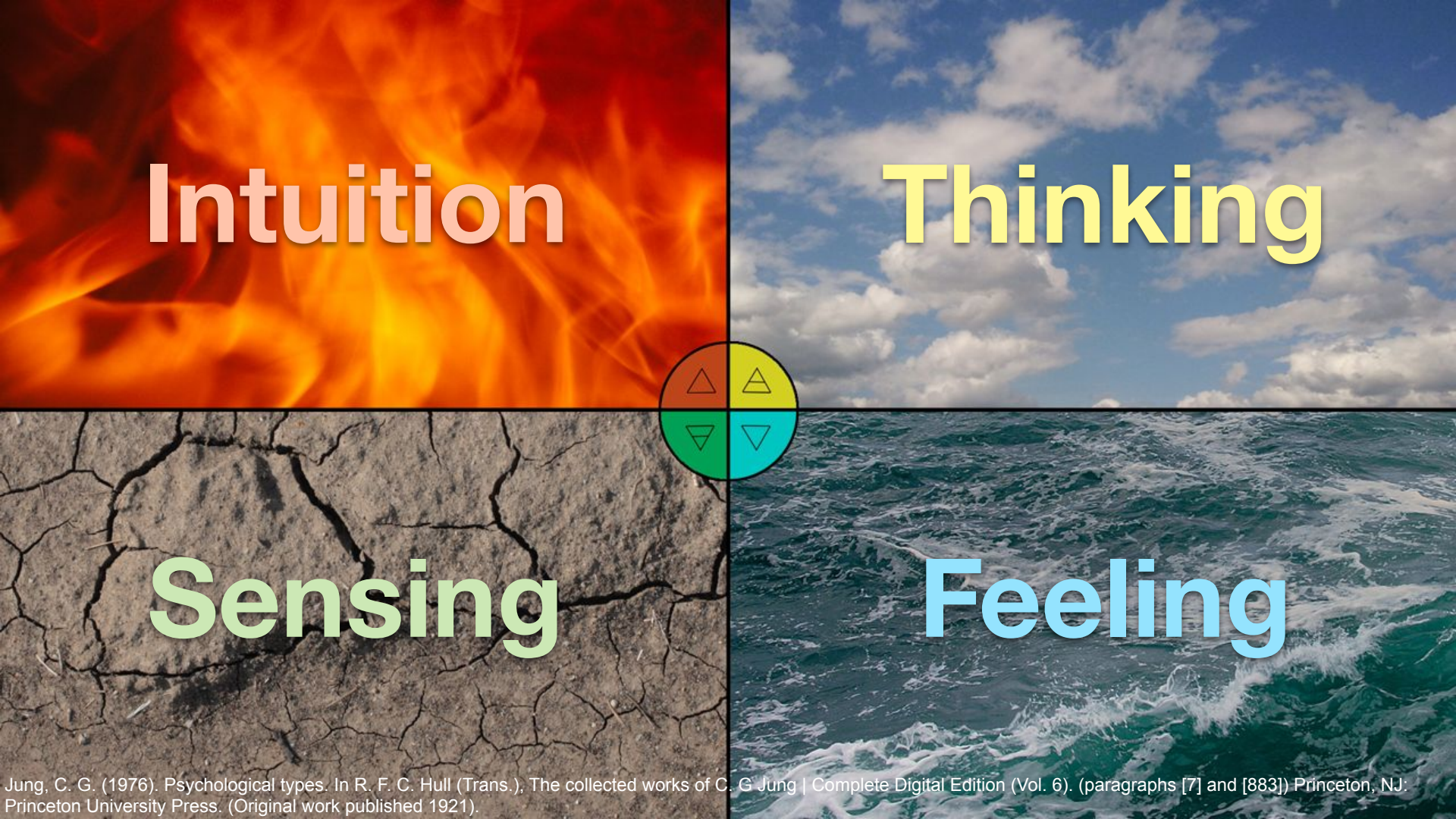
Jung's Psychological Types of "thinking, feeling, sensation, & intuition" inspired by Galen temperaments & the four elements (1921)



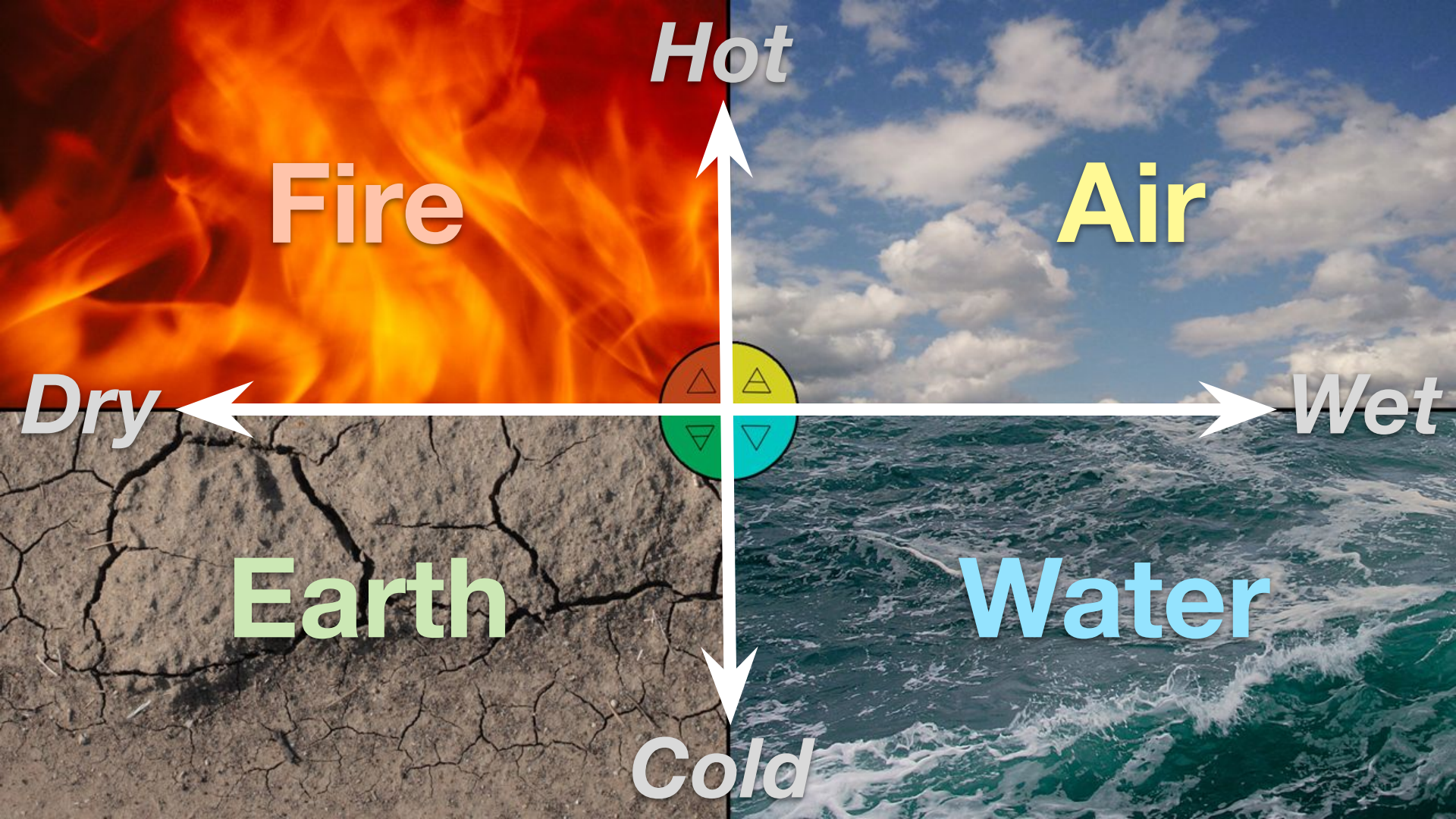
"I have found from experience that the basic psychological functions, that is, functions which are genuinely as well as essentially different from other functions, prove to be thinking, feeling, sensation, and intuition..." [7]

"From ancient times there have been numerous attempts to reduce the manifold differences between human individuals to definite categories… [Galen] distinguished four basic temperaments: the sanguine, the phlegmatic, the choleric, and the melancholic. The underlying idea goes back to the fifth century B.C., to the teachings of Hippocrates, that the human body was composed of the four elements, air, water, fire, and earth." [883]

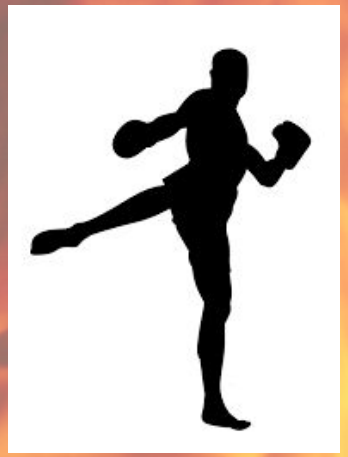
Jung, C. G. (1976). Psychological types. In R. F. C. Hull (Trans.), The collected works of C. G Jung | Complete Digital Edition (Vol. 6). (paragraphs [7] and [883]) Princeton, NJ: Princeton University Press. (Original work published 1921).



Jung, C. G. (1976). Psychological types. In R. F. C. Hull (Trans.), The collected works of C. G Jung | Complete Digital Edition (Vol. 6). (paragraphs [7] and [883]) Princeton, NJ: Princeton University Press. (Original work published 1921).


Hot
Fire
Air
Dry
Wet
Earth
Water
Cold

Giving Outward



Individuating

Bonding

Receiving Inward

Yang

Yin

Yang

Yin

Yang

Yin

Yang

Yin

Yang

Yin

Outward

Inward

Giving

Receiving

Talking

Listening

Yang

Day

Summer

Sun

Hot

Sunny Side

Giving

Shady Side

Receiving

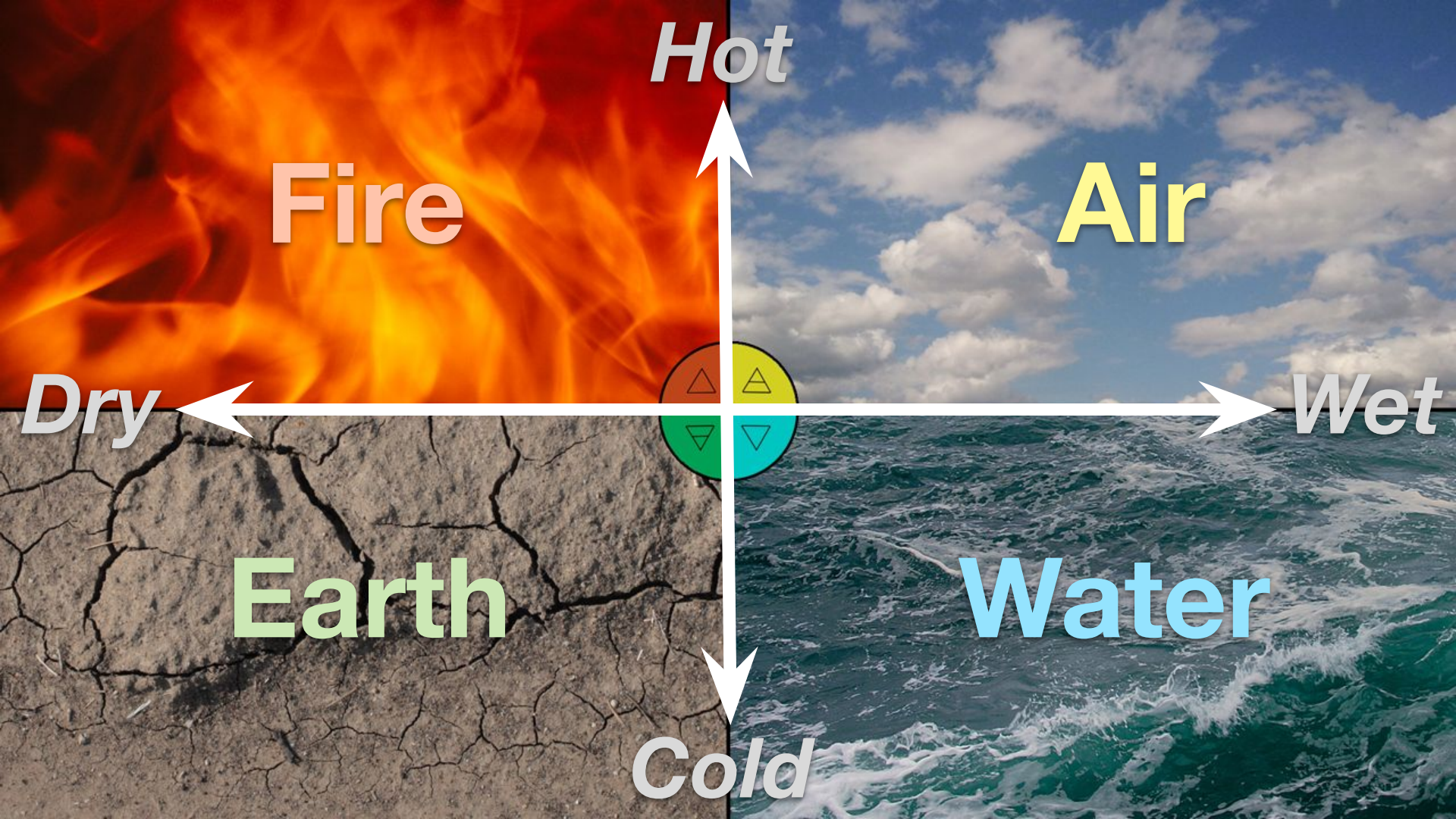
Moon

Cold

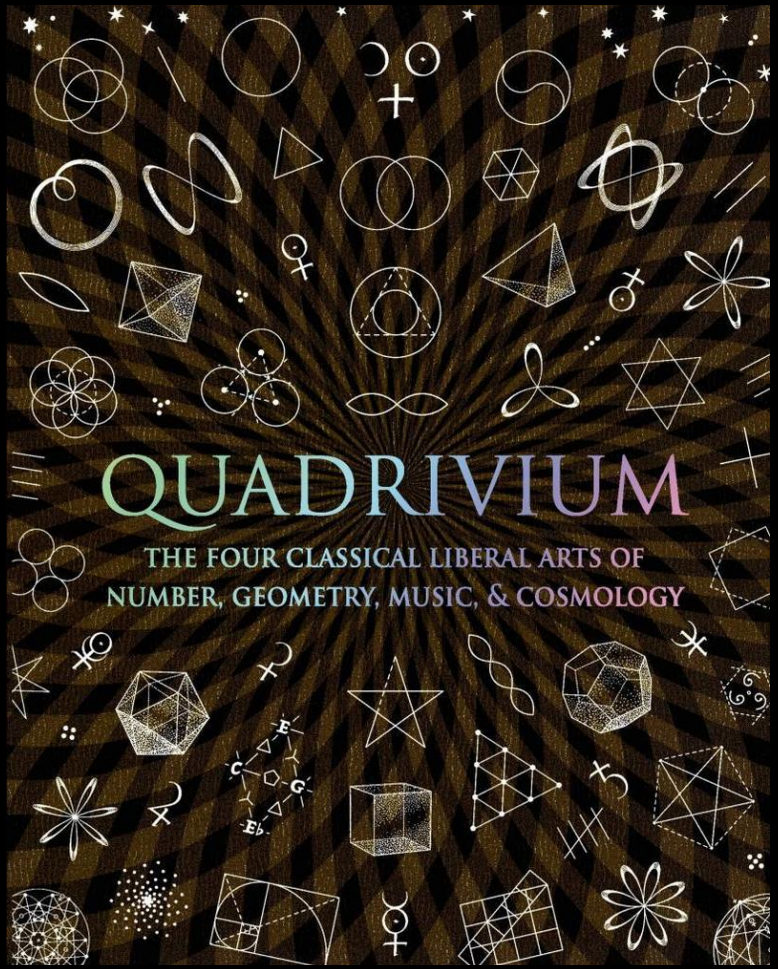
Night

Winter

Yin


Hot
Fire
Air
Dry
Wet
Earth
Water
Cold

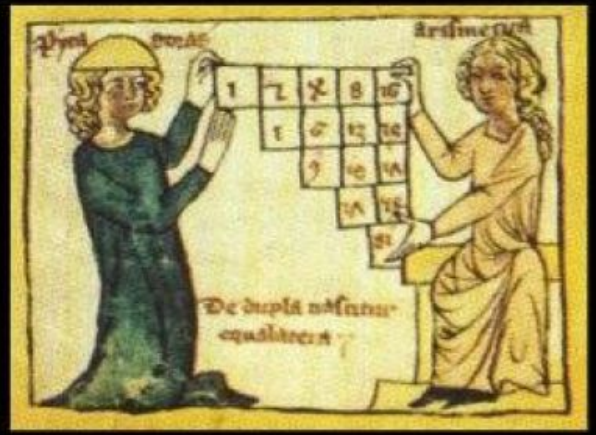

Nintendo
ENTERTAINMENT SYSTEM
disk II
disk II
apple II

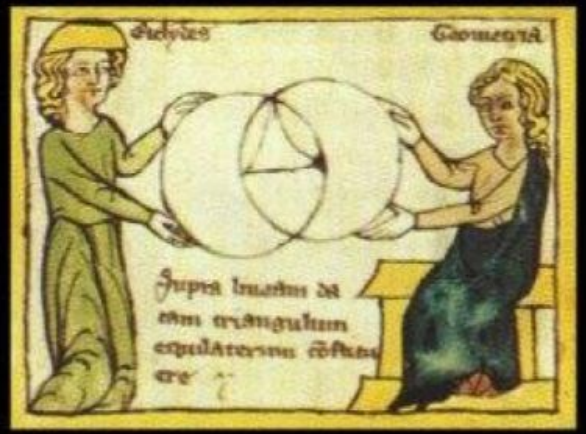


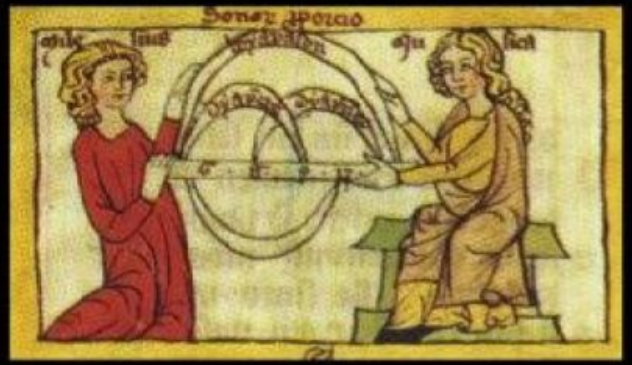
Lundy, M., Sutton, D., Ashton, A., Martineau, J. (2010) *Quadrivium: The Four Classical Liberal Arts of Number, Geometry, Music, & Cosmology.* Walker & Co.

Astronomy

Math







Geometry

Music

The Quadrivium

Number

Mathematics

The Quadrivium

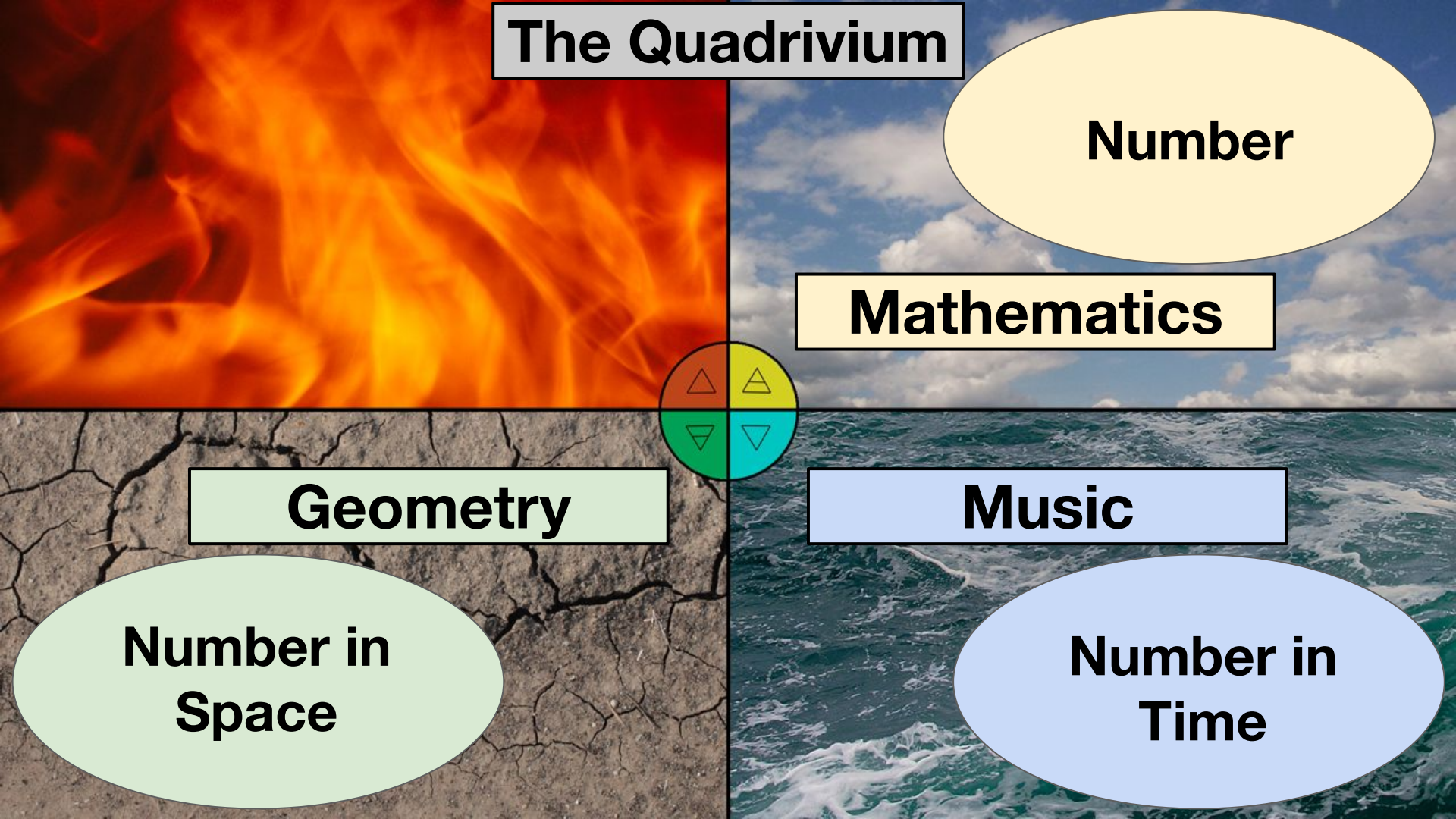
Number

Mathematics

Geometry

Number in Space

The Quadrivium



The Quadrivium

Number in Space & Time

Astronomy

Number

Mathematics

Geometry

Number in Space

Music

Number in Time

The Quadrivium

Objects Moving Through Space

Physics & Dynamics

Abstract Patterns & Forms

Rules & Mechanics

World & Body

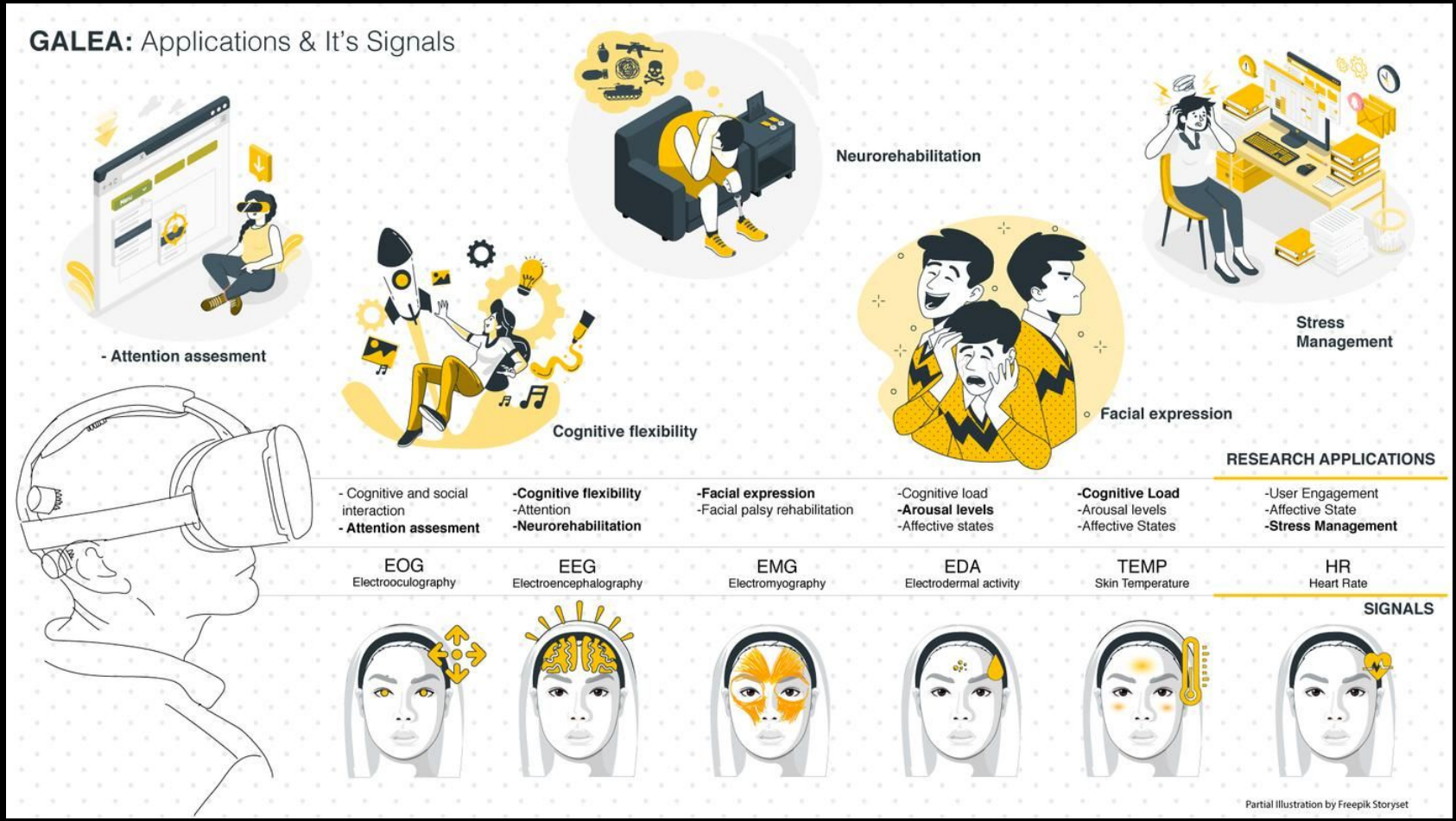
Architecture & Embodiment in Space

Unfolding Process

Consonance Dissonance Cycles In Time


Nintendo
ENTERTAINMENT SYSTEM
disk II
disk II
apple II

Presence Qualities of Biometric Sensors on OpenBCI's Project GALEA

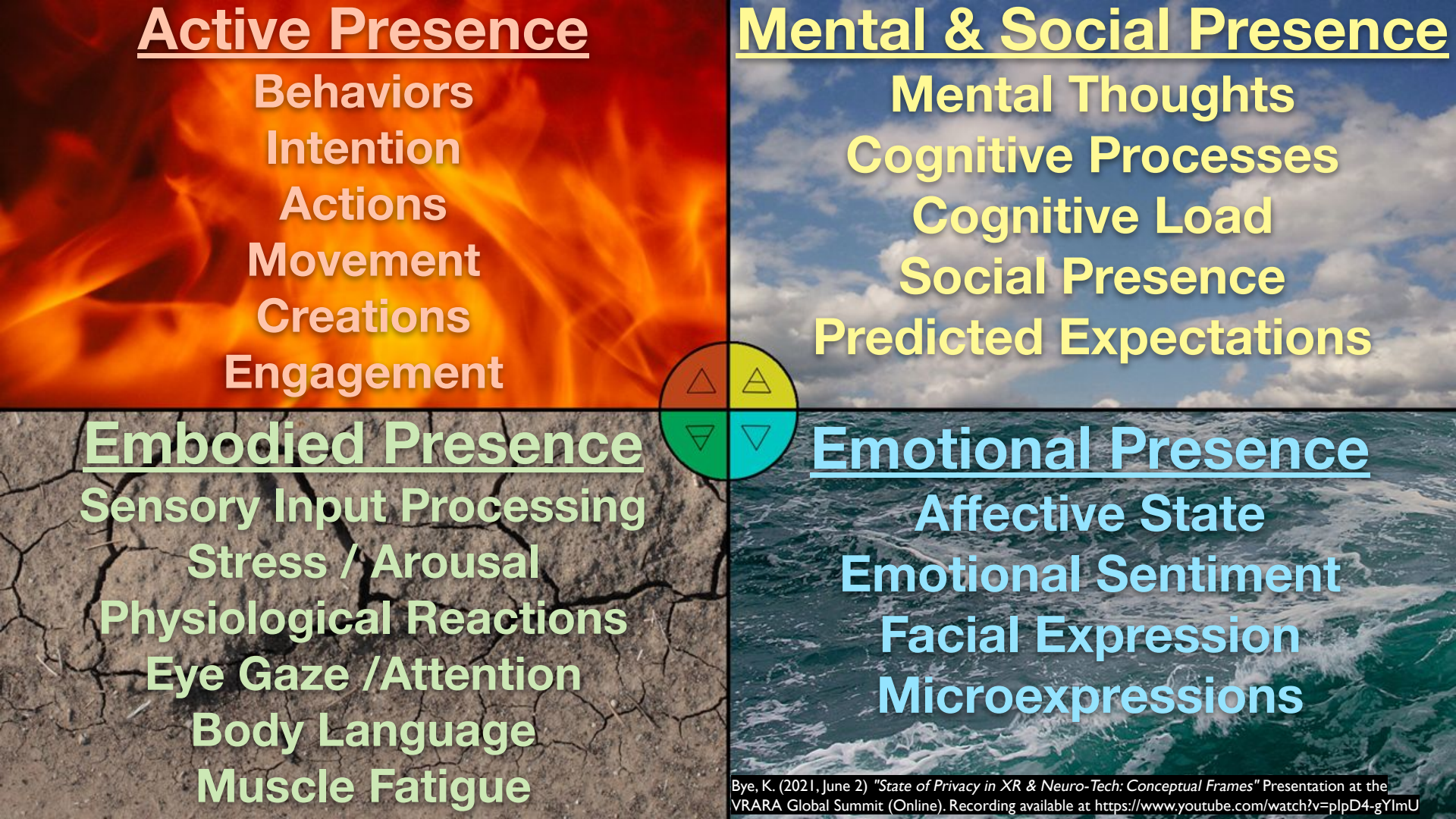


Bernal, G. (2021, April 15). *Developing Galea: An open source tool at the intersection of VR and neuroscience.* MIT Media Lab. https://www.media.mit.edu/posts/galea/.

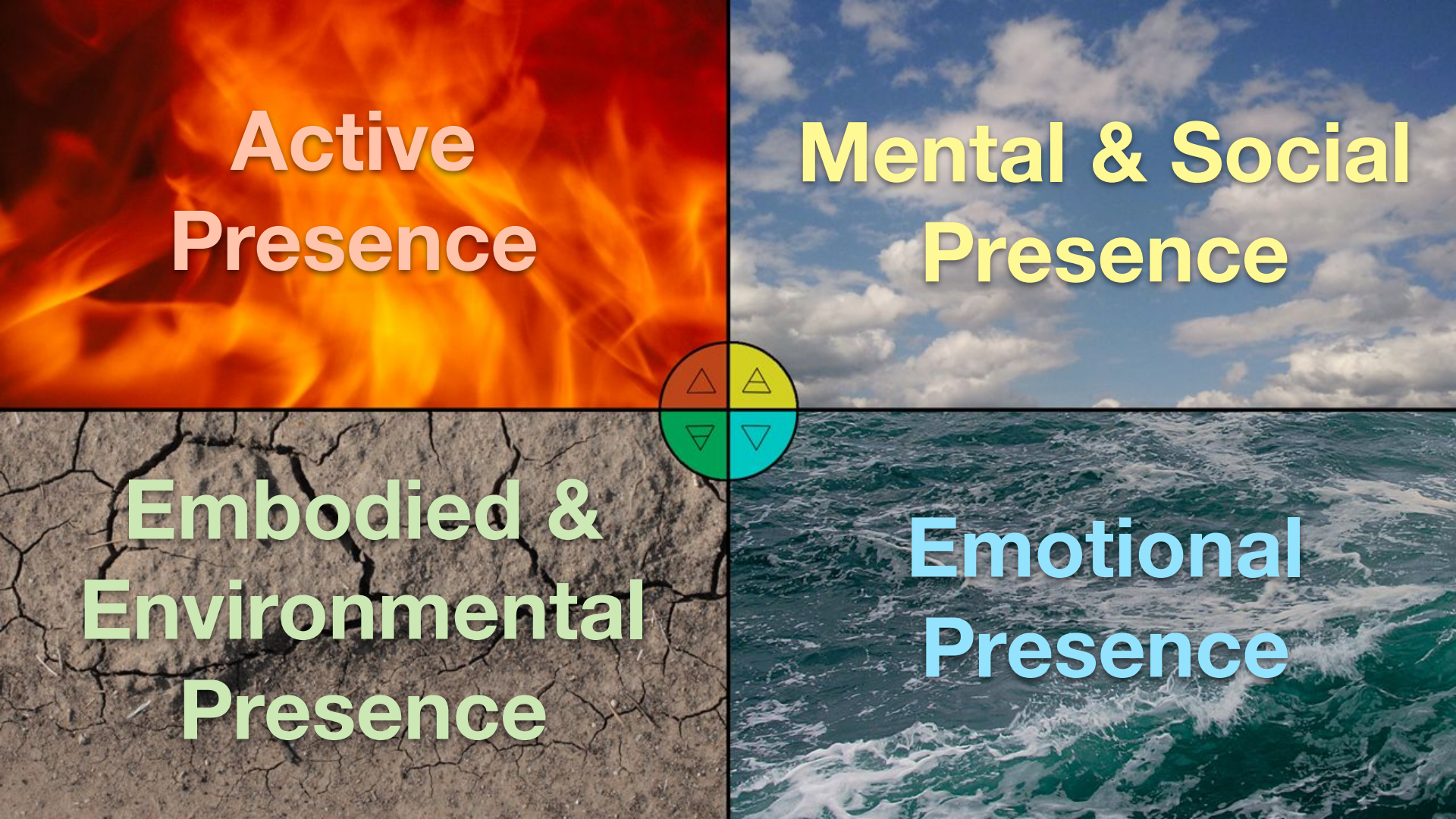
List of Physiological & Biometric Inputs

Eye Tracking and Pupil Response
Facial Scans
Movement Kinematics
Electrodermal Activity (EDA)
Galvanic Skin Response (GSR)
Skin Conductance Response (SCR)
Skin Conductance (SC)
Skin Temperature (SKT)
Body Temperature
Electromyography (EMG)
Mechanomyogram (MMG)
Strain-Based Sensor (SBS)
Electrocardiography (ECG / EKG)
Heart-Rate Variability (HRV)
Respiratory (RSP)
Respiratory Rate Variability (RRV)
Photoplethysmogram (PPG)
Impedance Plethysmography (IPG)
Blood Volume Pulse (BVP)
Electro-Oculogram (EOG)
Impedance Cardiography (ICG)
Gyrocardiography (GCG)
Ballistocardiography (BCG)
Magnetocardiography (MCG)
Seismocardiography (SCG)
Phonocardiogram (PCG)
Continuous Glucose Monitor (CGM)
Acoustic Respiratory Signals (ARS)
Blood Pressure (BP)
Pulse Arrival Time (PAT)
Pulse Transit Time (PTT)
Electroretinogram (ERG)
Electrogastrogram (EGG)
Magnetogastrography (MGG)
Electroencephalography (EEG)
Near-Infrared Spectroscopy-Based Cerebral Oxiometry (NIRSCO)
Optically-Pumped Magnetoencephalography (OP-MEG)
Optically-Pumped Magnetometers Magnetoencephalography (OPM-MEG)
Time Domain Functional Near-Infrared Spectroscopy (TD-fNIRS)
Functional Near-Infrared Spectroscopy (fNIRS)
High-Density Diffuse Optical Tomography (HD-DOT)
Intracranial Pressure (ICP)
Electrocorticography (ECoG)
Intracranial electroencephalography (iEEG)
Deep Brain Stimulation (DBS)
Local Field Potential (LFP)
Transcranial Doppler (TCD)
Somatosensory Evoked Potential (SSEP)
Brainstem Auditory Evoked Potential (BAEP)
Functional Magnetic Resonance Imaging (fMRI)
Magnetic Resonance Imaging (MRI)
Positron Emission Tomography (PET)
Magnetoencephalography (MEG)
Nuclear Magnetic Resonance Spectroscopy (NMR or MRS)
Subdural EEG (sdEEG)
Intracranial EEG (icEEG)
Diffuse Correlation Spectroscopy (DCS)
Subdermal EEG Needle
Superconducting QUantum Interface Device (SQUID)
Microneurography

Bye, K. (2021, May 30). Twitter. https://twitter.com/kentbye/status/1399143885427728384



Bye, K. (2021, June 2) *"State of Privacy in XR & Neuro-Tech: Conceptual Frames"* Presentation at the VRARA Global Summit (Online). Recording available at https://www.youtube.com/watch?v=plpD4-gYImU


Active Presence
Mental & Social Presence
Embodied & Environmental Presence
Emotional Presence

- Underlying Experiential Age Context
- My Elemental Theory of Presence
  - Connections to Experiential Marketing
  - Underlying Dialectics of Presence
  - Presence Theory Evolution & Synthesis
- My Immersive Storytelling & Experiential Design Framework
- Experiential Design & Immersive Story Breakdowns

Overview & Categorize other Presence Theory Approaches Surveyed in Skarbez et al, 2017

A Survey of Presence and Related Concepts

RICHARD SKARBEZ, FREDERICK P. BROOKS, Jr., and MARY C. WHITTON,
University of North Carolina at Chapel Hill, USA

The presence construct, most commonly defined as the sense of "being there," has driven research and development of virtual environments (VEs) for decades. Despite that, there is not widespread agreement on how to define or operationalize this construct. The literature contains many different definitions of presence and many proposed measures for it. This article reviews many of the definitions, measures, and models of presence from the literature. We also review several related constructs, including social presence, copresence, immersion, agency, transportation, reality judgment, and embodiment. In addition, we present a meta-analysis of existing presence models and propose a model of presence informed by Slater's Place Illusion and Plausibility Illusion constructs.

96

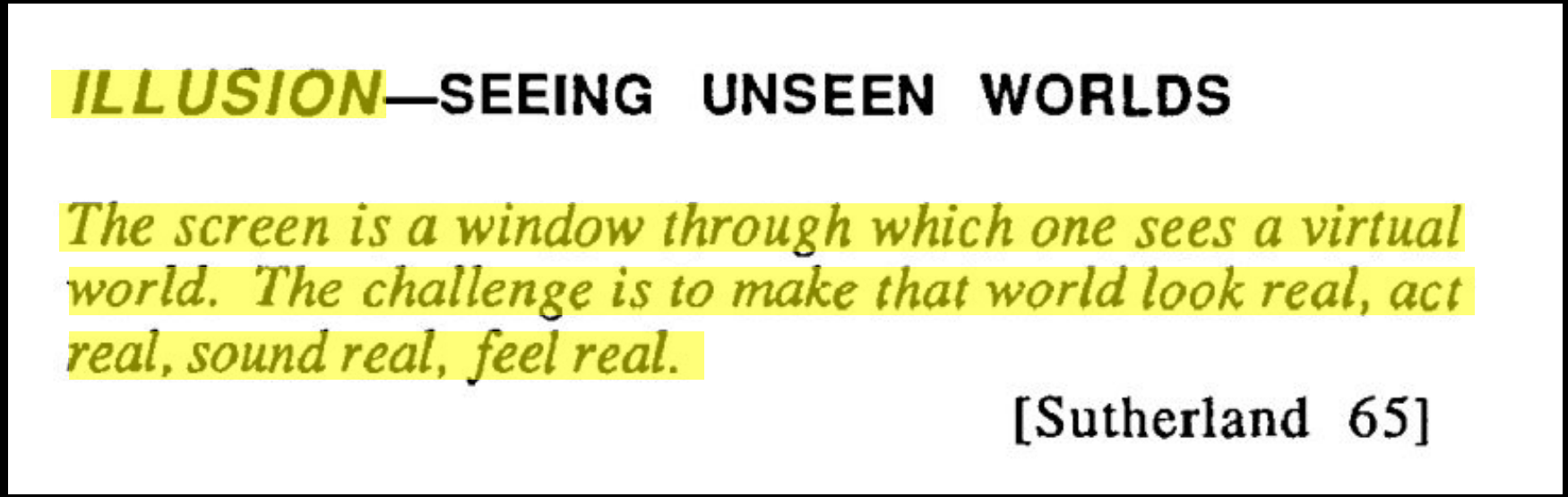
CCS Concepts: • **Human-centered computing** → **Virtual reality**;

Additional Key Words and Phrases: Presence, place illusion, plausibility illusion, social presence, copresence, immersion, coherence, virtual reality, virtual environments

ACM Reference format:
Richard Skarbez, Frederick P. Brooks, Jr., and Mary C. Whitton. 2017. A Survey of Presence and Related Concepts. *ACM Comput. Surv.* 50, 6, Article 96 (November 2017), 39 pages.
https://doi.org/10.1145/3134301

Skarbez, R., Brooks, Jr., F. P., & Whitton, M. C. (2017). *A Survey of Presence and Related Concepts*. ACM Computing Surveys, 50(6), 1–39. doi:10.1145/3134301

Fred Brooks Recounts Ivan Sutherland's 1965 "Ultimate Display" Presentation



ILLUSION—SEEING UNSEEN WORLDS

The screen is a window through which one sees a virtual world. The challenge is to make that world look real, act real, sound real, feel real.

[Sutherland 65]

- Brooks, F. P. (1988). *Grasping reality through illusion — Interactive graphics serving science*. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems - CHI '88. doi:10.1145/57167.57168
- Sutherland, I. E. (1965). *The ultimate display,* [invited lecture], IFIP Congress 65. An abstract appears in Information Processing 1965:Proceedings of IFIP [International Federation for Information Processing] 65, vol. 2, pp. 506-508. W.A. Kalenich, ed., Spartan Books, Washington, D.C., and Macmillan, New York.
- Bye, K., & Brooks., F. P. (2016, May 10). *#359: Fred Brooks on Sutherland's 1965 Ultimate Display Speech.* Voices of VR Podcast. Retrieved on April 23, 2022 from https://voicesofvr.com/359-fred-brooks-on-sutherlands-1965-ultimate-display-speech/

Sutherland's "Sword of Damocles" HMD (1968)

A head-mounted three dimensional display*

by IVAN E. SUTHERLAND**

The University of Utah
Salt Lake City, Utah

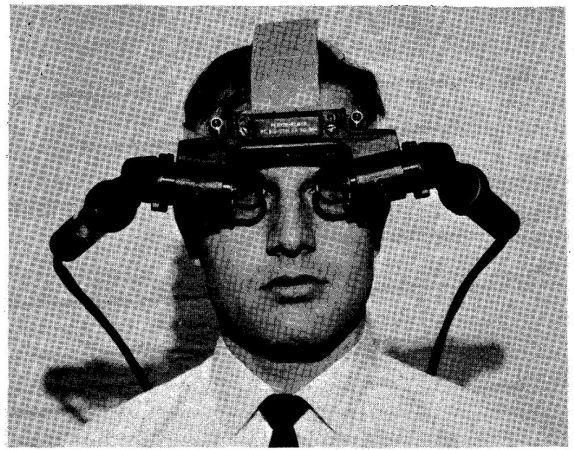


FIGURE 2—The head-mounted display optics with miniature CRT's

FIGURE 4—The ultrasonic head position sensor in use

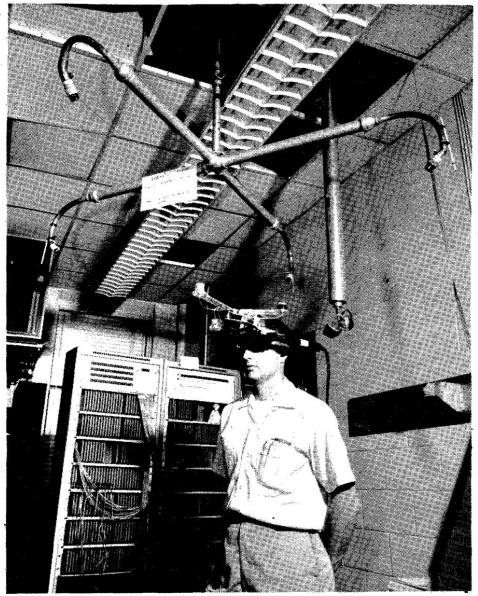


FIGURE 3—The mechanical head position sensor in use

Sutherland, I. E. (1968). *A head-mounted three dimensional display*. Proceedings of the December 9-11, 1968, Fall Joint Computer Conference, Part I on - AFIPS '68 (Fall, Part I). doi:10.1145/1476589.1476686

“Telepresence” coined by Minsky (1980)

The foremost authority on intelligent machines calls for a remote-controlled economy

TELEPRESENCE

BY MARVIN MINSKY

Teaching machines how to think for themselves is what Marvin Minsky does best. As founder of MIT's artificial intelligence laboratory, Minsky directs one of the world's leading research groups in computers and robotics. In this exclusive essay the cyberscientist from Cambridge proposes a 20 year plan that will alleviate the painful side effects of modern civilization

You don a comfortable jacket lined with sensors and musclelike motors. Each motion of your arm, hand, and fingers is reproduced at another place by mobile mechanical hands. Light, dextrous, and strong, these hands have their own sensors through which you see and feel what is happening. Using this instrument, you can "work" in another room, in another city, in another country, or on another planet. Your remote presence possesses the strength of a giant or the delicacy of a surgeon. Heat or pain is translated into informative but tolerable sensation. Your dangerous job becomes safe and pleasant.

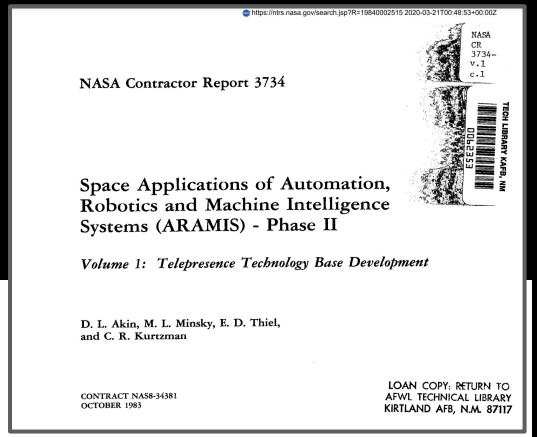
The crude robotic machines of today can do little of this. By building new kinds of versatile

Minsky and his 14-jointed, three-elbowed, computer controlled, hydraulic-muscled mechanical arm

PHOTOGRAPHS BY DAN McCOY

Minsky, M. (1980). Telepresence. Omni, 45-51.Retrieved on April 23, 2022 from http://www.housevampyr.com/training/library/books/omni/OMNI_1980_06.pdf.

Telepresence Defined in 1983



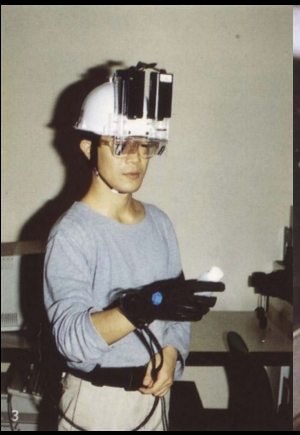
TELEPRESENCE DEFINITION

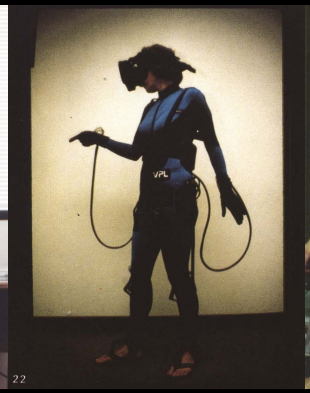
AT THE WORKSITE, THE MANIPULATORS HAVE THE DEXTERITY TO ALLOW THE OPERATOR TO PERFORM NORMAL HUMAN FUNCTIONS

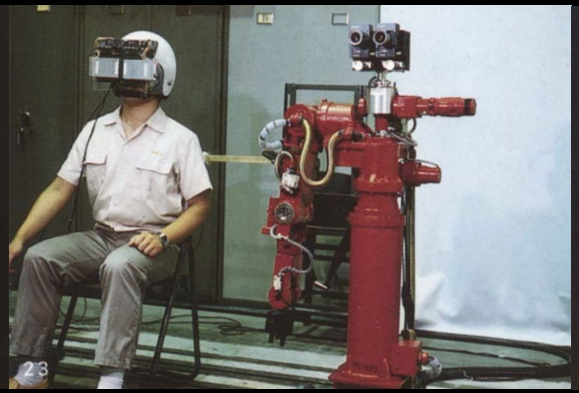
AT THE CONTROL STATION, THE OPERATOR RECEIVES SUFFICIENT QUANTITY AND QUALITY OF SENSORY FEEDBACK TO PROVIDE A FEELING OF ACTUAL PRESENCE AT THE WORKSITE

David L. Akin, Marvin L. Minsky, Eric D. Thiel, and Clifford R. Kurtzman. 1983. *Space Applications of Automation, Robotics, and Machine Intelligence Systems (ARAMIS), Phase II, Vol. 1: Telepresence Technology Base Development*. Technical Report. Massachusetts Institute of Technology, Cambridge, MA. (No. NASA-CR 3734-v.1 c.1). Retrieved on April 21, 2022 from https://ntrs.nasa.gov/api/citations/19840002515/downloads/19840002515.pdf.

Ellis' NASA Essay on Origins of Virtual Environments (1991)







Ellis, S. R. (1991). *Nature and origins of virtual environments: a bibliographical essay*. Computing Systems in Engineering, 2(4), 321–347. doi:10.1016/0956-0521(91)90001-I

NASA's Virtual Environment Display System (1986)

VIRTUAL ENVIRONMENT DISPLAY SYSTEM

S.S. Fisher, M.McGreevy, J.Humphries, W.Robinett
Aerospace Human Factors Research Division
NASA Ames Research Center
Moffett Field, California 94035

ABSTRACT

A head-mounted, wide-angle, stereoscopic display system controlled by operator position, voice and gesture has been developed for use as a multipurpose interface environment. The system provides a multisensory, interactive display environment in which a user can virtually explore a 360-degree synthesized or remotely sensed environment and can viscerally interact with its components. Primary applications of the system are in telerobotics, management of large-scale integrated information systems, and human factors research. System configuration, application scenarios, and research directions are described.

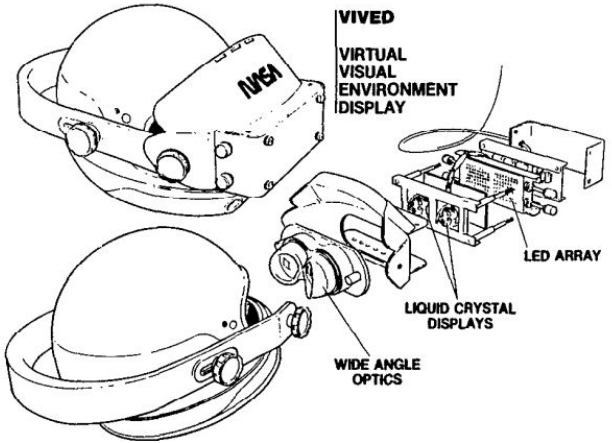


Fig.1 Protoype virtual environment display system. Principal investigators: M.McGreevy & J.Humphries, NASA/Ames, 1985.

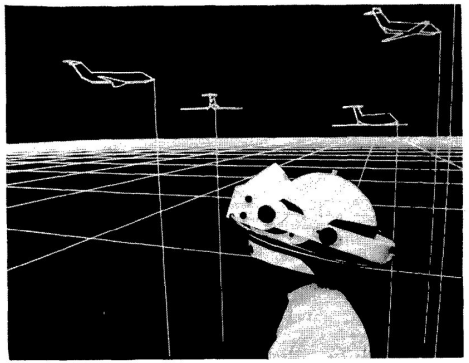


Fig.3 Imagery displayed in the virtual environment appears to completely surround the user in 3-space and enables the operator to explore virtual objects and environments in real time and from multiple viewpoints.

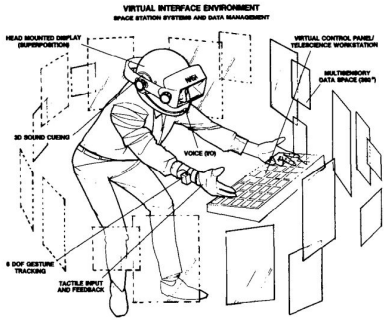
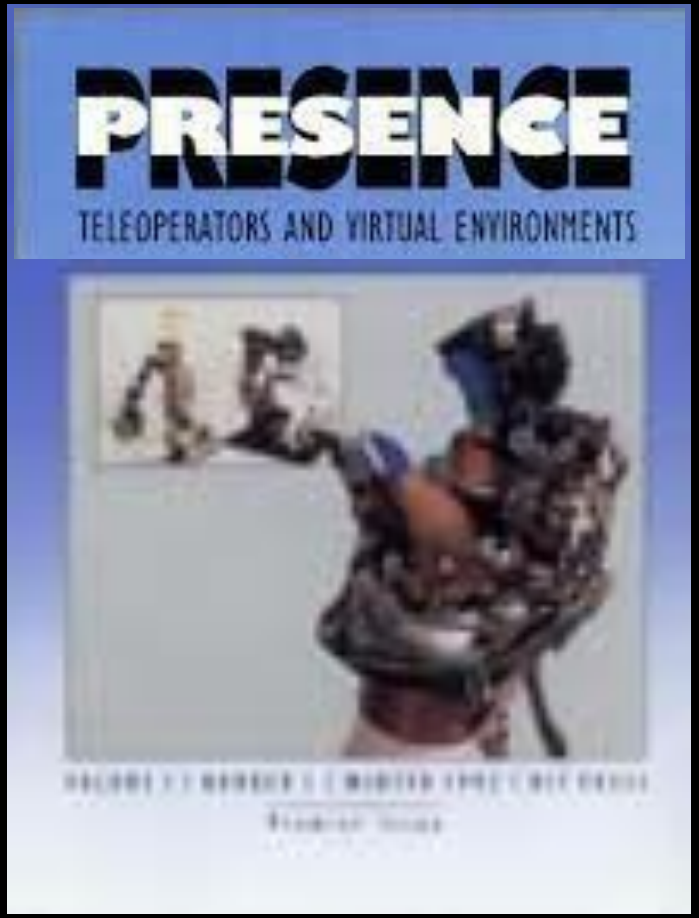


Fig.12 Virtual interface environment for management of large-scale integrated information systems.

Fisher, S. S., McGreevy, M., Humphries, J., & Robinett, W. (1987). *Virtual environment display system*. Proceedings of the ACM 1986 Workshop on 3D Interactive Graphics - SI3D '86., Chapel Hill, North Carolina, October 23-24, 1986. doi:10.1145/319120.319127

“Presence” Journal Launched at start of 1992



Welcome to the new journal!

Some of you have already spent many years contributing to the development of teleoperator and virtual-environment systems. Others are only now becoming involved with such systems. In either case, we hope *PRESENCE* will provide a valuable means of communication and we thank you for joining us.

In both teleoperator and virtual environment systems, the human operator is projected into a new interactive environment mediated by artificial electronic and electromechanical devices. The operator's performance, experience, and sense of presence in these new environments depend strongly on the human–machine interface and the associated environmental interactions. The primary focus of *PRESENCE* is the understanding and design of these interactions and interfaces.

Secondary foci include (1) the human operator's own cognitive and sensorimotor systems, particularly those elements of these systems that are directly related to the human–machine interface or to the sense of presence; (2) the more peripheral components of the two types of systems, namely, the telerobotic mechanism and its environment in the case of teleoperators and the computer and simulation software in the case of virtual environments; and (3) the impact of transformed presence, achieved by either teleoperators or virtual environments, in philosophy, culture, and aesthetics.

The purpose of *PRESENCE* is to disseminate information and to stimulate the creation and development of ideas, techniques, analyses, models, devices, and applications relevant to these foci.

At present, the culture associated with teleoperators is dominated by engineers, whereas the culture associated with virtual environments is dominated by individuals concerned with computer programming, media, and the arts. Thus, despite the logical overlap between the two types of systems, there are major cultural differences between the associated groups. Our hope (based in part on the positive results obtained at the Engineering Foundation Conference in Santa Barbara in 1990) is that these differences will enrich rather than diminish our new journal.

As indicated in the Table of Contents, *PRESENCE* is divided into two main sections. Whereas the first section will be relatively constant in form across issues, the second, entitled “Forum,” will depend strongly on the kinds of material that are available for the particular issue.

The covers of *PRESENCE* will have two special features. First, the background color will remain constant over the year, but vary from year to year. Second, the cover image will be selected by the Editors from images submitted by the readers. We invite all readers to submit images that they believe would be appropriate for this purpose.

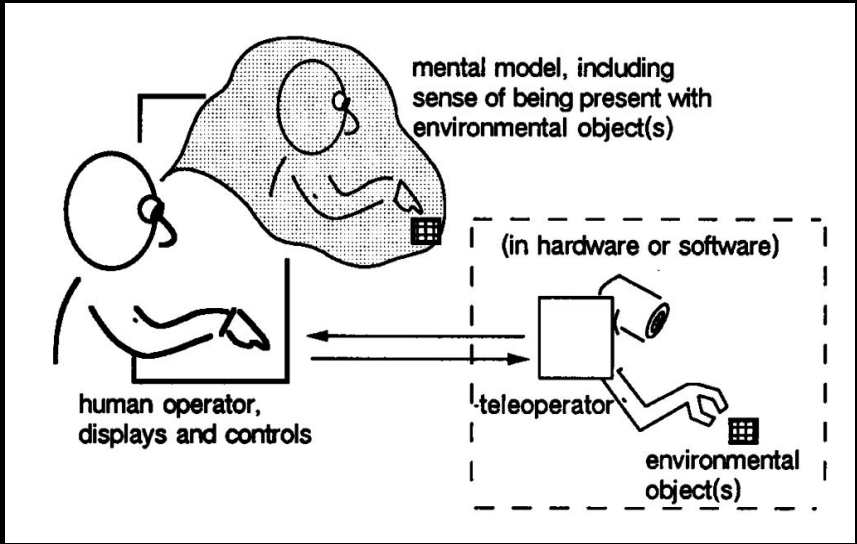
In general, we encourage all of you to communicate with us not only about specific issues that arise in connection with material published in *PRESENCE,* but also about the general character of *PRESENCE.* Obviously, the manner in which *PRESENCE* evolves will depend strongly on such communications.

We look forward to working with you. Thank you for your interest.

The Editors

[unnamed editors] (1992). *Welcome to the new journal!* Presence: Teleoperators and Virtual Environments, 1(1), iii. doi:10.1162/pres.1992.1.1.iii

Sheridan's Telepresence vs Virtual Presence (1992)



Telepresence

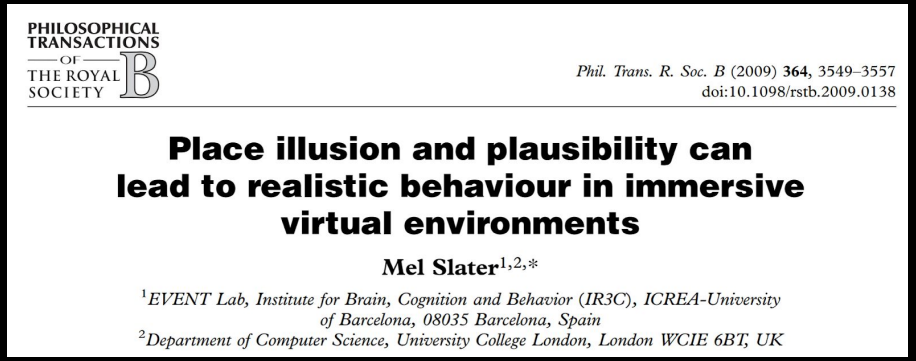
"sense of being physically present with virtual object(s) at the remote teleoperator site"

Virtual Presence

"sense of being physically present with visual, auditory, or force displays generated by a computer"

Sheridan, T. B. (1992). *Musings on Telepresence and Virtual Presence*. Presence: Teleoperators and Virtual Environments, 1(1), 120–126. doi:10.1162/pres.1992.1.1.120

Slater is Focused on Sensorimotor Contingencies of the Illusions of Presence & Not Subjective Phenomenology (2009)



PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B

Phil. Trans. R. Soc. B (2009) **364**, 3549–3557
doi:10.1098/rstb.2009.0138

Place illusion and plausibility can lead to realistic behaviour in immersive virtual environments

Mel Slater[1,2,*]

[1]*EVENT Lab, Institute for Brain, Cognition and Behavior (IR3C), ICREA-University of Barcelona, 08035 Barcelona, Spain*
[2]*Department of Computer Science, University College London, London WCIE 6BT, UK*

"Immersive systems can be characterized by the sensorimotor contingencies (SCs) that they support…" as they "...define a set of valid actions that are meaningful in terms of perception within the virtual environment depicted."

Slater, M. (2009, Dec 14). *Place illusion and plausibility can lead to realistic behaviour in immersive virtual environments*. Philosophical Transactions of the Royal Society B: Biological Sciences, 364(1535), 3549–3557. doi:10.1098/rstb.2009.0138.

Sheridan's Principal Determinants for the Sense of Presence (1992)

Sensory Presence

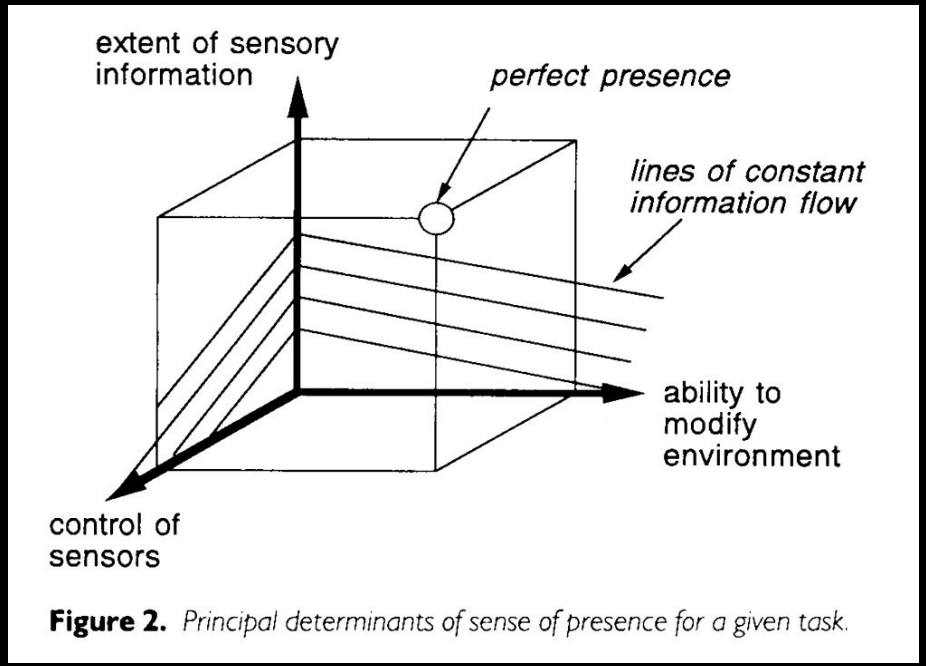


Figure 2. *Principal determinants of sense of presence for a given task.*

Embodied & Spatial Presence

Active Presence

Sheridan, T. B. (1992). *Musings on Telepresence and Virtual Presence*. Presence: Teleoperators and Virtual Environments, 1(1), 120–126. doi:10.1162/pres.1992.1.1.120

Heeter's Three Subjective Dimensions of Presence (1992)

Being There: The Subjective Experience of Presence

1 Introduction

What do you feel when you enter a virtual world? What creates the experience of presence? What factors contribute to making you feel like you are there[1]?

This paper offers a subjective explanation of presence in which the yardstick to measure presence is applied not to assessing how closely a virtual world mimics real world sensations, but instead to analyzing the kinds of evidence a virtual experience provides to participants that help convince them they are there. Sensory realism is subsumed within this broader perspective, as one of the means that contributes to the experience of presence. The effectiveness of the illusion of presence created by a virtual world can be partially assessed by studying visitors to virtual worlds' subjective experience of how exist. It may be enhanced if the virtual environment itself seems to acknowledge your existence. As a framework to focus discussion, three dimensions of the subjective experience of presence (of existing), personal, social, and environmental presence, will be defined.

Subjective personal presence is a measure of the extent to which and the reasons why you feel like you are in a virtual world. Possible reasons are myriad, for example,

1 I see my own hand in the world.
2 The virtual world gives me a sense of déjà vu, as if I've been here before.
3 Although the rules of this world are different than the laws of physics in the real world, there seems to be a consistent pattern that I can learn to recognize.

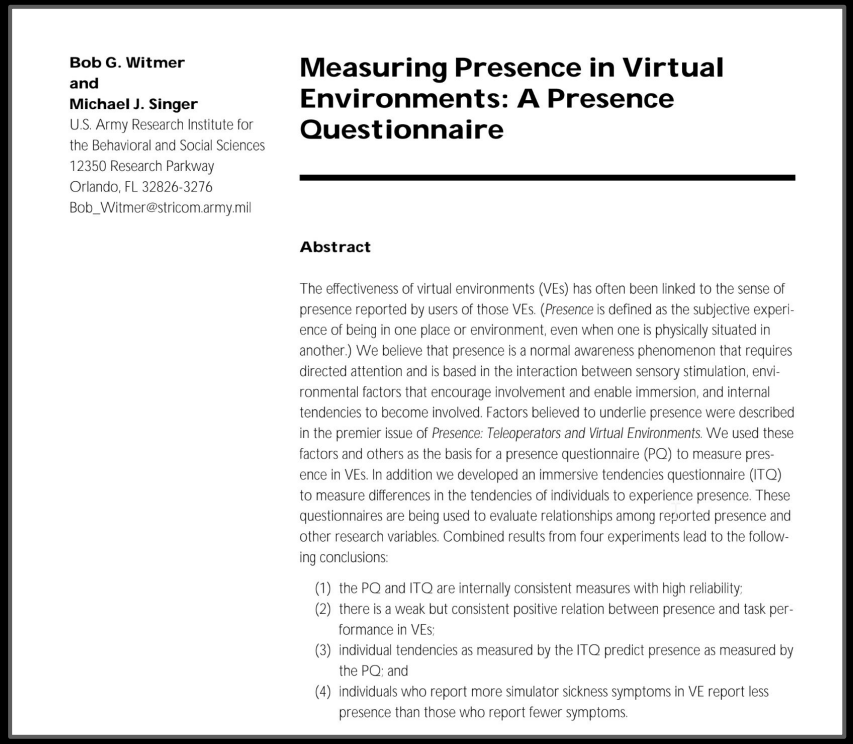
"**Subjective Personal Presence** is a measure of the extent to which and the reasons why you feel like you are in a virtual world."

"**Social Presence** refers to the extent to which other beings (living or synthetic) also exist in the world and appear to react to you."

"**Environmental Presence** refers to the extent to which the environment itself appears to know that you are there and to react to you."

Heeter, C. (1992). *Being There: The Subjective Experience of Presence.* Presence: Teleoperators and Virtual Environments, 1(2), 262–271. doi:10.1162/pres.1992.1.2.262

Witmer & Singer's 1998 Presence Definition



Bob G. Witmer
and
Michael J. Singer
U.S. Army Research Institute for
the Behavioral and Social Sciences
12350 Research Parkway
Orlando, FL 32826-3276
Bob_Witmer@stricom.army.mil

Measuring Presence in Virtual Environments: A Presence Questionnaire

Abstract

The effectiveness of virtual environments (VEs) has often been linked to the sense of presence reported by users of those VEs. (*Presence* is defined as the subjective experience of being in one place or environment, even when one is physically situated in another.) We believe that presence is a normal awareness phenomenon that requires directed attention and is based in the interaction between sensory stimulation, environmental factors that encourage involvement and enable immersion, and internal tendencies to become involved. Factors believed to underlie presence were described in the premier issue of *Presence: Teleoperators and Virtual Environments*. We used these factors and others as the basis for a presence questionnaire (PQ) to measure presence in VEs. In addition we developed an immersive tendencies questionnaire (ITQ) to measure differences in the tendencies of individuals to experience presence. These questionnaires are being used to evaluate relationships among reported presence and other research variables. Combined results from four experiments lead to the following conclusions:

(1) the PQ and ITQ are internally consistent measures with high reliability;
(2) there is a weak but consistent positive relation between presence and task performance in VEs;
(3) individual tendencies as measured by the ITQ predict presence as measured by the PQ; and
(4) individuals who report more simulator sickness symptoms in VE report less presence than those who report fewer symptoms.

"*Presence* is defined as the subjective experience of being in one place or environment, even when one is physically situated in another."

Witmer, B. G., & Singer, M. J. (1998). *Measuring presence in virtual environments: A presence questionnaire*. Presence, 7(3), 225-240.

Lots of Overlap Between Presence & Game Immersion

Brown & Cairns (2004)

- Engagement
- Engrossment
- Total Immersion (aka Presence)

Haywood & Cairns (2006)

- Participation
- Narration
- Co-Presence with Others

Jennet et al (2008)

- Flow:
  - Lack of awareness of time.
- Cognitive absorption:
  - Loss of awareness of the real world.
- Presence:
  - Involvement and a sense of being in the task environment.

- Brown, E., & Cairns, P. (2004). A grounded investigation of game immersion. Extended Abstracts of the 2004 Conference on Human Factors and Computing Systems - CHI '04. doi:10.1145/985921.986048
- Haywood, N., Cairns, P. (2006). Engagement with an Interactive Museum Exhibit. In: McEwan, T., Gulliksen, J., Benyon, D. (eds) People and Computers XIX — The Bigger Picture. Springer, London. doi:10.1007/1-84628-249-7_8
- Jennett, C., Cox, A. L., Cairns, P., Dhoparee, S., Epps, A., Tijs, T., & Walton, A. (2008). Measuring and defining the experience of immersion in games. International Journal of Human-Computer Studies, 66(9), 641–661. doi:10.1016/j.ijhcs.2008.04.004

Survey of Presence Concepts (Skarbez et al, 2017): Social Presence Illusion & Copresence Illusion

Place Illusion (PI)

Subjective Personal Presence
(Heeter, 1992)
Arrival
(Kim and Biocca, 1997)
Departure
(Kim and Biocca, 1997)
Presence
(Baños et al., 2000)
Transportation
(Lombard et al., 2000)
Spatial Presence: Self-Location
(Vorderer et al., 2004)

Sensorimotor Valid Actions

Sensory Factors
(Held and Durlach, 1992)
Motor Factors
(Held and Durlach, 1992)
Extent of Sensory Info
(Sheridan, 1992)
Control of Sensors
(Sheridan, 1992)
Sensory
(Witmer and Singer, 1998)
Immersion
(Lombard et al., 2000)
Extent and Fidelity of Sensory Information
(IJsselsteijn et al., 2004)
Match between Sensors and Display
(IJsselsteijn et al., 2000)
Visual/Spatial Imagery
(Vorderer et al., 2004)
Sensory
(Chertoff et al., 2010)

Plausibility Illusion (Psi)

Reality Judgment
(Baños et al., 2000)

Environmental Coherence

Environmental Presence
(Heeter, 1992)
Realism
(Witmer and Singer, 1998)
Realism
(Baños et al., 2000)
Realism (Perceptual)
(Lombard et al., 2000)

Overall Coherence

Correlation between Feedback and Actions
(Held and Durlach, 1992)
Congruence/Continuity
(Baños et al., 2000)

Effective Valid Actions

Control
(Witmer and Singer, 1998)
Control
(Baños et al., 2000)
Ability to Modify Physical Environment
(Sheridan, 1992)
Spatial Presence: Possible Actions
(Vorderer et al., 2004)

Social Presence Illusion

Social Presence
(Heeter, 1992)

Social Coherence

Social Richness
(Lombard et al., 2000)
Realism (Social)
(Lombard et al., 2000)
Social Actor in a Medium
(Lombard et al., 2000)
Relational
(Chertoff et al., 2010)

Attention / Distraction

Attention to Mediated Environment
(Draper et al., 1998)
Attention to Ignoring Distractors
(Draper et al., 1998)
Distraction
(Witmer and Singer., 1998)
Attention/Flow
(Baños et al., 2000)
Attention Allocation
(Vorderer et al., 2004)
Higher Cognitive Involvement
(Vorderer et al., 2004)
Suspension of Disbelief
(Vorderer et al., 2004)
Absorption
(Vorderer et al., 2004)
Cognitive
(Chertoff et al., 2010)

Individual Characteristics

Identification with the Robot
(Held and Durlach, 1992)
Familiarity with the System
(Held and Durlach, 1992)
User Characteristics
(IJsselsteijn et al., 2000)
Expectations
(Baños et al., 2000)
General Cognitive Factors
(Sas and O'Hare, 2003)
Task-Specific Cognitive Factors
(Sas and O'Hare, 2003)
Domain-Specific Interest
(Vorderer et al., 2004)

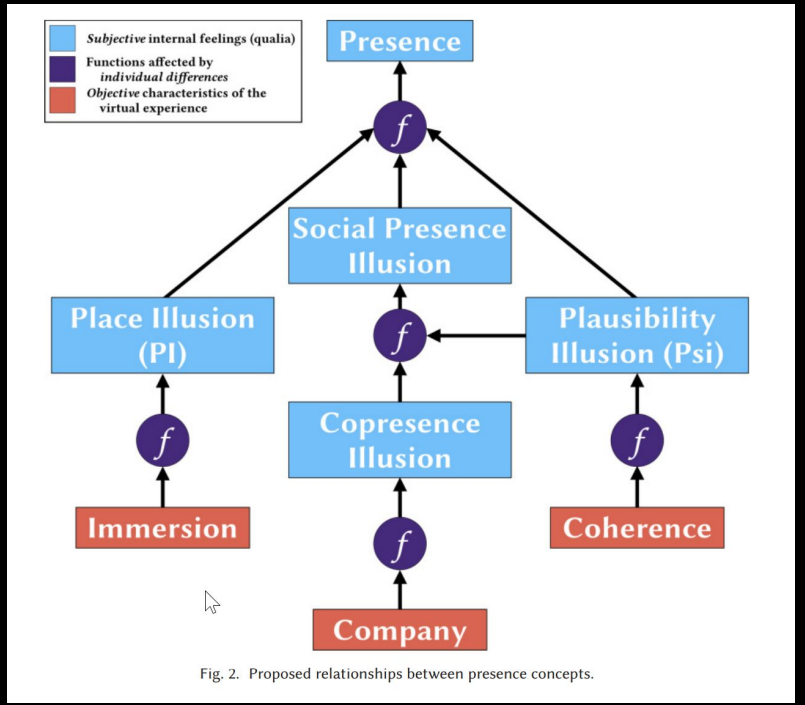
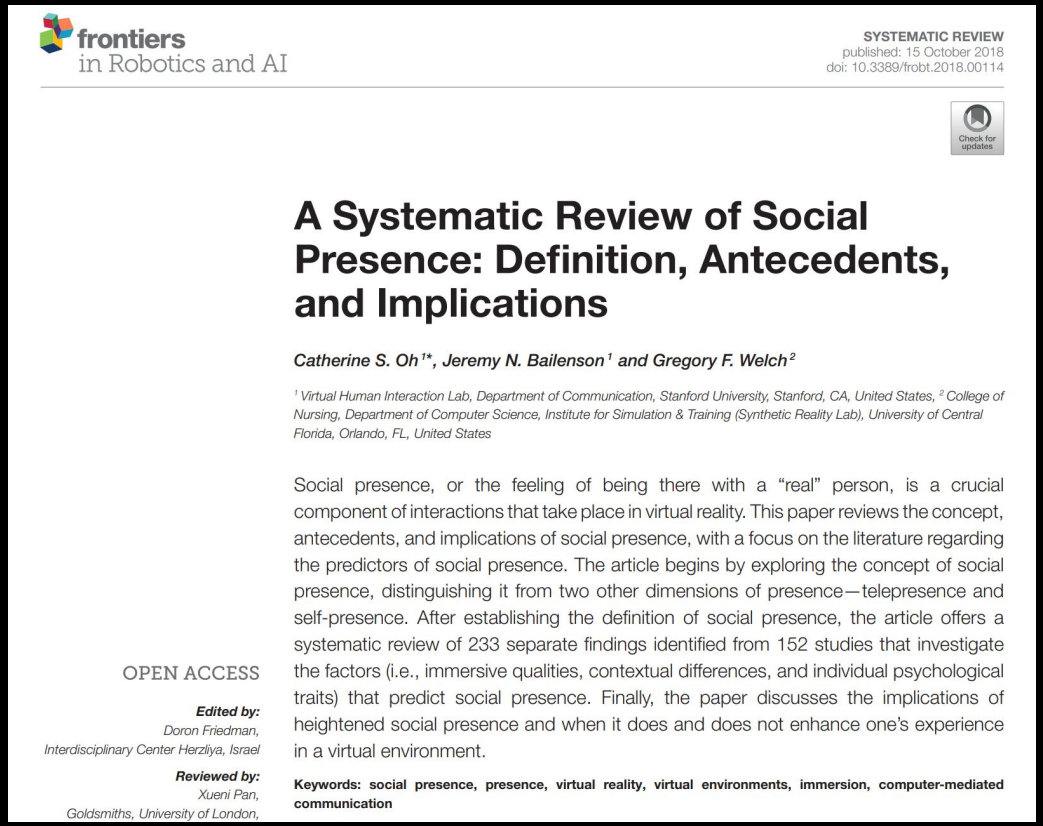


Fig. 2. Proposed relationships between presence concepts.

Skarbez, R., Brooks, Jr., F. P., & Whitton, M. C. (2017). *A Survey of Presence and Related Concepts*. ACM Computing Surveys, 50(6), 1–39. doi:10.1145/3134301

Oh et al's Systematic Review of Social Presence (2018)



frontiers in Robotics and AI

SYSTEMATIC REVIEW
published: 15 October 2018
doi: 10.3389/frobt.2018.00114

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A Systematic Review of Social Presence: Definition, Antecedents, and Implications

Catherine S. Oh[1]*, *Jeremy N. Bailenson*[1] *and Gregory F. Welch*[2]

[1] *Virtual Human Interaction Lab, Department of Communication, Stanford University, Stanford, CA, United States,* [2] *College of Nursing, Department of Computer Science, Institute for Simulation & Training (Synthetic Reality Lab), University of Central Florida, Orlando, FL, United States*

Social presence, or the feeling of being there with a "real" person, is a crucial component of interactions that take place in virtual reality. This paper reviews the concept, antecedents, and implications of social presence, with a focus on the literature regarding the predictors of social presence. The article begins by exploring the concept of social presence, distinguishing it from two other dimensions of presence—telepresence and self-presence. After establishing the definition of social presence, the article offers a systematic review of 233 separate findings identified from 152 studies that investigate the factors (i.e., immersive qualities, contextual differences, and individual psychological traits) that predict social presence. Finally, the paper discusses the implications of heightened social presence and when it does and does not enhance one's experience in a virtual environment.

Keywords: social presence, presence, virtual reality, virtual environments, immersion, computer-mediated communication

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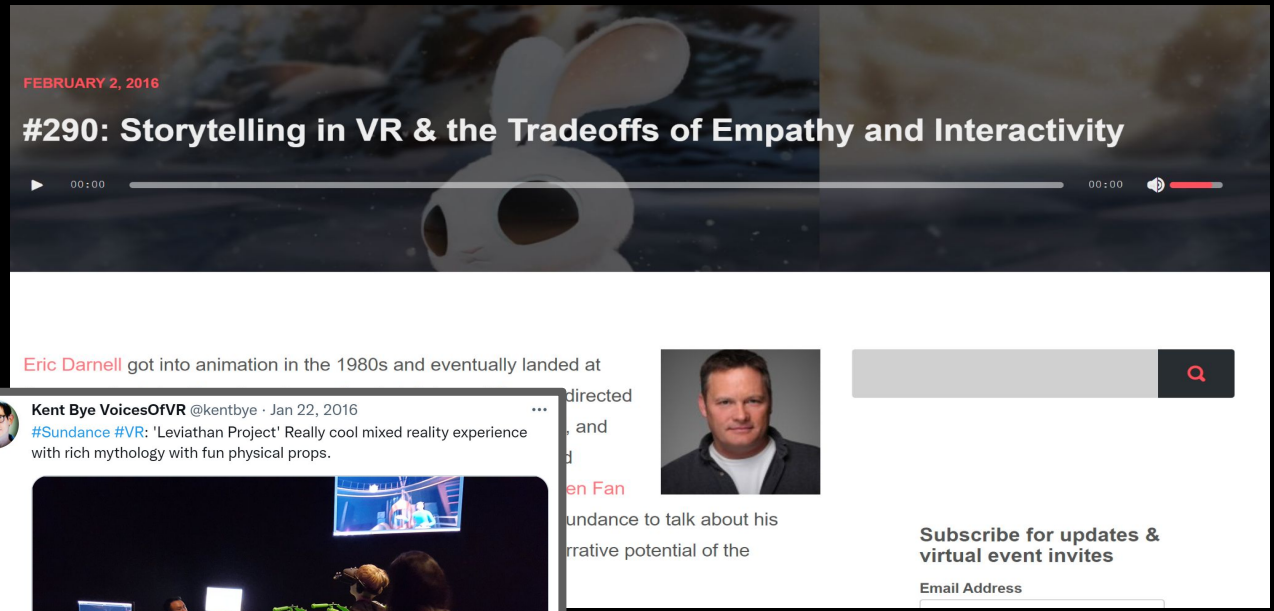
Features that Influence Social Presence

- Modality
- Visual Representations Interactivity
- Haptic Feedback
- Depth Cues
- Audio Quality
- Display

Oh, C. S., Bailenson, J. N., & Welch, G. F. (2018). *A systematic review of social presence: Definition, antecedents, and implications*. Frontiers in Robotics and AI, 114.

VR Storytelling at Sundance: Emotional Presence



Bye, K. & Darnell, E. (2016, February 2). *#290: Storytelling in VR & the Tradeoffs of Empathy and Interactivity.* Retrieved on April 22, 2022 from https://voicesofvr.com/290-storytelling-in-vr-the-tradeoffs-of-empathy-and-interactivity/

Dramatic Presence causing “immediate, personal emotions” (1993)

Margaret Thomas Kelso
Peter Weyhrauch
and
Joseph Bates
College of Fine Arts and
School of Computer Science
Carnegie Mellon University
Pittsburgh, Pennsylvania 15213

Dramatic Presence

Abstract

Let us consider the presentation by computers of r
inhabited by dynamic and complex characters, and
stories. We shall call this interactive drama, and we
acters, aesthetic presentation, and long-term dram
an experiment designed to help us understand hov
principal questions are addressed. One, how does
virtual world filled with characters and story? Two,
(actors) in such a virtual world? Three, what is requ
present an introduction to interactive drama, sumn
create and present such experiences, and describe
drawing from the experiment, we suggest several

5.1 Dramatic Presence Is Engrossing and Powerful

Most importantly, we discovered that a person will become emotionally engaged when confronted with an imaginary world containing interesting characters, when that world is under the direction of an interactive plot. We found that the interactor, like a viewer of a play, a film, or television, is willing to suspend his or her disbelief and participate in the story. However, when comparing traditional and interactive media, interactors found interactive drama more powerful, easily causing immediate, personal emotions, not the traditional vicarious empathy for other characters.

Kelso, M. T., Weyhrauch, P., & Bates, J. (1993). *Dramatic Presence.* Presence: Teleoperators and Virtual Environments, 2(1), 1–15. doi:10.1162/pres.1993.2.1.1

Emotional Involvement via Transportation in Narrative Worlds (2004)

Communication Theory

Fourteen: Four

November 2004

Pages 311–327

Melanie C. Green
Timothy C. Brock
Geoff F. Kaufman

Understanding Media Enjoyment: The Role of Transportation Into Narrative Worlds

"Transportation into a narrative world" is an experience of cognitive, emotional, and imagery involvement in a narrative. Transportation theory (Green & Brock, 2000, 2002) provides a lens for understanding the concept of media enjoyment. The theory suggests that enjoyment can benefit from the experience of being immersed in a narrative world, as well as from the consequences of that immersion. Consequences implied by transportation theory include connections with characters and self-transformations.

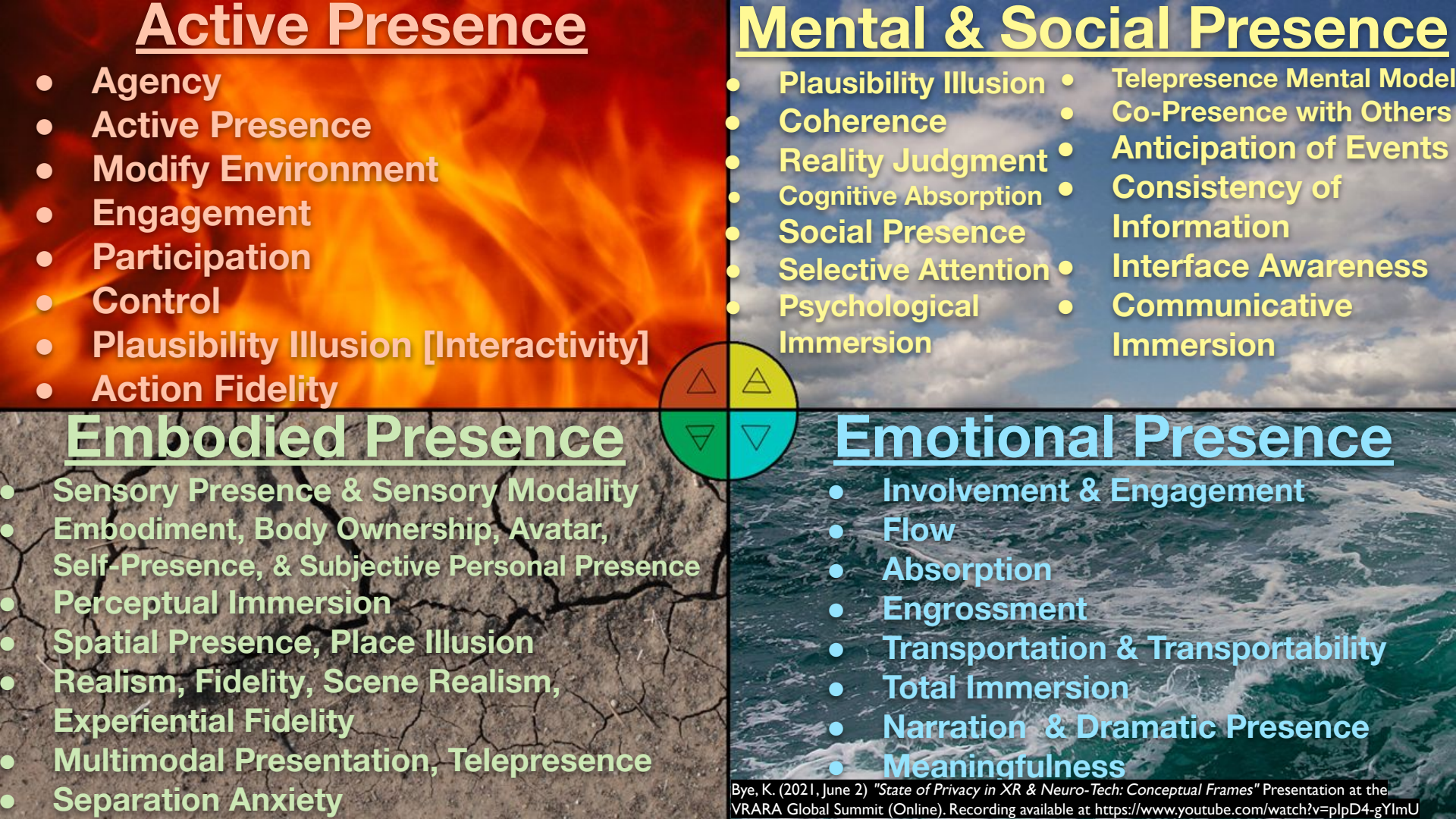
Green, M. C., Brock, T. C., & Kaufman, G. F. (2004). *Understanding Media Enjoyment: The Role of Transportation Into Narrative Worlds*. Communication Theory, 14(4), 311–327. doi:10.1111/j.1468-2885.2004.tb00317.x

Survey of Presence Concepts (Skarbez et al, 2017)

Table 2. List of Presence/Telepresence Models and Their Components

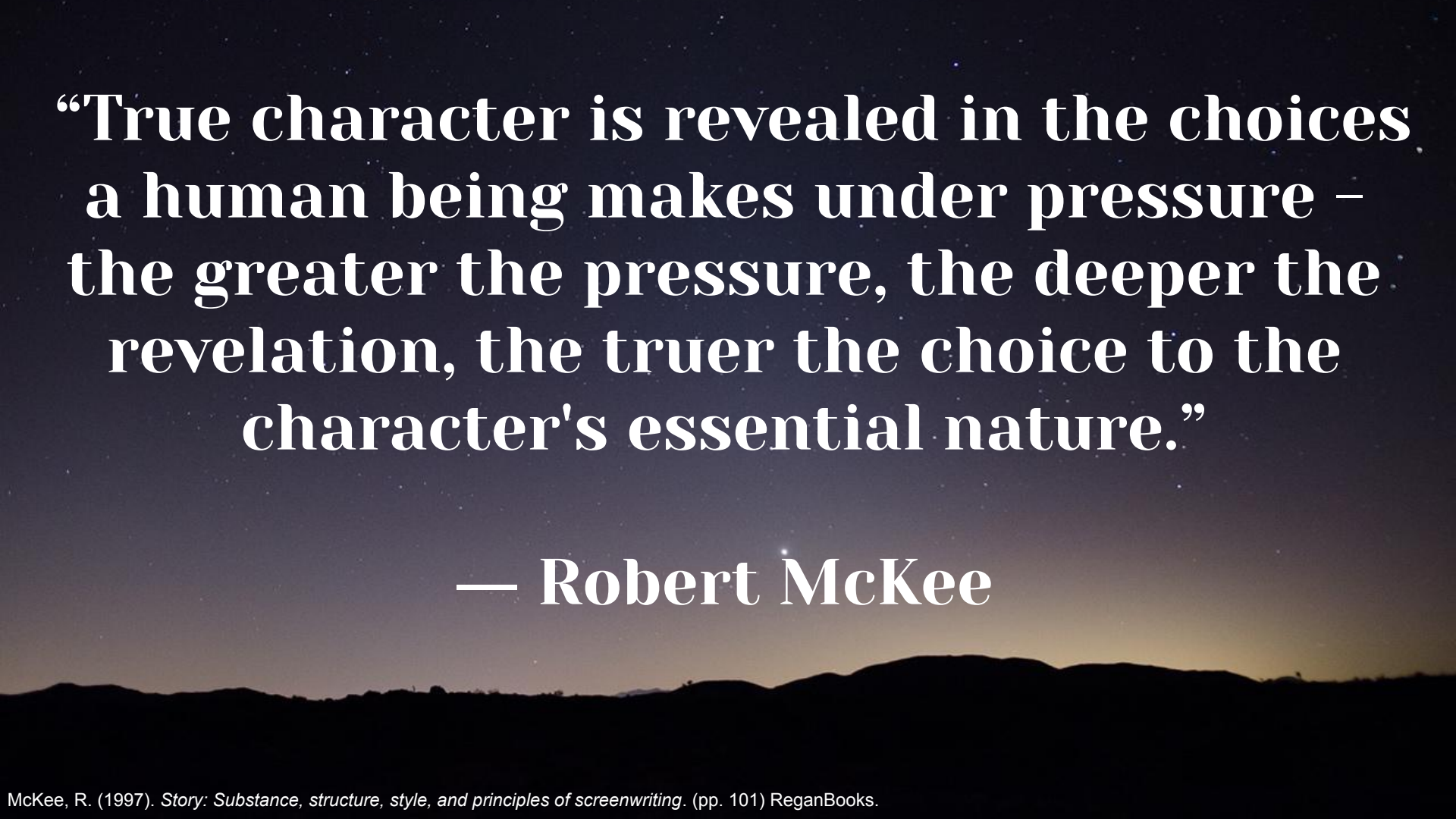
Source	Model components (order as listed in source)				
Akin et al., 1983 [2]	Ability to act in remote environment	Ability to sense in local environment			
Heeter, 1992 [60]	Subjective personal presence	Social presence	Environmental presence		
Sheridan, 1992 [113]	Extent of sensory information	Control of sensors	Ability to modify physical environment	Task dependent characteristics	
Held and Durlach, 1992 [61]	Sensory factors	Motor factors	Correlation between feedback and actions	Identification with the robot	Familiarity with the system
Kim and Biocca, 1997 [71]	Arrival	Departure			
Draper et al., 1998 [44]	Attention to mediated environment	Attention to ignoring distractors			
Witmer and Singer, 1998 [157]	Control	Sensory	Distraction	Realism	
Baños et al., 2000 [8]	Reality judgment	Presence	Emotional involvement	Interaction	Control
	Attention/Flow	Realism	Congruence/Continuity	Expectations	
IJsselsteijn et al., 2000 [68]	Extent and fidelity of sensory information	Match between sensors and display	Content factors	User characteristics	
Lombard et al., 2000 [81]	Social Richness	Realism (Social)	Realism (Perceptual)	Transportation	Immersion
	Social Actor in a Medium	Medium as Social Actor			
Sas and O'Hare, 2003 [105]	General cognitive factors	Task-specific cognitive factors	Technological factors	Media content	
Takatalo et al. 2008 [142]	Spatial	Action	Attention	Real[ness]	Arousal
Vorderer et al., 2004 [149]	Attention allocation	Spatial situation model	Spatial presence: self-location	Spatial presence: possible actions	Higher cognitive involvement
	Suspension of disbelief	Domain-specific interest	Visual/Spatial imagery	Absorption	
Chertoff et al., 2010 [36]	Affective	Cognitive	Sensory	Active	Relational

Skarbez, R., Brooks, Jr., F. P., & Whitton, M. C. (2017). *A Survey of Presence and Related Concepts*. ACM Computing Surveys, 50(6), 1–39. doi:10.1145/3134301



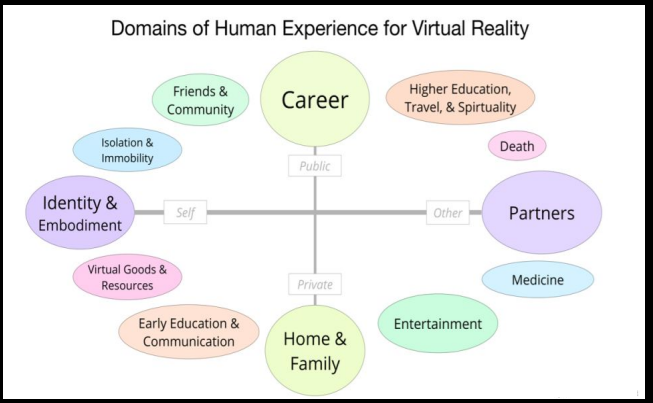
Bye, K. (2021, June 2) *"State of Privacy in XR & Neuro-Tech: Conceptual Frames"* Presentation at the VRARA Global Summit (Online). Recording available at https://www.youtube.com/watch?v=plpD4-gYImU

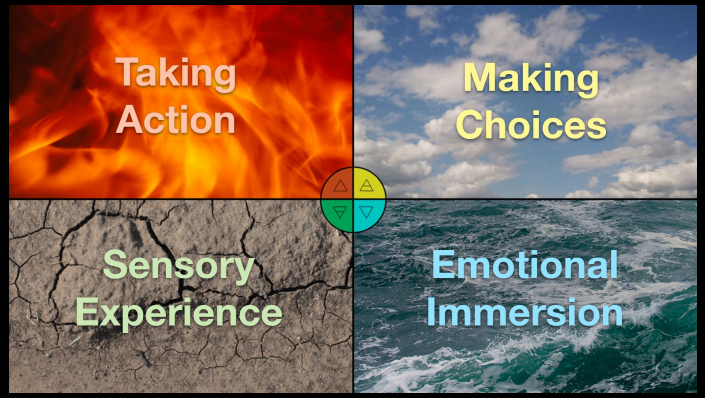
- Underlying Experiential Age Context
- My Elemental Theory of Presence
  - Connections to Experiential Marketing
  - Underlying Dialectics of Presence
  - Presence Theory Evolution & Synthesis
- **My Immersive Storytelling & Experiential Design Framework**
- Experiential Design & Immersive Story Breakdowns

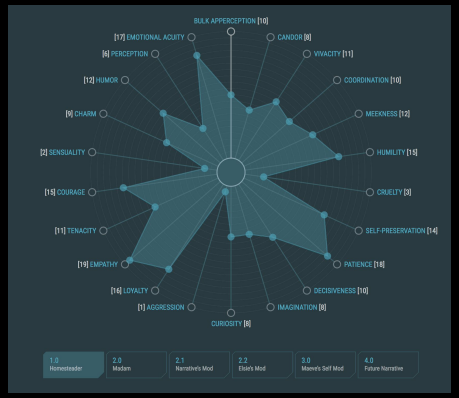


McKee, R. (1997). *Story: Substance, structure, style, and principles of screenwriting*. (pp. 101) ReganBooks.

Placed in a Context with Pressure + Make Choices & Take Action = Essential Character is Revealed





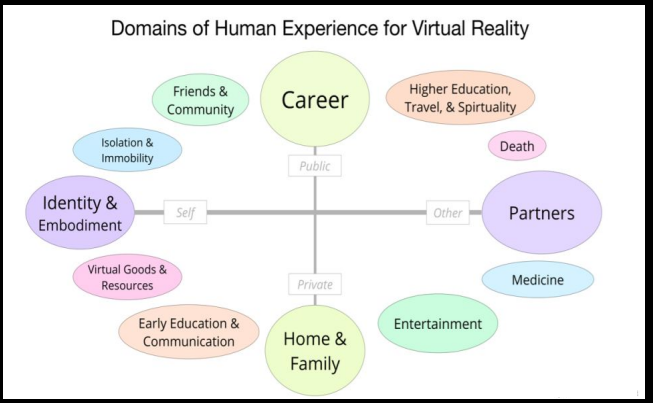


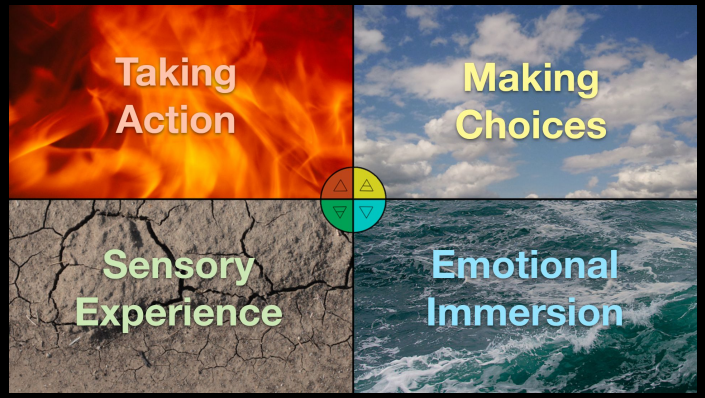
Unfolding Process Over Time

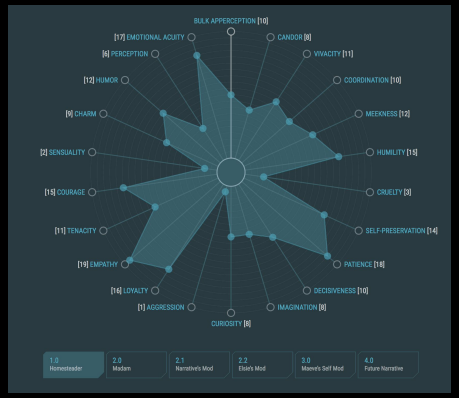
Context

Quality

Character





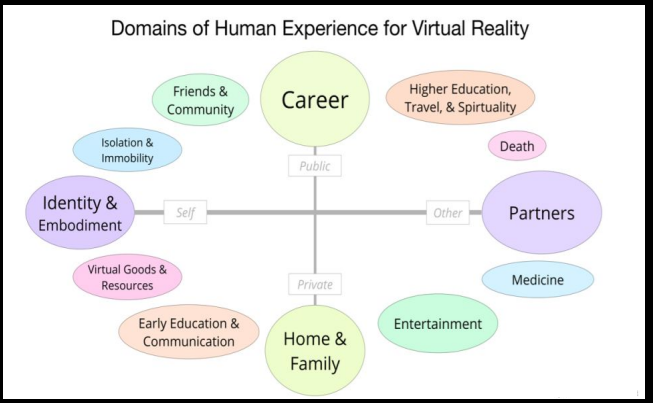


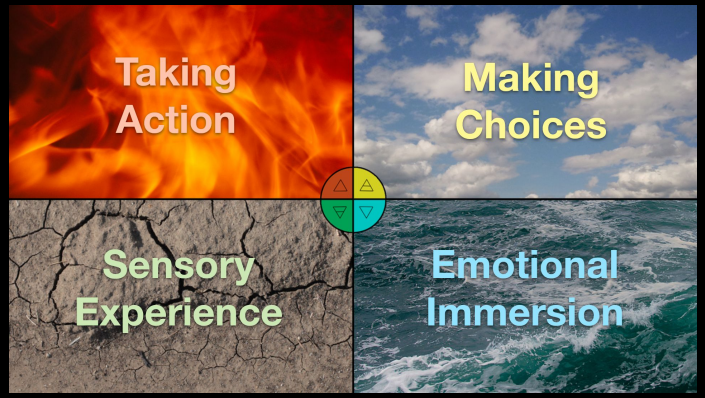
Story

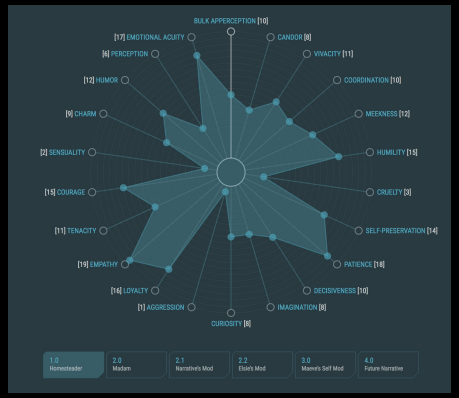
Context

Quality

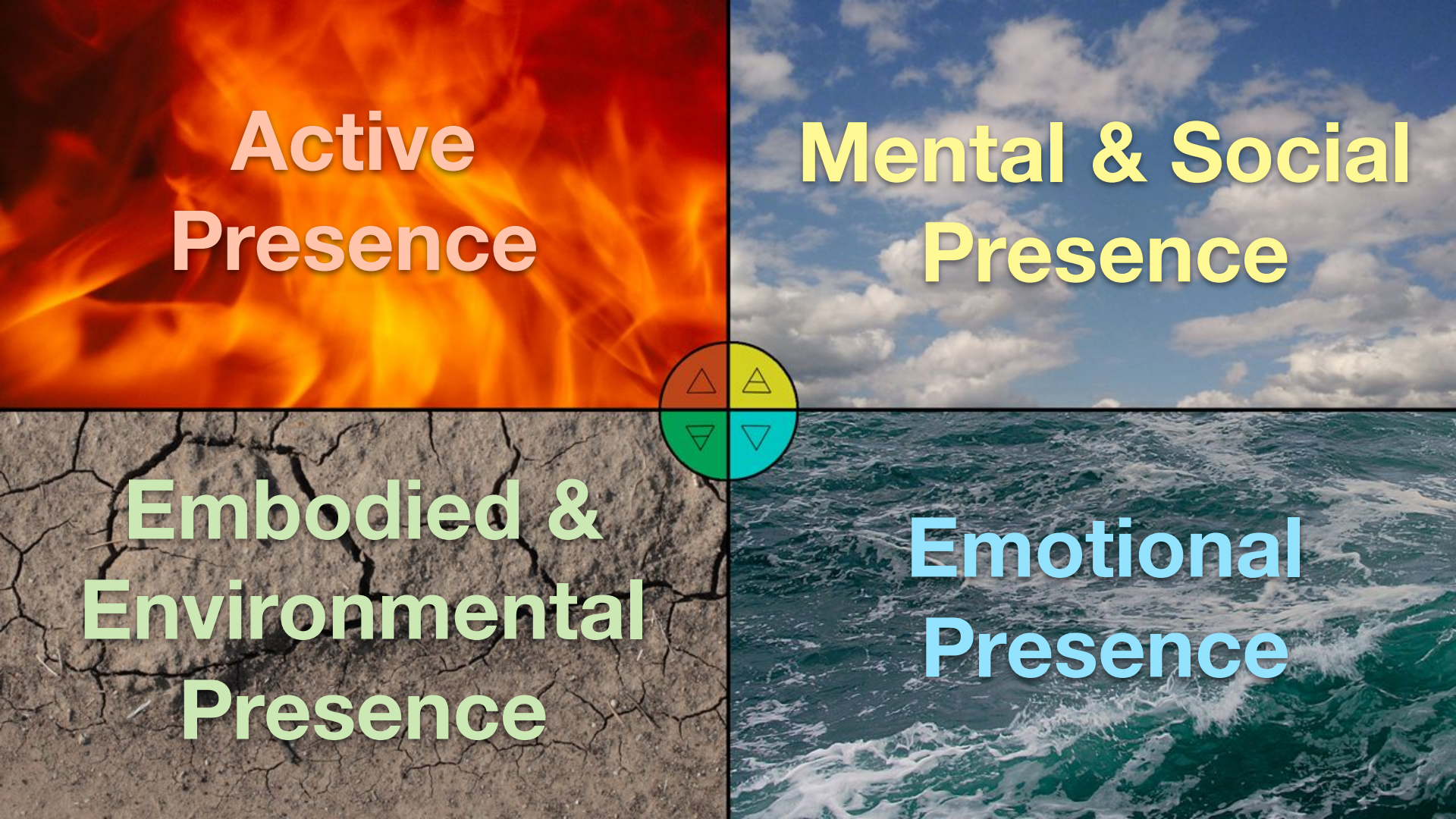
Character





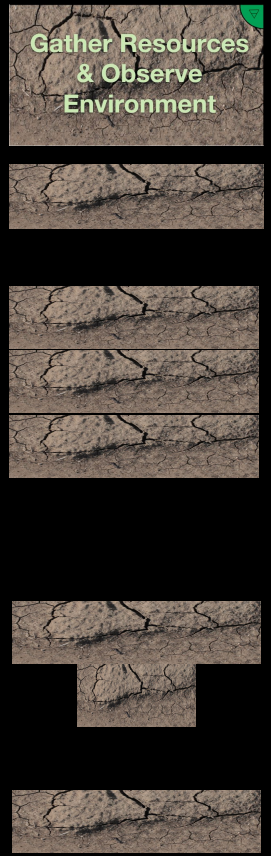


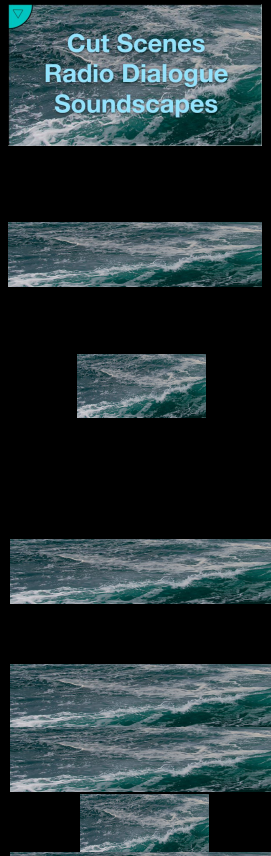
Story

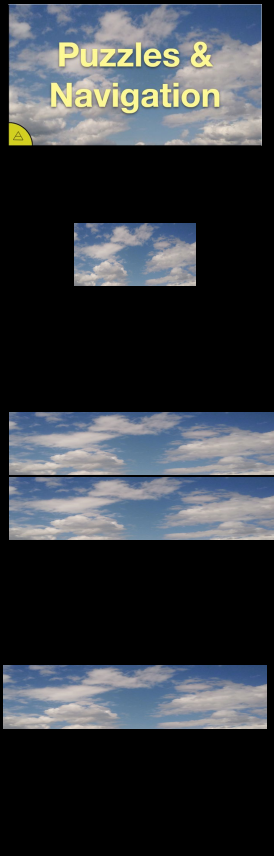

Active Presence
Mental & Social Presence
Embodied & Environmental Presence
Emotional Presence

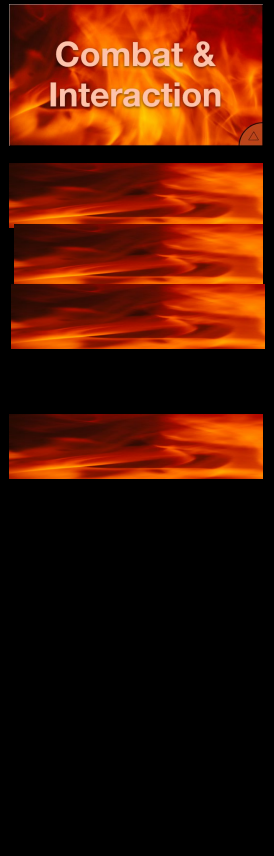
The Center of Gravity of Presence Shifts from Scene to Scene

First Level of
Half-Life: Alyx

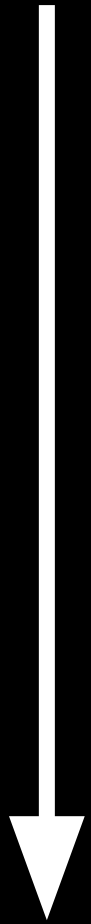


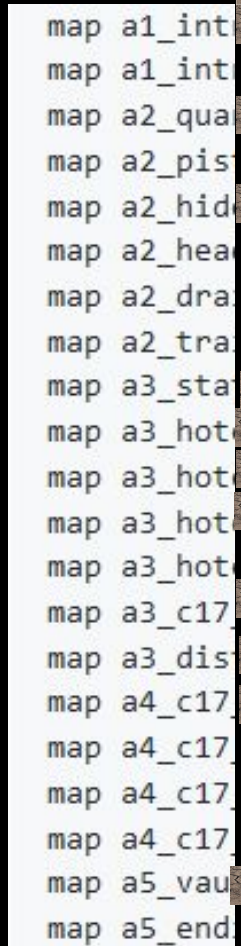


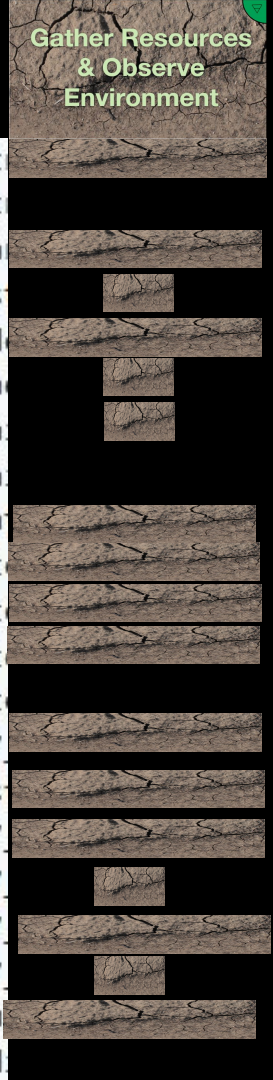


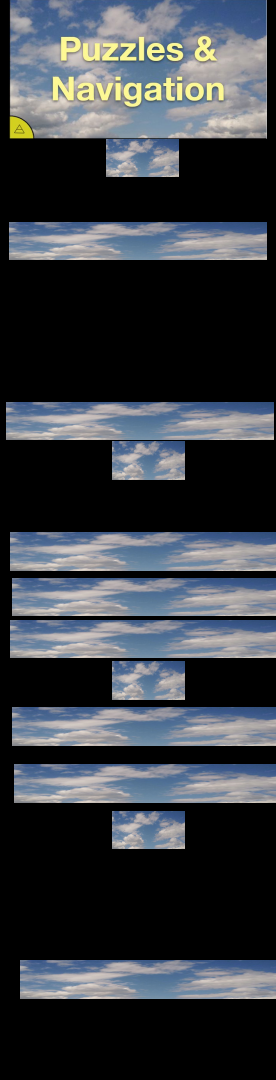


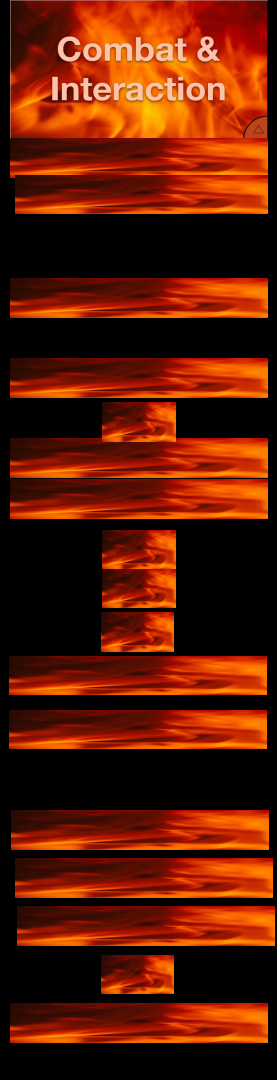
All levels of
Half-Life: Alyx

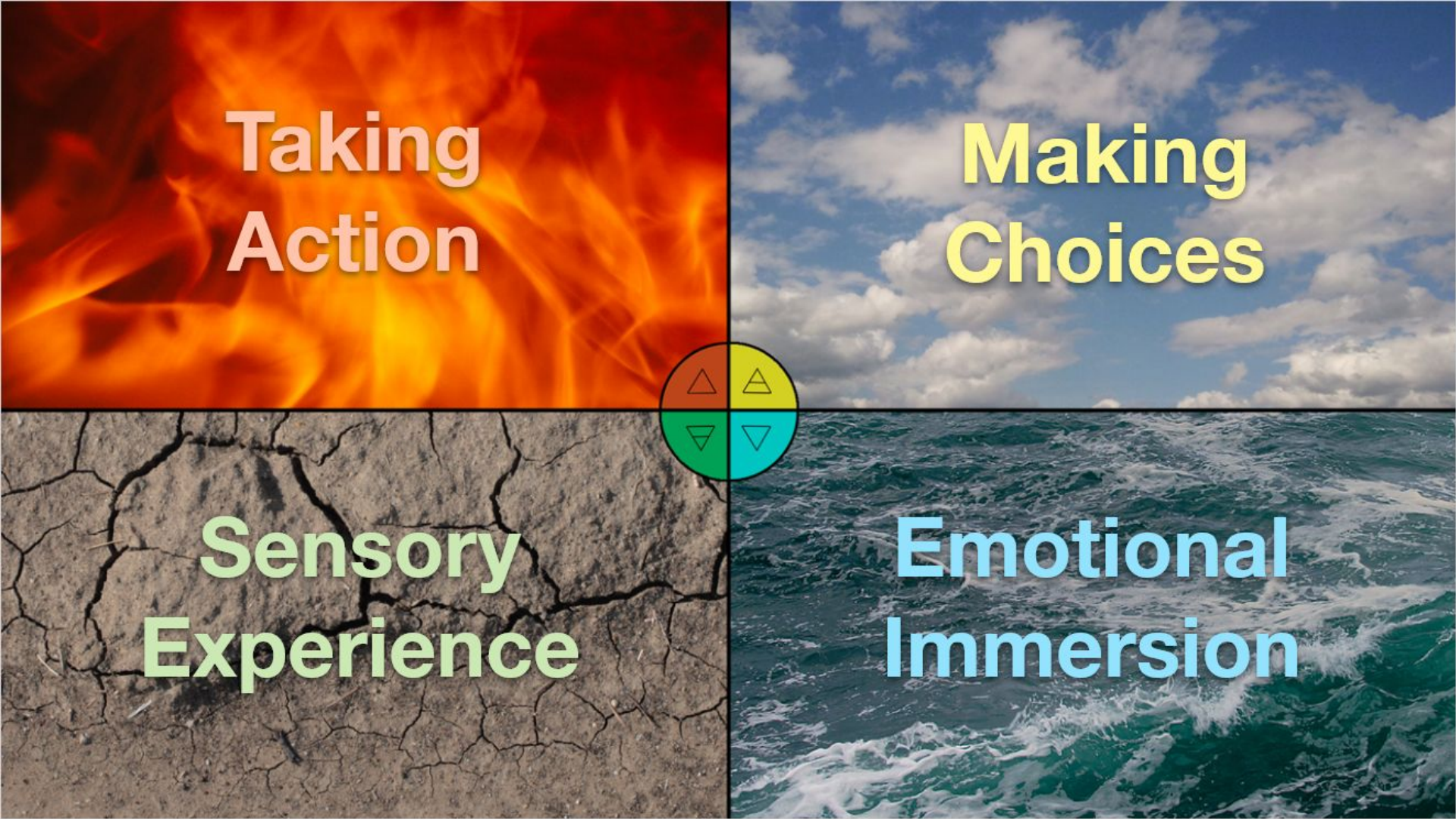


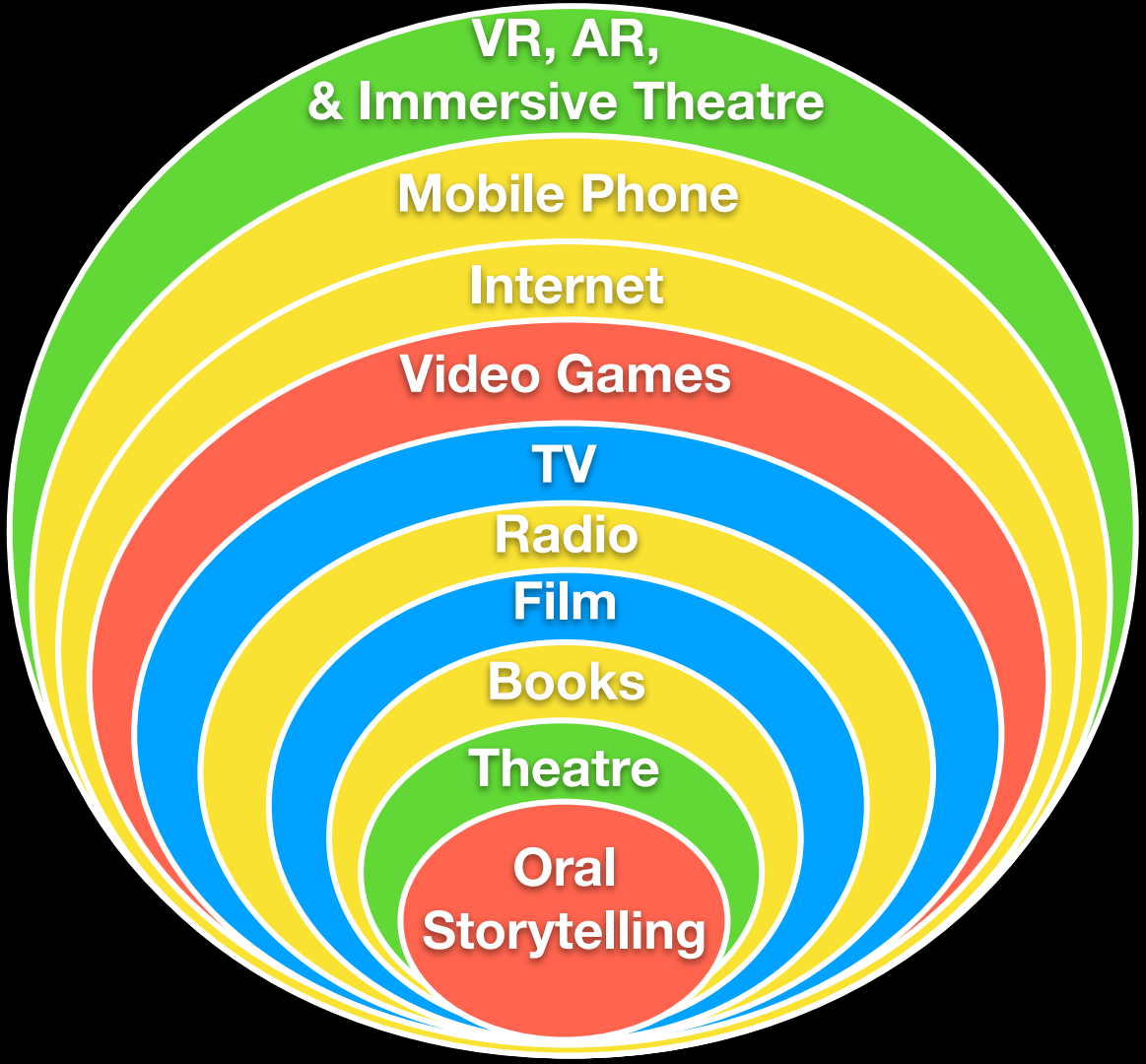


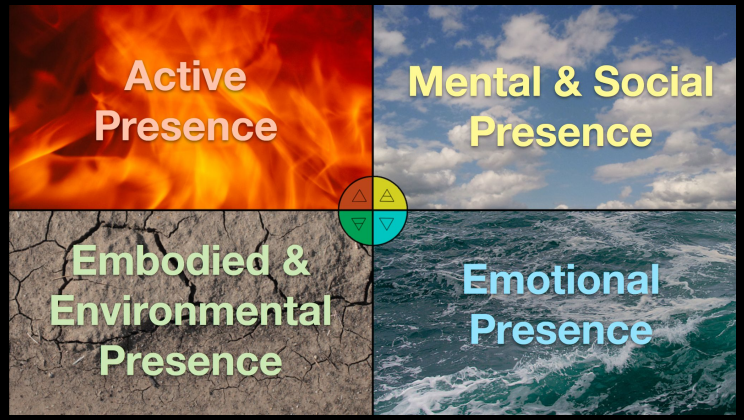




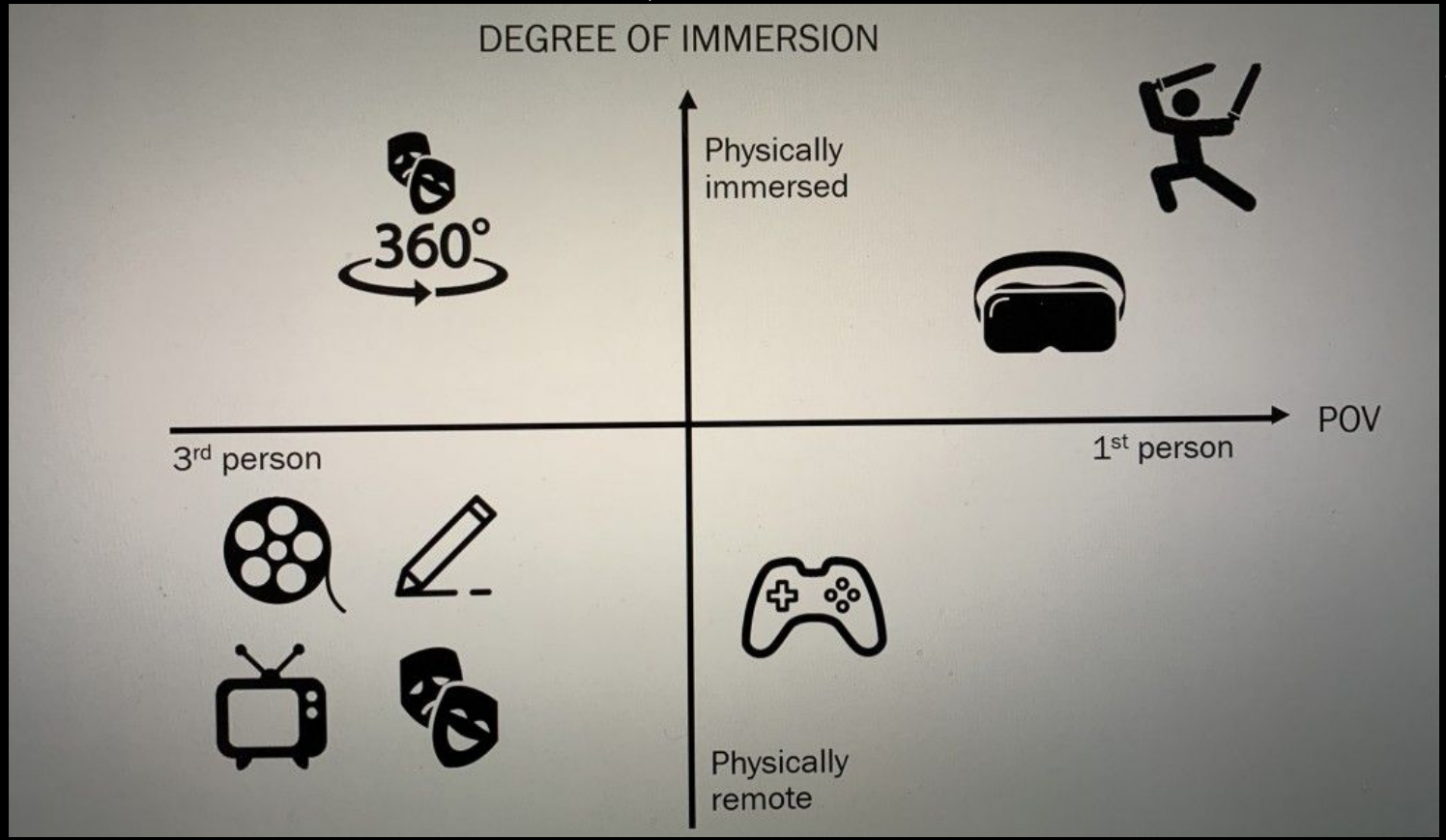



Taking Action
Making Choices
Sensory Experience
Emotional Immersion


VR, AR,
& Immersive Theatre
Mobile Phone
Internet
Video Games
TV
Radio
Film
Books
Theatre
Oral
Storytelling


Active
Presence
Mental & Social
Presence
Embodied &
Environmental
Presence
Emotional
Presence

1st Person POV (Experiencing Your Own Qualities of Presence) vs 3rd Person POV (Watching the Character's Presence)



Illusion of Non-Mediated Presence within a 3D Spatial Context

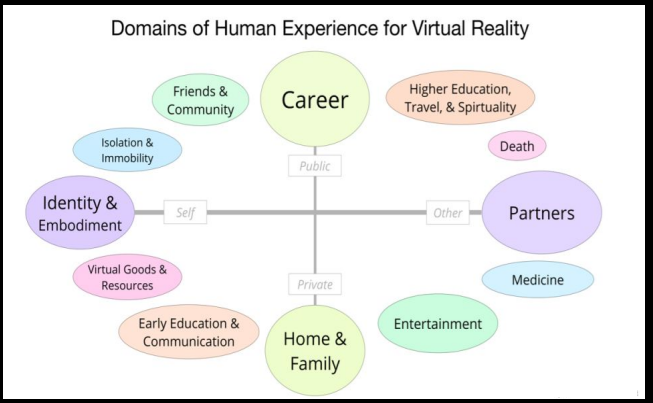
Mediated through a 2D Frame

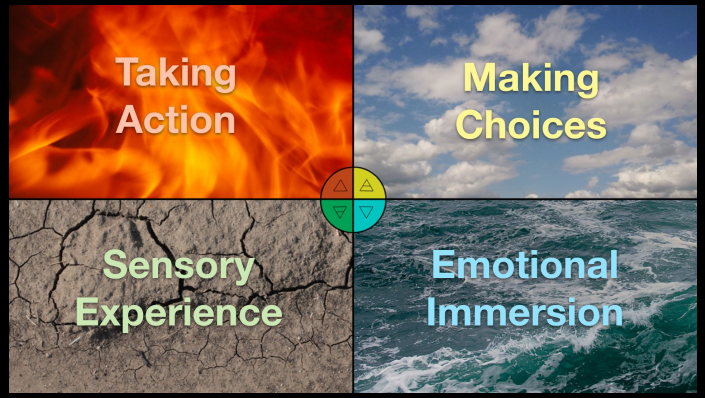
Tricart, C. (2022, March 14). *Immersive Storytelling. SXSW Film & Interactive Film Festival.* [Keynote presentation]. Austin, TX; Austin Convention Center. Retrieved on April 1, 2022 from https://voicesofvr.com/1074-celine-tricarts-sxsw-keynote-on-immersive-storytelling-live-action-role-play-emotional-bleed/

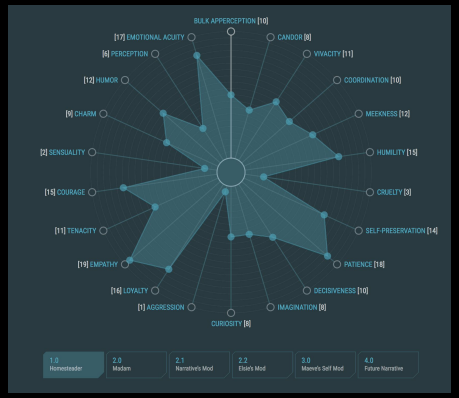
Context

Quality

Character

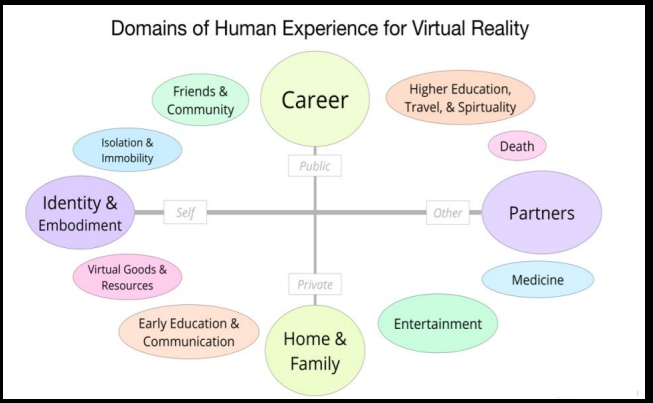




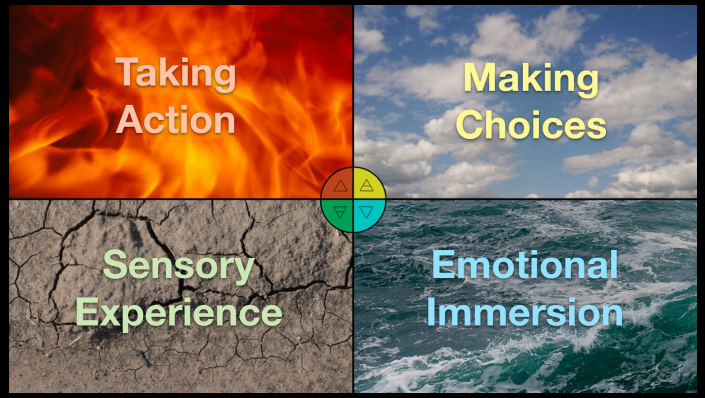


Story

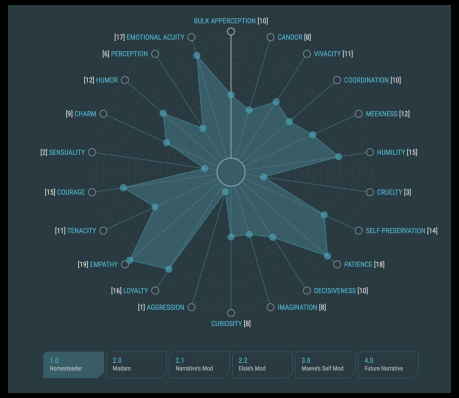
Context



Quality

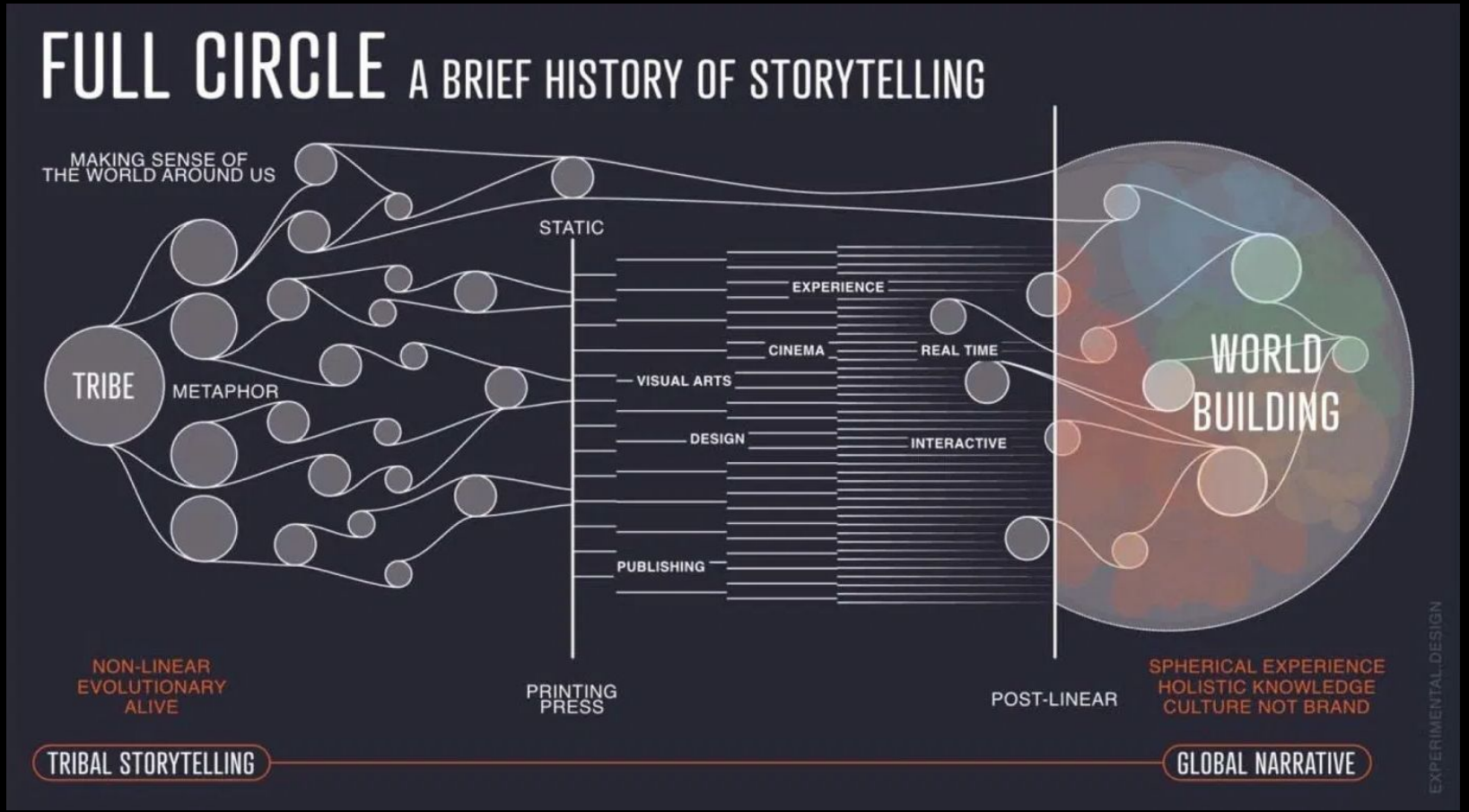


Character



Story

Alex McDowell's Brief History of Storytelling



McDowell, Alex. (2020, January 25). *Storytelling shapes the future*. Retrieved March 03, 2021, from https://www.theantiagency.org/storytelling-shapes-the-future/

Spectrum of Story Authorship

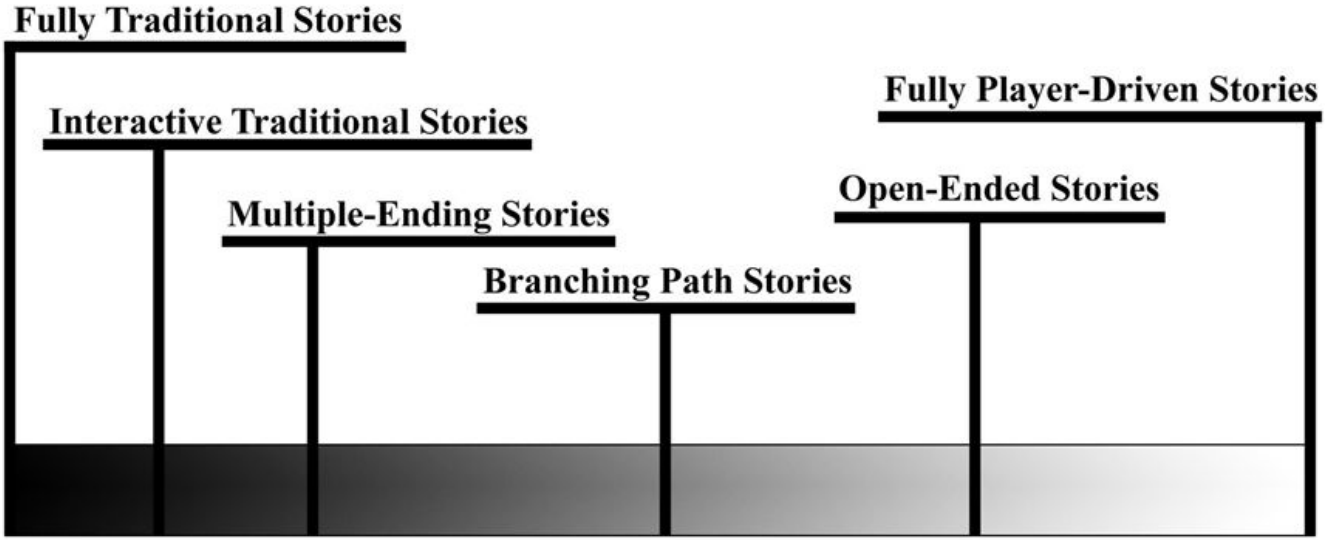
Authored Narrative

Generative Narrative

No Agency or Impact on Story

Maximized Agency & Expression of Will

Spectrum of Meaningful Engagement

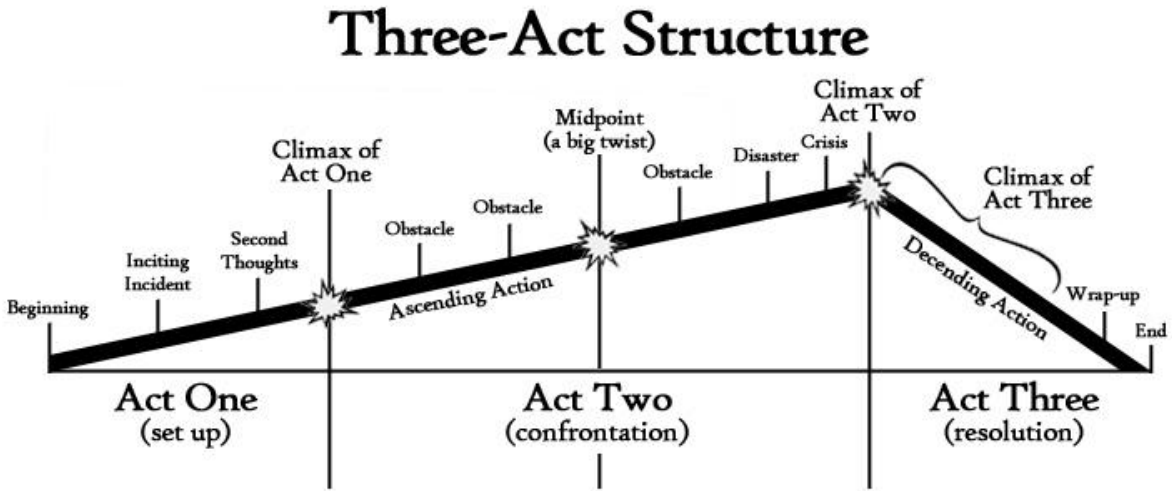


Authored Narrative

Generative Narrative

Lebowitz, Josiah and Klug, Chris. (2011) *"Interactive Storytelling for Video Games: A Player-Centered Approach to Creating Memorable Characters and Stories."* (pp. 120) Focal Press.

Fully Traditional Stories



Authored Narrative

Generative Narrative

Image retrieved from Forsyth, K (2013, January) on November 13, 2021: https://web.archive.org/web/20130420041820/http://www.kateforsyth.com.au/images/Blog%20January%202013/ThreeActStructureFlat.jpg

Interactive Traditional Story

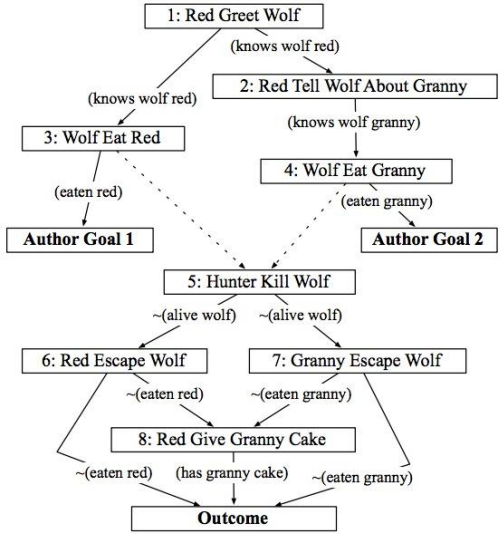


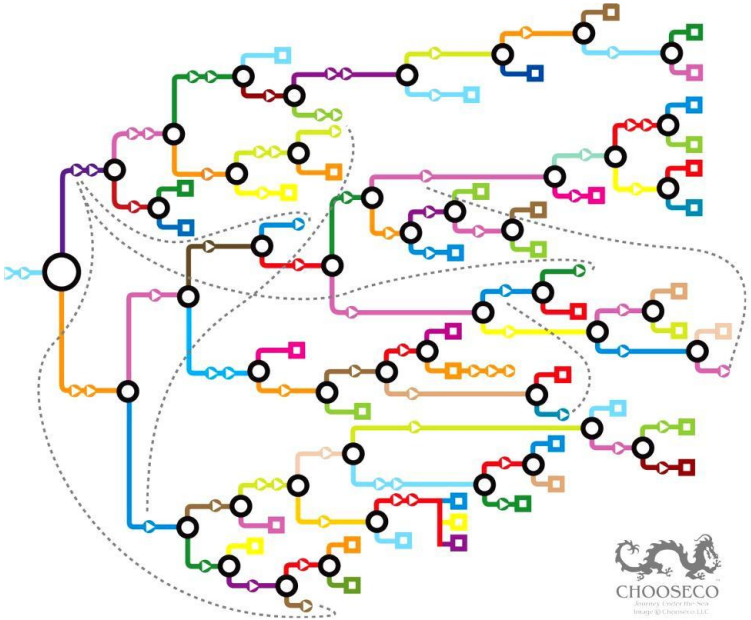
Figure 2: Example narrative plan set in the Little Red Riding Hood world.

Authored Narrative

Generative Narrative

Riedl, Mark. *"Incorporating Authorial Intent into Generative Narrative Systems,"* Association for the Advancement of Artificial Intelligence, 2009.

Branching Path Stories

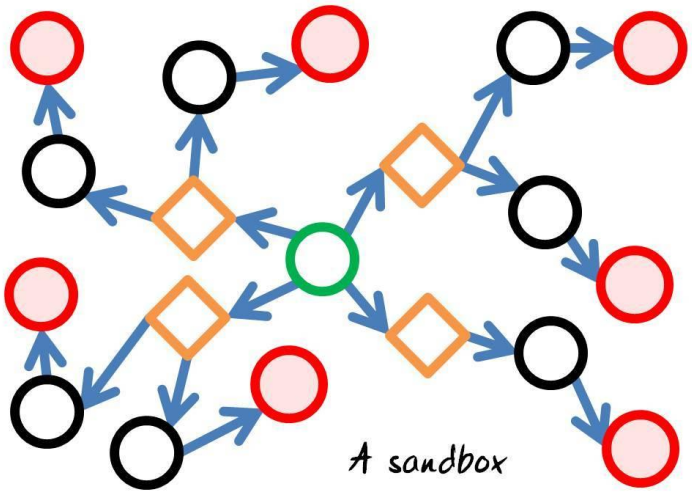


Authored Narrative

Generative Narrative

Laskow, S. (2017, June 13). These maps reveal the hidden structures of 'Choose your own adventure' books. Atlas Obscura. Retrieved November 14, 2021, from https://www.atlasobscura.com/articles/cyoa-choose-your-own-adventure-maps.

Open-Ended Stories



Authored Narrative

Generative Narrative

Koster, R. (2013, April 24). *On choice architectures*. Raph's Website. Retrieved November 13, 2021, from https://www.raphkoster.com/2013/04/24/on-choice-architectures/#more-11622.

Drama Manager

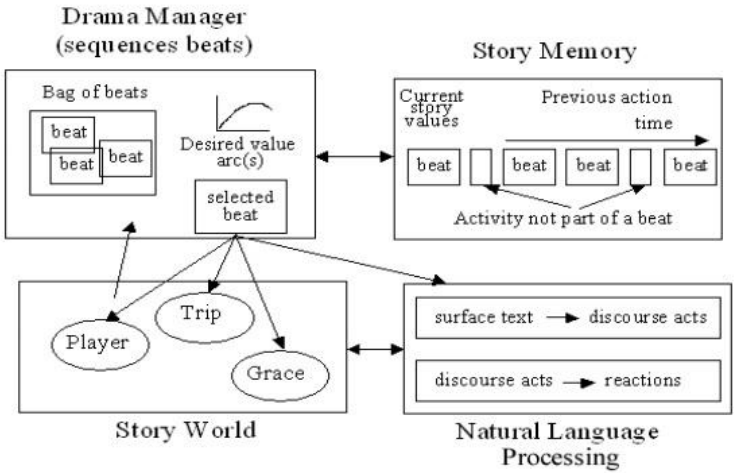


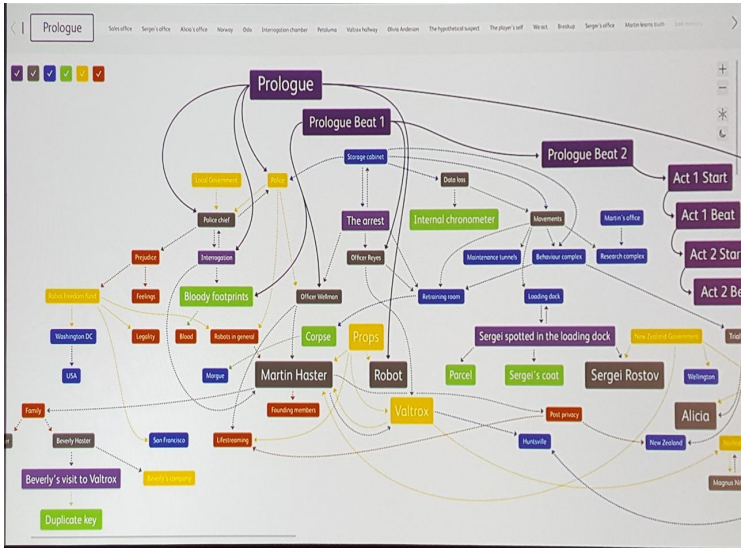
Figure 2. Façade interactive drama architecture

Authored Narrative

Generative Narrative

Mateas, Michael. *"Interactive Drama, Art, and Artificial Intelligence."* PhD Thesis. Technical Report CMU-CS-02-206. School of Computer Science, Carnegie Mellon University, Pittsburgh, PA, December 2002.

Fully Player-Driven Stories



Authored Narrative

Generative Narrative

Short, E. (2017, February 28) Spirit AI presented at *"Narrative Innovation Showcase"*, Game Developers Conference, San Francisco, CA.

Passive Experience with Static Particle-like Actuals

Participatory Experience with Dynamic Waves of Potential

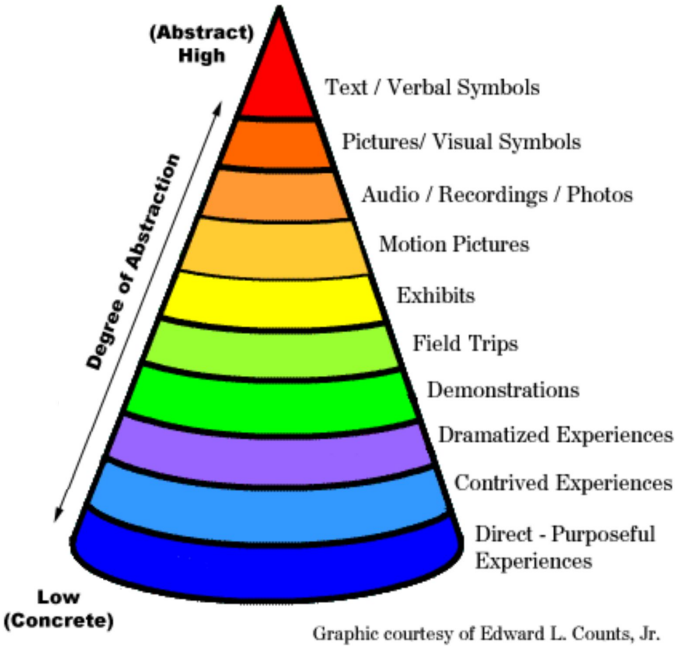
Abouhaib, A. (2014). Retrieved on November 13, 2021 from http://ffden-2.phys.uaf.edu/webproj/212_spring_2014/Abdel_Abouhaib/101559128653564b3256663/uploads/2/8/6/1/28617611/1047737_orig.jpg

Skimmers, Dippers, & Divers

Skimmer

Dipper

Diver



Graphic courtesy of Edward L. Counts, Jr.

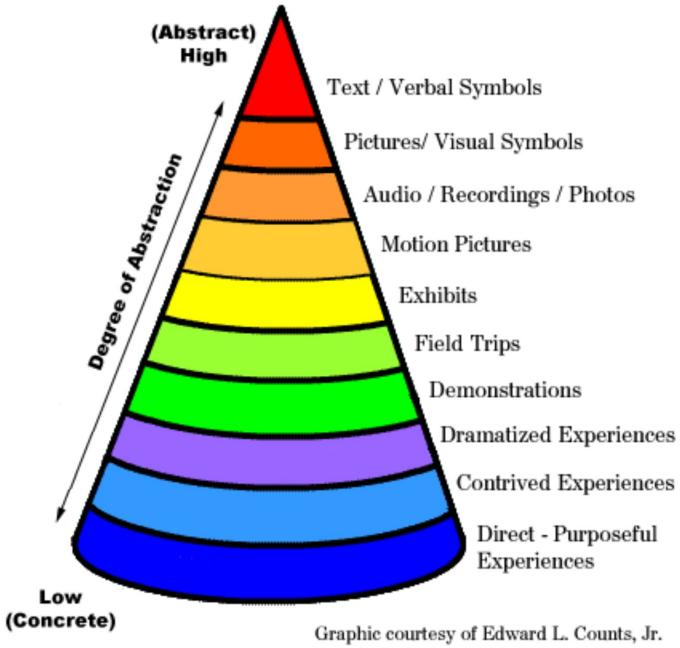
Kumar, G., & Singh, K. (2014). *Enhanced Learning and Retention of Course Content among Global Education using Multimedia Aids*. Retrieved on November 13, 2021 from https://www.ijettcs.org/Volume2Issue6/IJETTCS-2013-12-25-097.pdf

Skimmers, Dippers, & Divers

Skimmer

Dipper

Diver



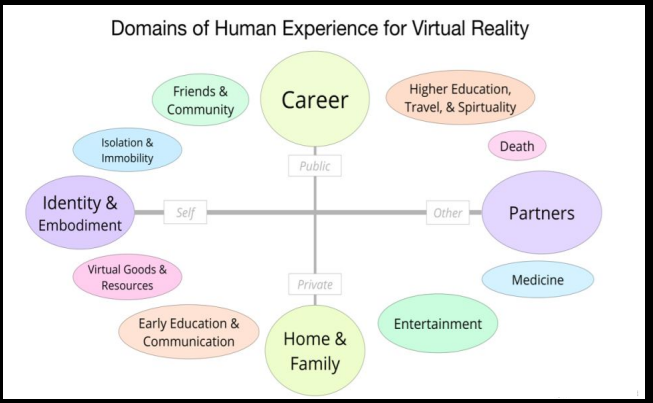
Graphic courtesy of Edward L. Counts, Jr.

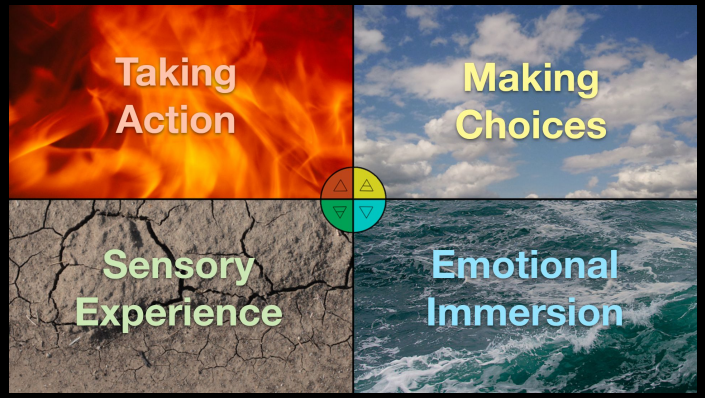
Kumar, G., & Singh, K. (2014). *Enhanced Learning and Retention of Course Content among Global Education using Multimedia Aids*. Retrieved on November 13, 2021 from https://www.ijettcs.org/Volume2Issue6/IJETTCS-2013-12-25-097.pdf

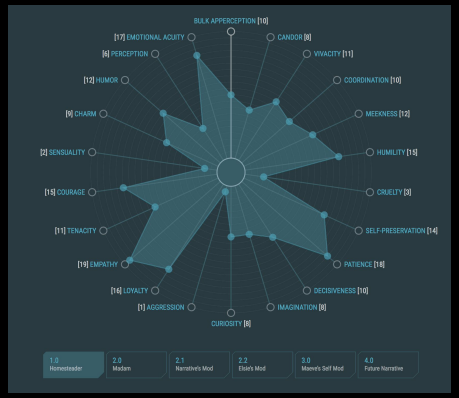
Context

Quality

Character

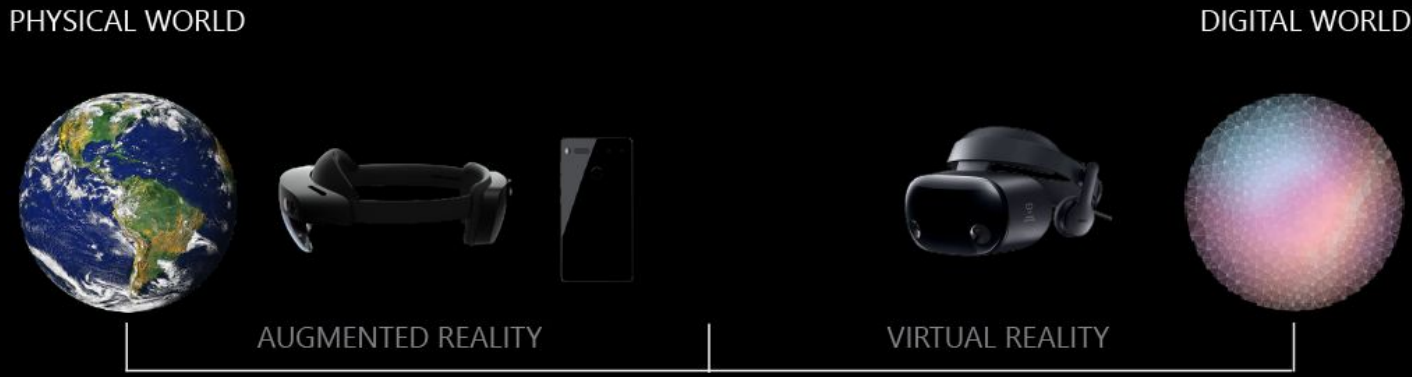


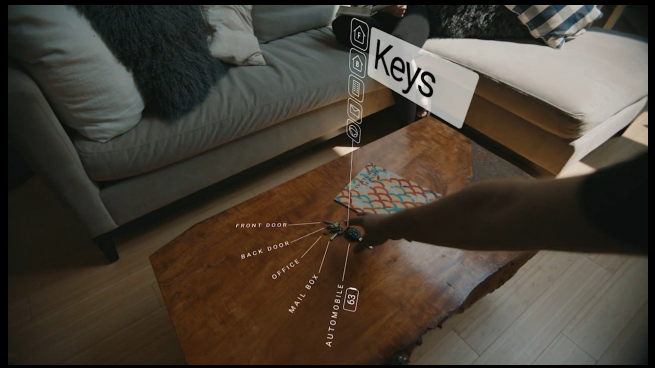




Story

AR Modify Your Existing Context
VR Completely Switch Your Existing Context

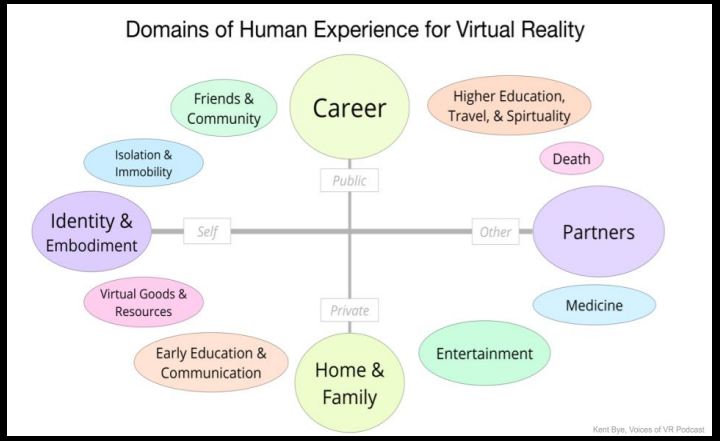


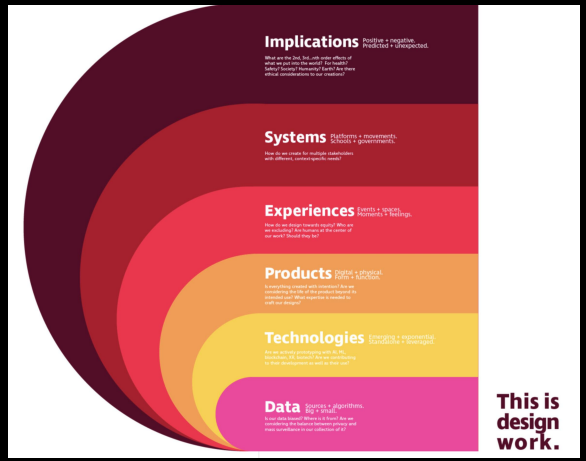


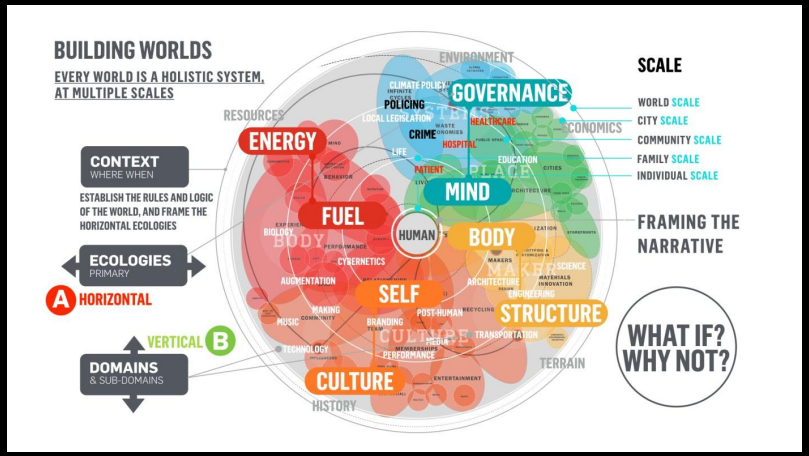
MIXED REALITY SPECTRUM

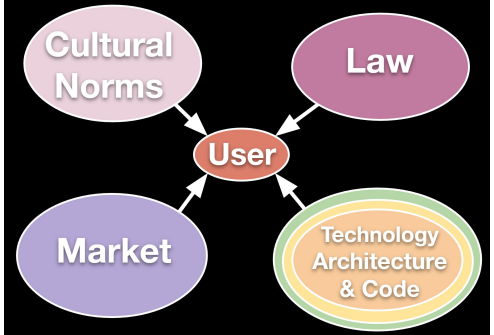
Microsoft (2020, August 26). *What is mixed reality?* Retrieved April 02, 2021, from https://docs.microsoft.com/en-us/windows/mixed-reality/discover/mixed-reality

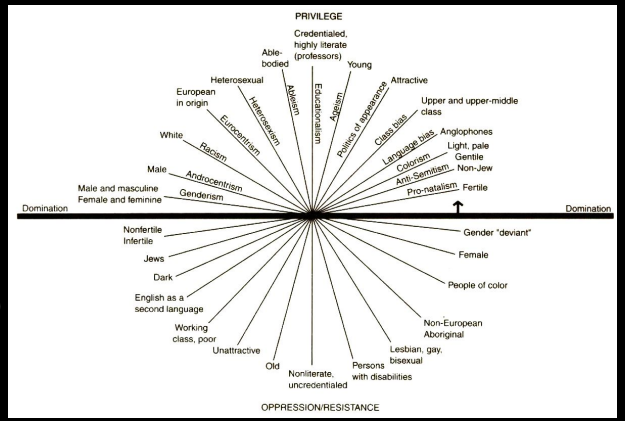
Different Models of Context



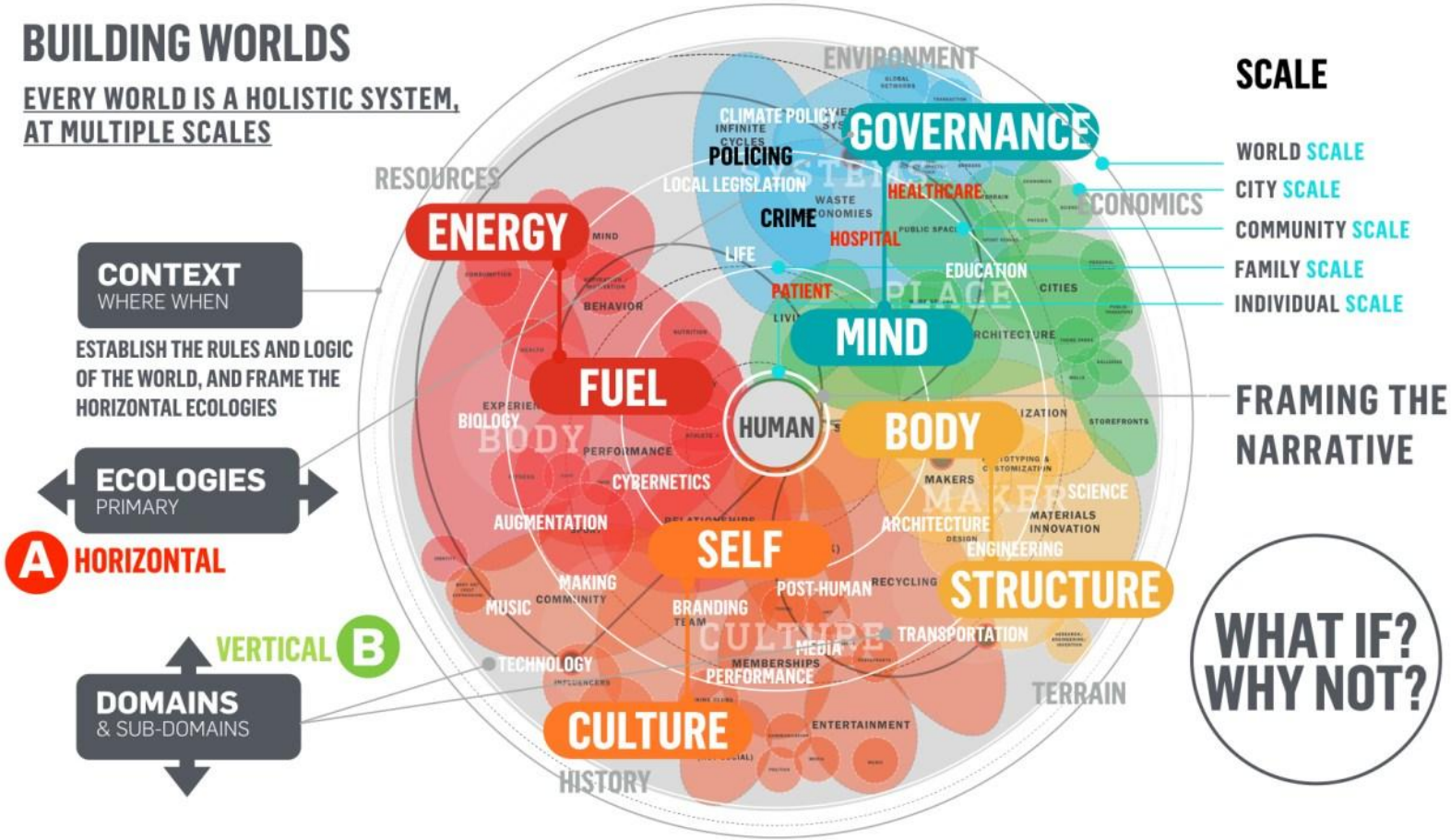




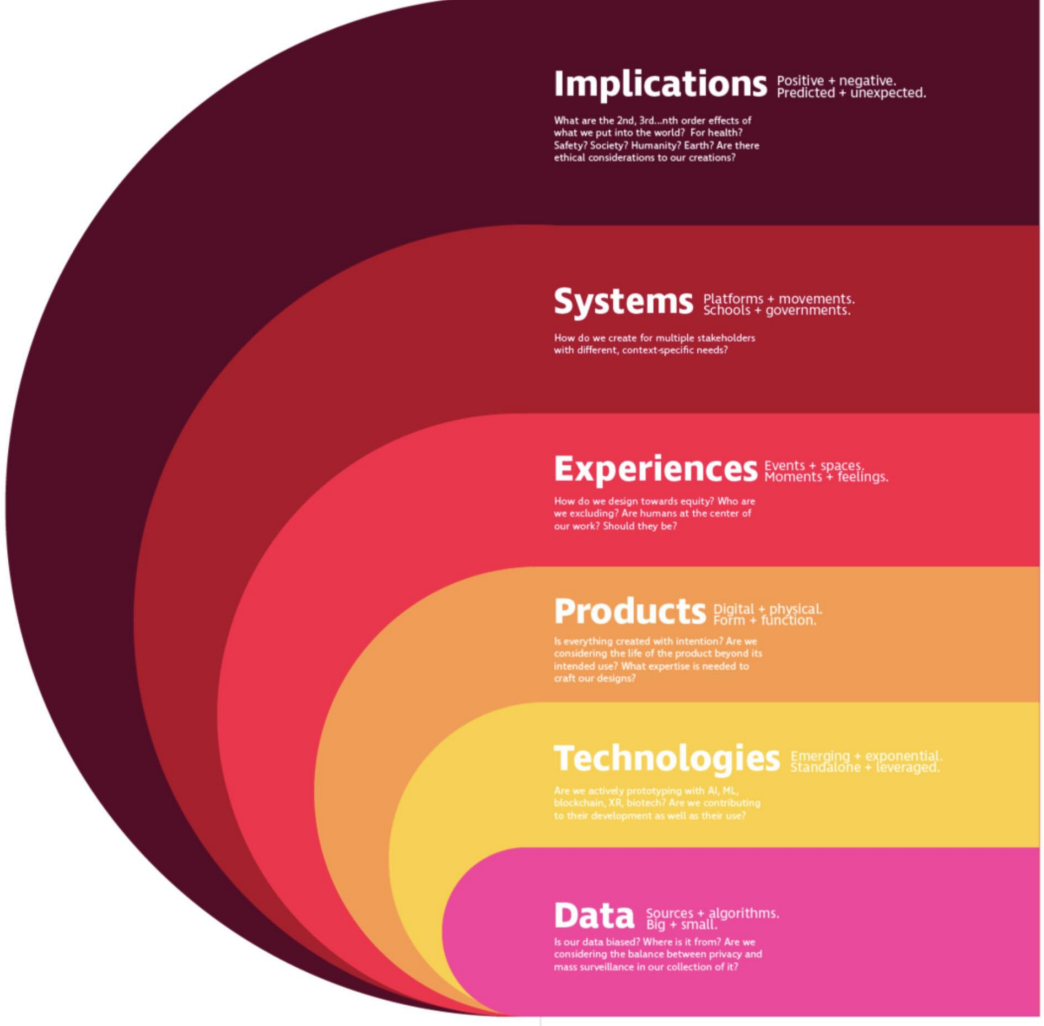




Alex McDowell's World Building Mandala



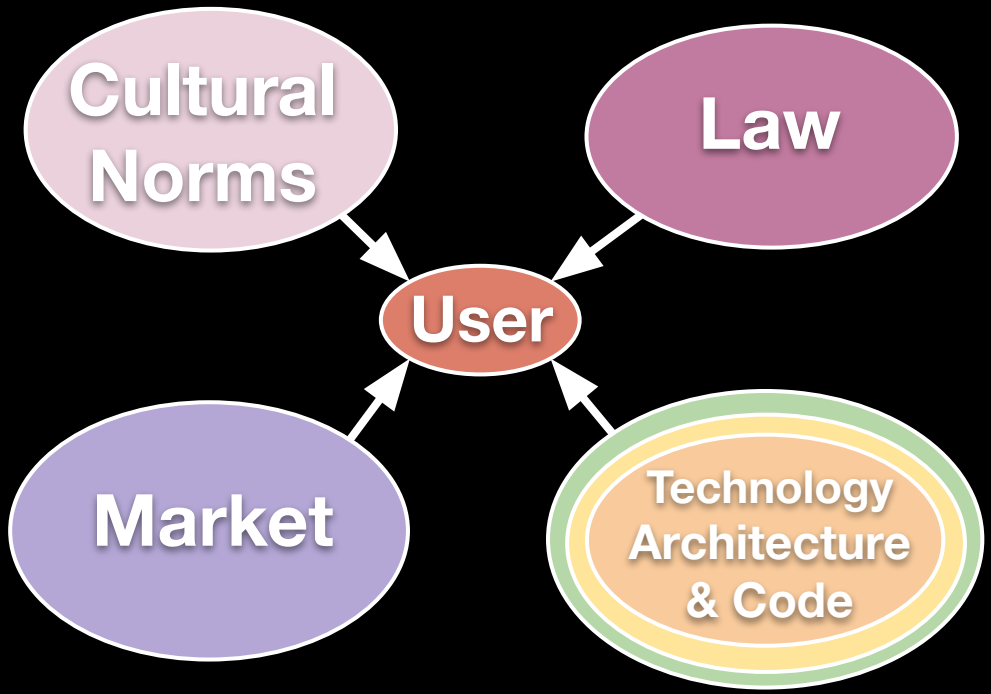
McDowell, Alex. (2020, January 25). *Storytelling shapes the future.* Retrieved March 03, 2021, from https://www.theantiagency.org/storytelling-shapes-the-future/



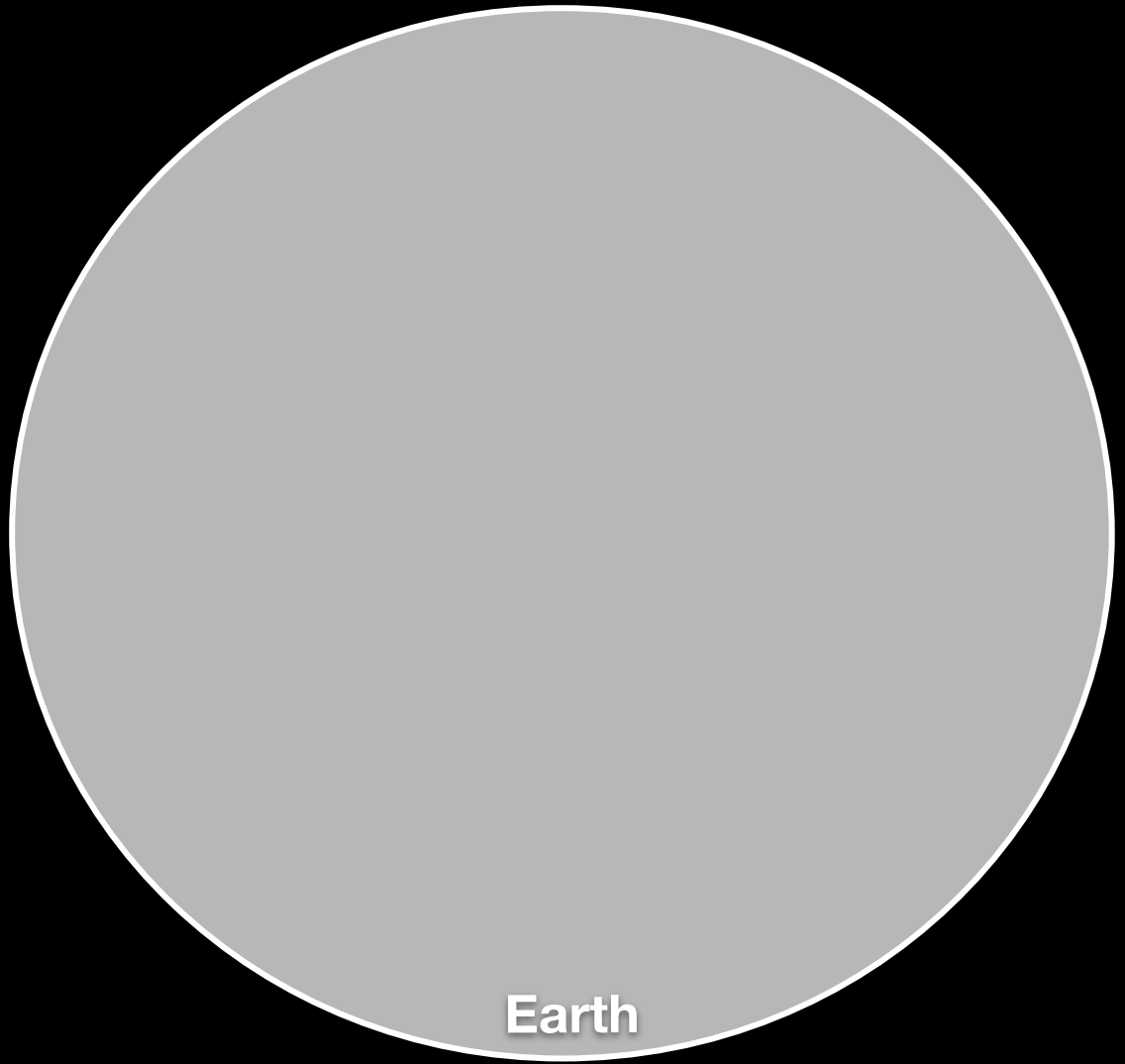
This is design work.

Whearley, N. (2020, December 11). *Teach a class*. Retrieved March 03, 2021, from https://dschool.stanford.edu/teaching-learning/teach-a-class

Lessig's Pathetic Dot Theory vs Nested Contexts



Lessig, Lawrence, (2006). *Code 2.0, Chapter: What Things Regulate* (pp. 120–137). New York : Basic Books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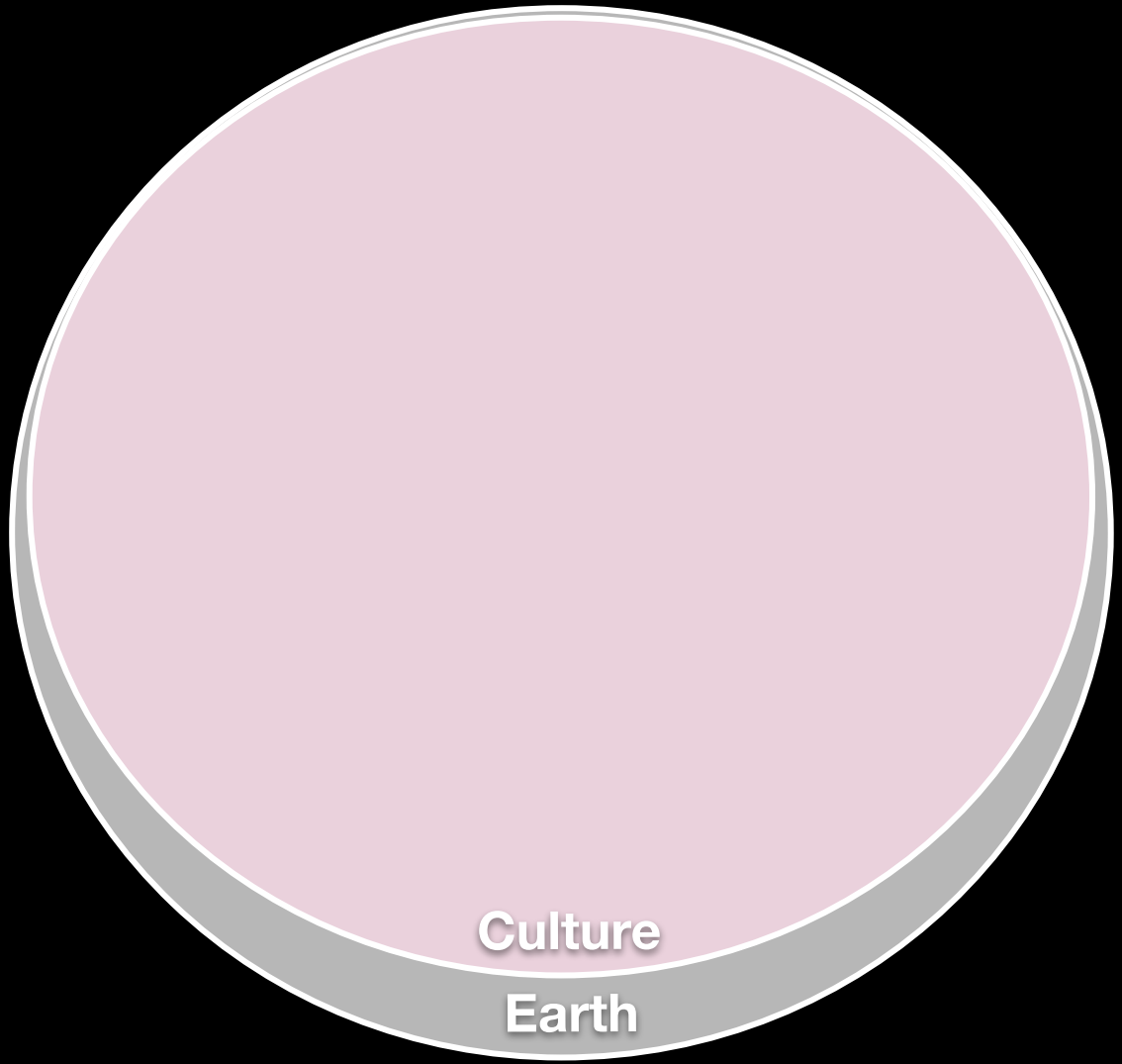
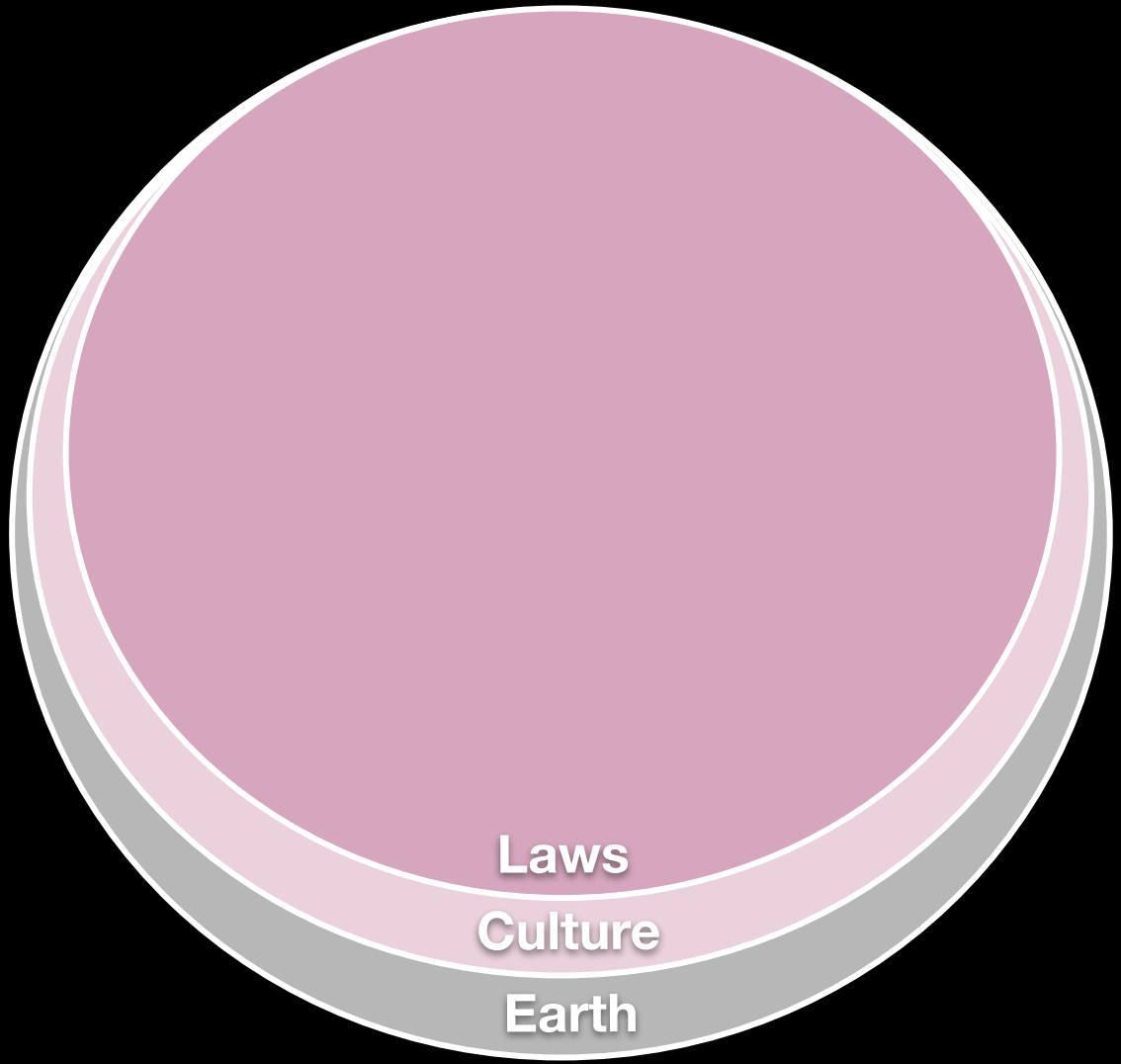
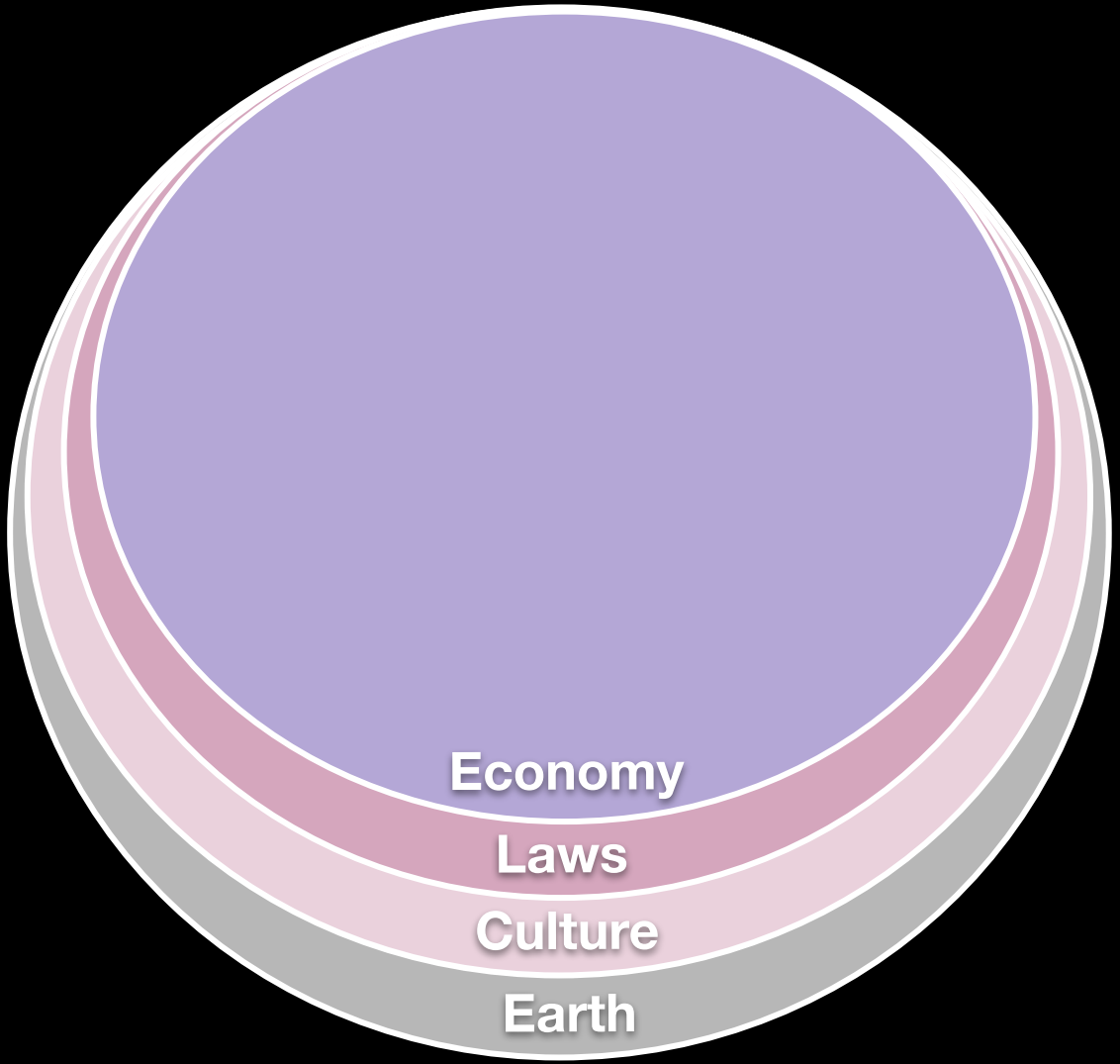
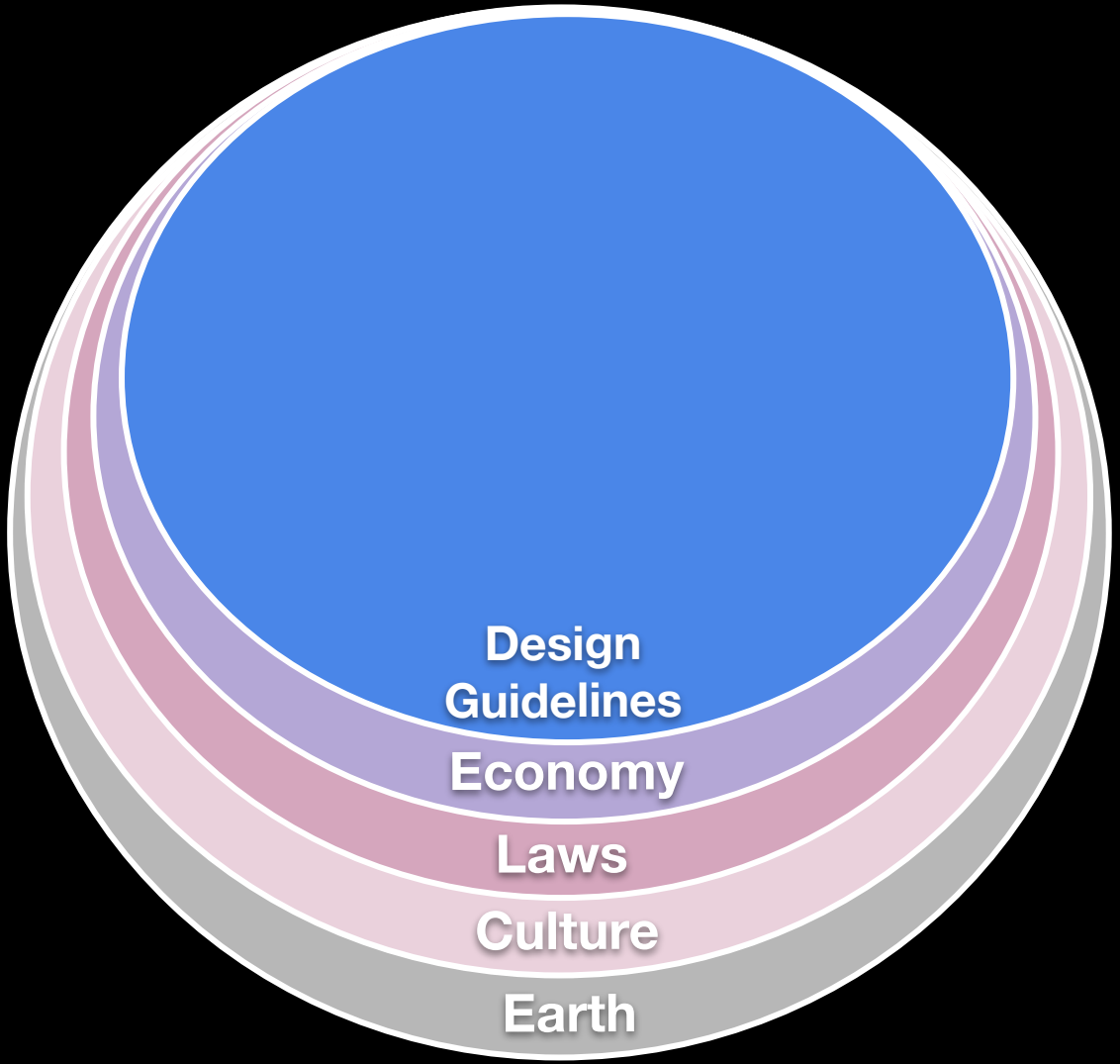
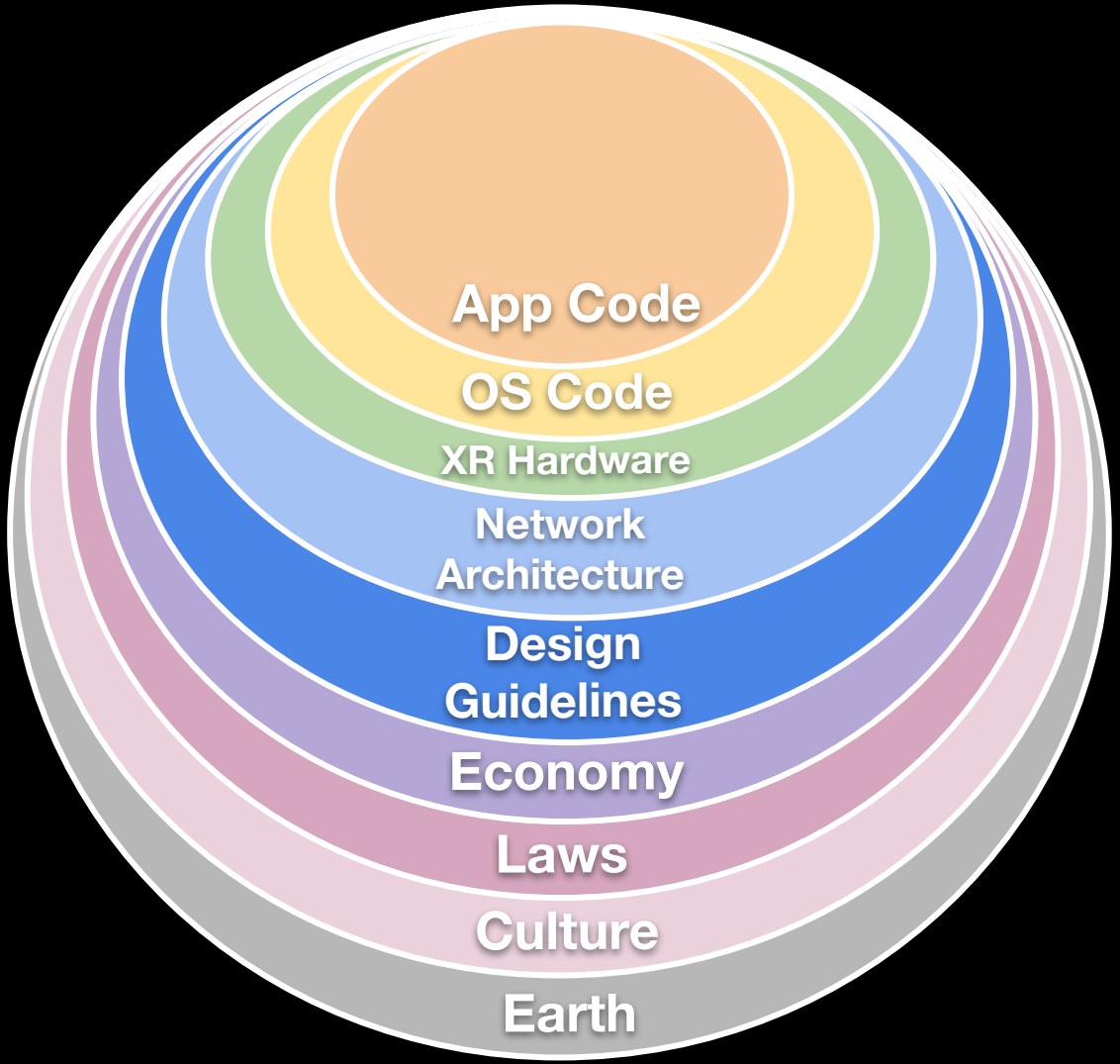
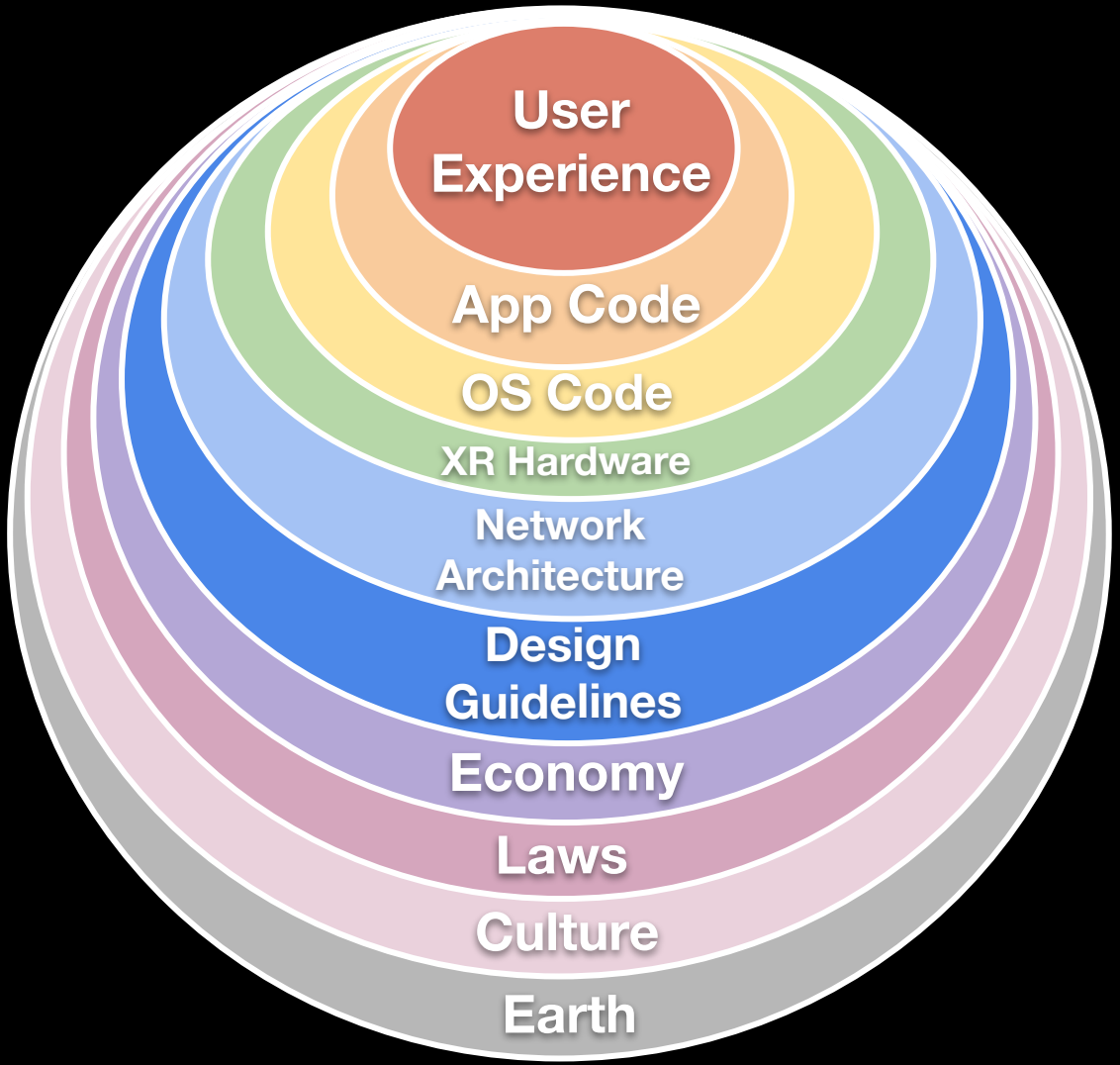

Culture
Earth


Laws
Culture
Earth


Economy
Laws
Culture
Earth


Design
Guidelines
Economy
Laws
Culture
Earth


App Code
OS Code
XR Hardware
Network
Architecture
Design
Guidelines
Economy
Laws
Culture
Earth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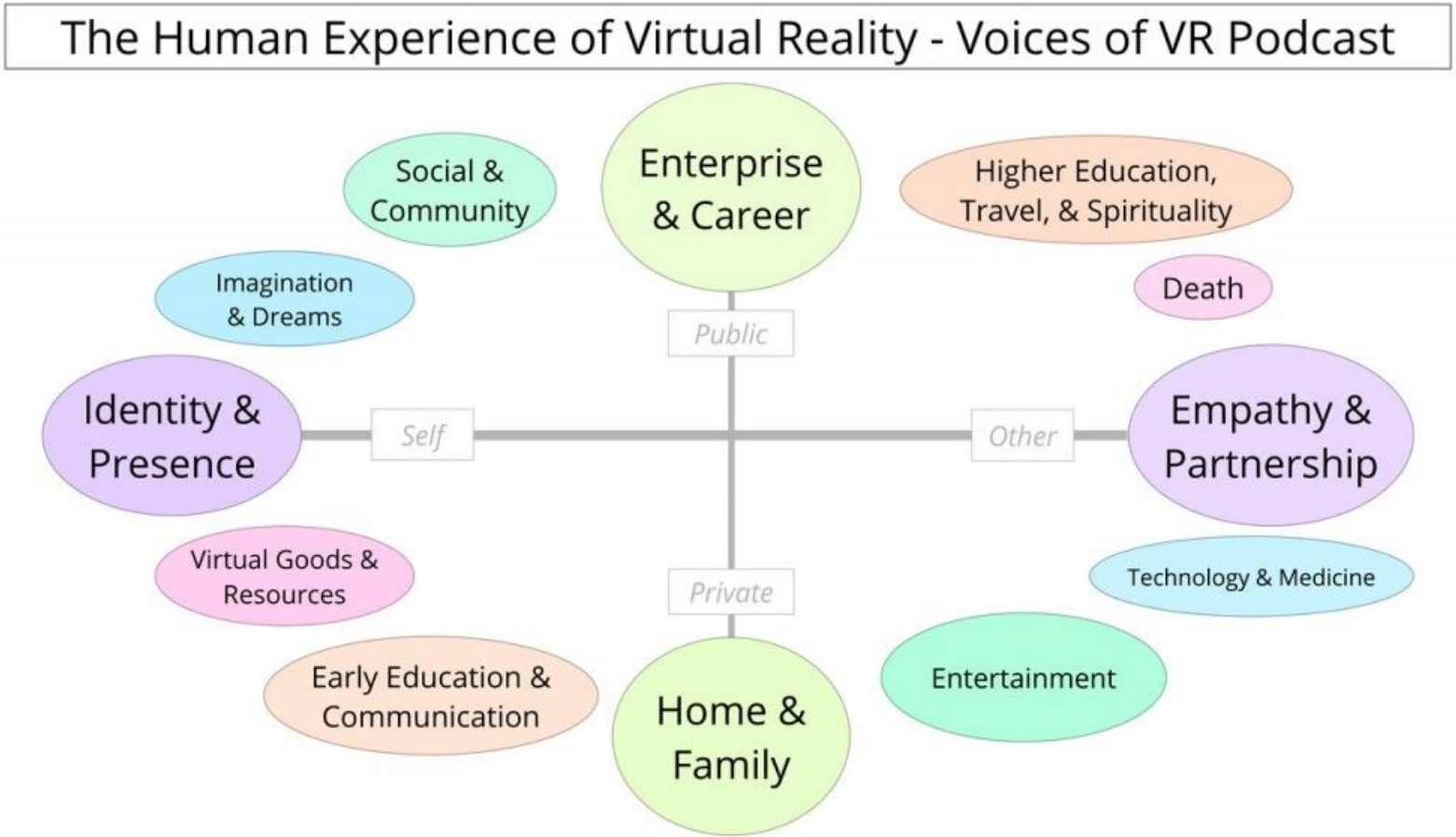
OS Code
XR Hardware
Network Architecture
Design Guidelines
Economy
Laws
Culture
Earth



Bye, K. (2016, April 28). *The Human Experience of Virtual Reality: A Model of the VR Landscape* [Presentation], Silicon Valley Virtual Reality Conference, April 28, 2016 (San Jose, CA). Published on YouTube, May 3, 2016. Retrieved on November 10, 2021 from https://www.youtube.com/watch?v=acp0UI0QImI. Also Published on Voices of VR Podcast on May 4, 2016. Retrieved on November 10, 2021 from https://voicesofvr.com/355-the-human-experience-of-virtual-reality-a-model-of-the-vr-landscape/.

XI. Friends / Community / Culture

- Diversity & inclusion
- Cultural differences
- Cultural norm conflicts
- Algorithmic bias
- Code of Conduct
- Elements of culture
- Trust & safety social scores
- Harms to society
- Changing social norms
- Social hallucinations
- Weaken implicit racism
- Sustainable communities
- Reducing inequalities
- Social anxiety
- Augmenting other people
- Sharing public sphere
- Context-blind tech
- Stakeholder deliberations
- Data during humanitarian crises.
- Extremist indoctrination
- Japanese "hikikomori" & acute social withdrawal
- Sharing biometric data as part of identity expression

X. Career / Government / Institutions

- Enterprise XR Ethics
- Remote work
- Using XR for hiring decisions
- Automation & job displacement
- Conflicts of interest between academia & industry
- Governmental surveillance
- Fourth Amendment
  - Third-Party Doctrine
- Governmental loyalty tests
- Governmental nudging
- Governmental propaganda
- Future of online public space
- Right to augment public space

IX. Philosophy / Higher Education / Law

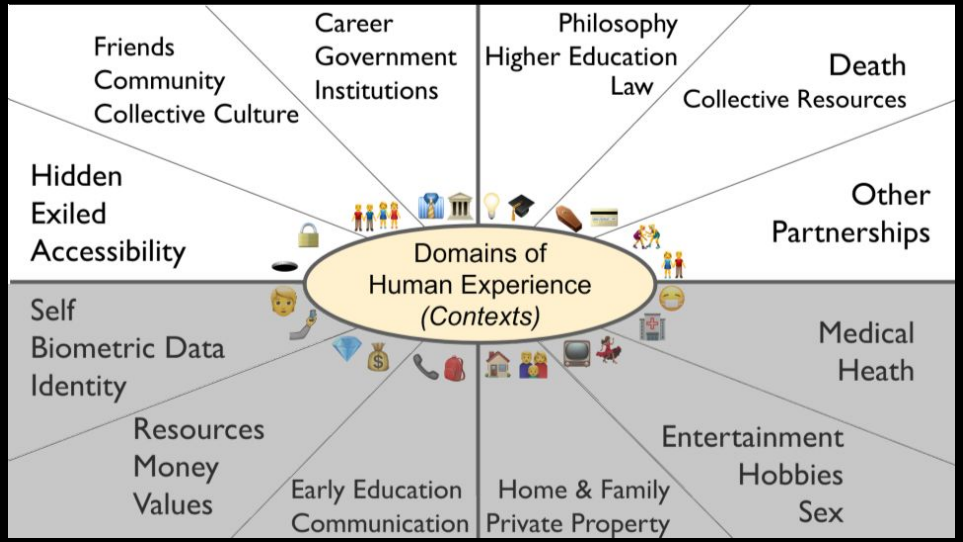
- Philosophical implications
  - What is reality?
  - What is truth?
  - The virtual vs the real
- Filter bubbles of reality
- Religious manipulation
- XR ethics & design
- Philosophy of privacy
- Neuroethics
- Ethics of human augmentation
- Workforce skills training
- XR's impact on law
- XR as judicial evidence
- What content is illegal?
- Future risks of XR tech
- Terms of conditions
- Algorithmic oversight
- Institutional Review Boards
- International Law
- Human Rights Law
- Longitudinal studies
- Beneficence vs autonomy
- Informed consent

VIII. Death

- Virtual resurrections
- Image rights after death
- Account blocks & permanent bans
- Right to be forgotten
  - Account/data erasure
- Violence & killing in VR
  - Humanoid vs non-humanoid NPCs
- Filtering violent or terrorist content
- Military dual use
- Using VR for torture
- Experiential Warfare
- Autonomous weapons systems & drones
  - Virtual suicide bombing
  - Virtually-mediated extrajudicial killings
- Life-threatening security vulnerabilities

XII. Hidden / Exiled / Accessibility

- Accessibility
  - Render content depending on ability
- Inclusive design
- Truly anonymized avatars
- Re-identifying de-identified PII data
- Combating social isolation
- Temporary & permanent exile of user suspensions
- Prisoner rehabilitation
- Addictive escapism
- Dark spatial web
- Closing technology gap for older generations



VII. Other / Partnerships

- Harassment Prevention
  - Personal Space Bubble
- Assault
- Hostile Conflict Zone
- Information Warfare
- Disinformation
- Deep Fakes
- Identity Theft
- Nudging Behaviors
- Deception
- Virtual Beings
  - Dangers of Anthropomorphic AI
  - Dangers of Synthetic Phenomenology
  - Relationships with AI
- Super Intelligence
- Empathy Machine & Technological Determinism
- Ethics Washing

I. Self / Biometric Data / Identity

- Psychological Impacts
- Embodiment
- Avatar Representation
- Body Perception
- Identity
- Self-Model Changes
- Sensory Experience
- Long-Term Impacts
- Virtual Body Ownership
- Self-Determination
- Context Sensitivity
- Cybersickness
- Biometrically-Inferred Data
- Agency
- Suggested Memories
- Proteus Effect
- Planting Memories
- Modulating Memories
- Affective Computing
- Body Swap
- Mind Plasticity
- Epigenetic Traits

VI. Medicine / Healing

- Do Not Harm
- Detecting Medical Conditions
- Triggering Seizures
- Harm to Mental Health
- Depersonalization / Derealization Disorder
- Out-of-Body Disassociation
- PTSD Treatment/triggering
- Biometrically-inferred info
- Telemedicine privacy
- Health Insurance Portability & Accountability Act
- Autonomy of Healing
- Public health
- Recovered memories of abuse
- XR as a medical device
- False hope of XR's promise
- Mandatory treatments
- Body dysmorphic disorder
- Virtual therapeutics
- Well-being applications
- VR rehabilitation
- VR exercise
- Physiological reactions to Sexual Assault

II. Resources / Money / Values

- Virtual Commerce
- Virtual Goods
- Virtual Economy
- Business Models
  - Surveillance Capitalism
  - Subscription Models
- Who owns data?
- Exporting data
- Pay for Privacy?
- Closed vs Open Ecosystem
- Anti-Money Laundering
- Cryptocurrency
- Blockchain
- Digital Divide
- Economic Disparities
- Neuromarketing
- Advertising as Behavioral Modification
- Attention Economy
- Homomorphic encryption
- Lobbyist Influence of Policy

III. Early Education / Communication / Local Travel

- Minimum Age for VR
- Negative Transference
- Personalized Education
- Family Educational Rights & Privacy Act
- Ability to Mute Others
- Mitigating & Moderating Hate/Dangerous Speech
- Telepresence Fidelity
- Broadcasting Biometrics
- Non-verbal comm norms
- Recording Conversations
- Automatic Audio Transcripts
- BCI Reading Thoughts
- End-to-End Encryption
- Geolocation Tracking
- Navigation Distractions

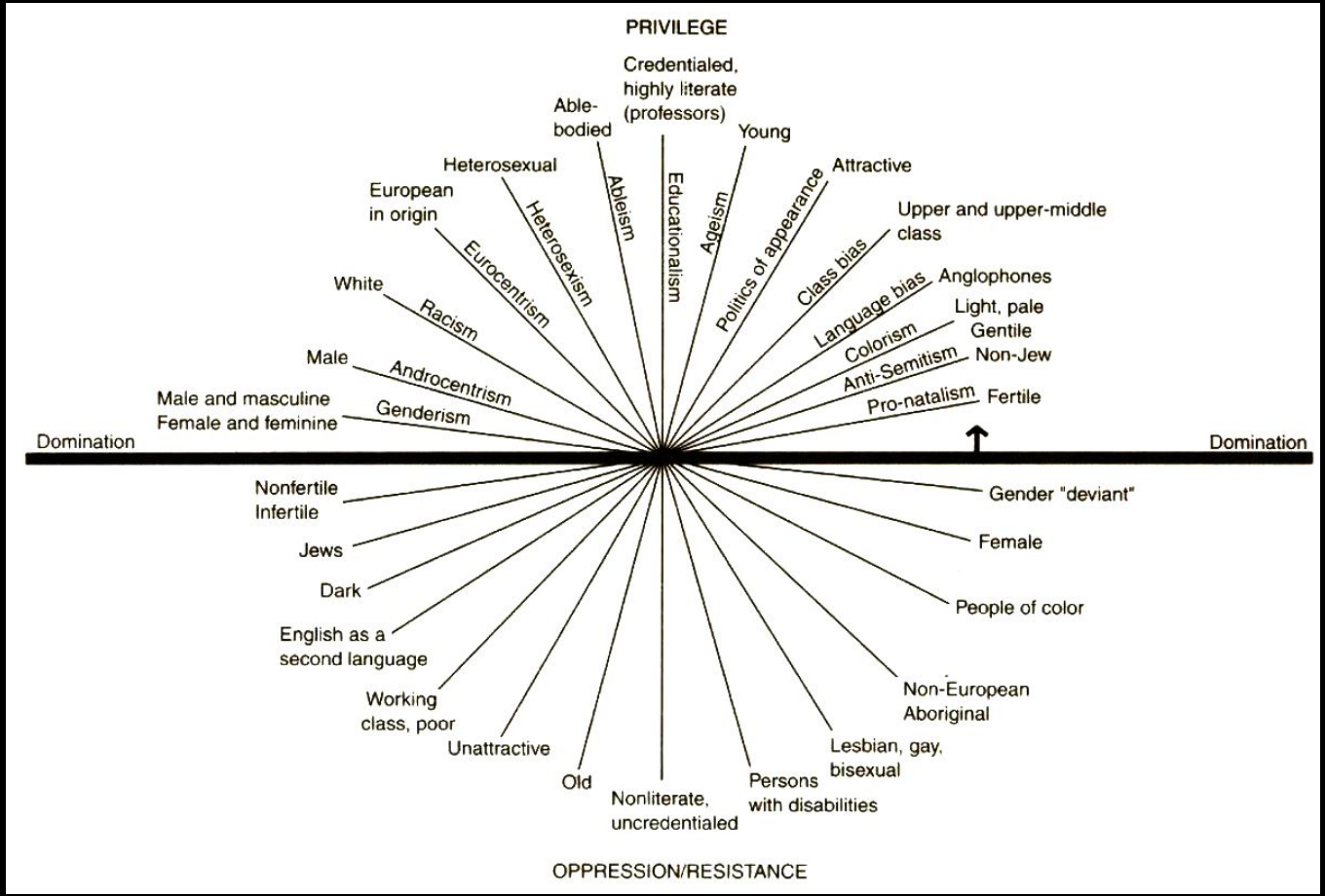
IV. Home & Family / Private Property / Earth

- Privacy of volumetric scans of your home
- Collective privacy of family in your home
- Spatial doxxing
- Fourth Amendment defines public vs private spaces
  - All of cyberspace is "public"
  - Third-Party Doctrine
- Who can augment?
  - Property rights
- Context of places
  - (e.g. Pokémon at Holocaust Museum)
- Control & modulate perception of environment
- Data security
- Ecological Impact

V. Entertainment / Content Creation / Sex

- Virtual Violence
- Addictive Entertainment
- Hijacking Attention
- The Dopamine Economy
- Escapism
- Game Ratings
- Content Warnings
- Content Moderation
- Children's Online Privacy Protection Rule (COPPA)
- Undermining User Agency
- Media Ethics
- Psychographic profiling of entertainment preferences
- Undermine User Agency
- XR Porn Implications
- Dystopia Narratives
- New forms of immersive storytelling

Intersecting Axes of Privilege, Domination, & Oppression

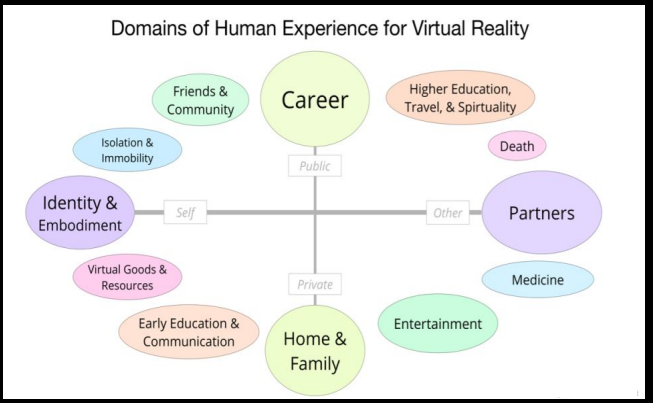


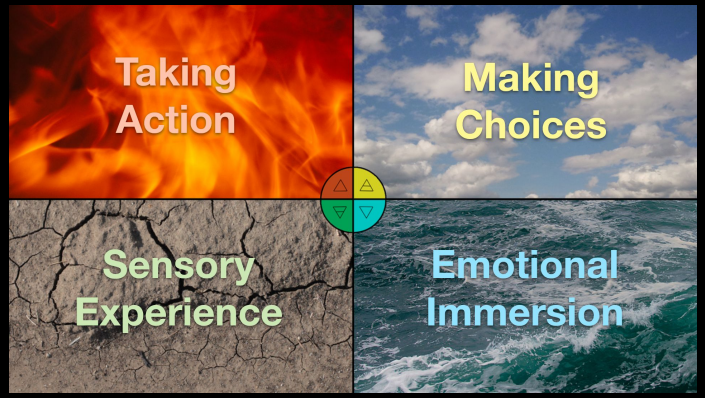
Diller, A., Ayim, M., Pauly Morgan, K., & Houston, B. (1996). Figure 8.1 (p. 107). *In The Gender Question in Education: Theory, Pedagogy, & Politics*. Routledge, Taylor et Francis Group.

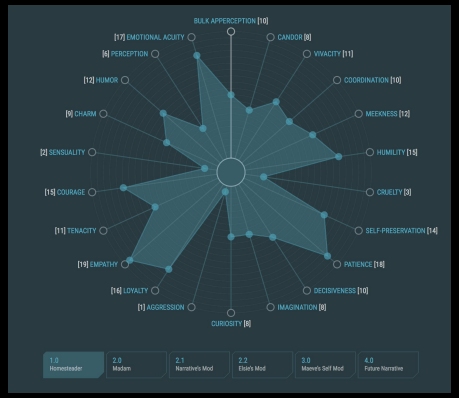
Context

Quality

Character

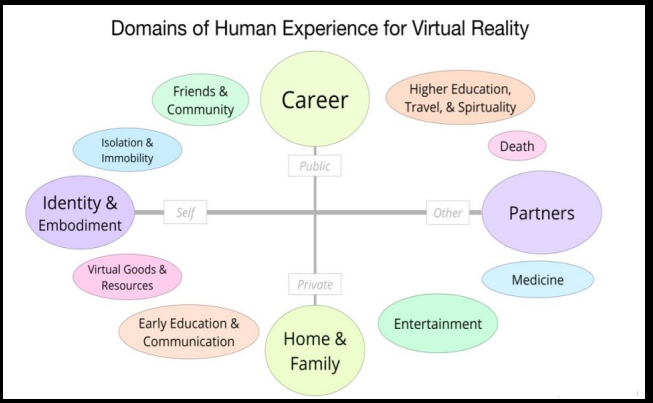


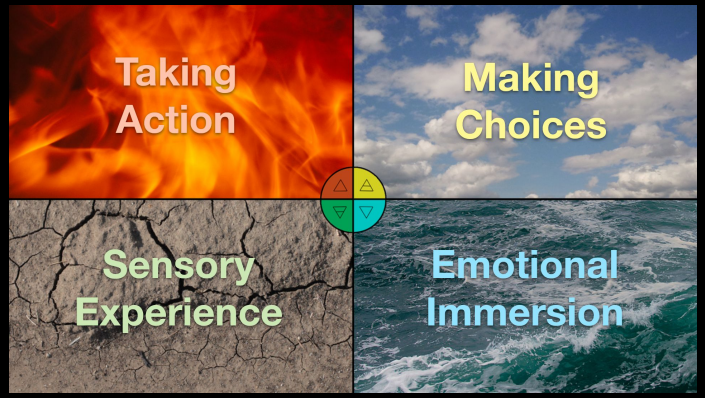


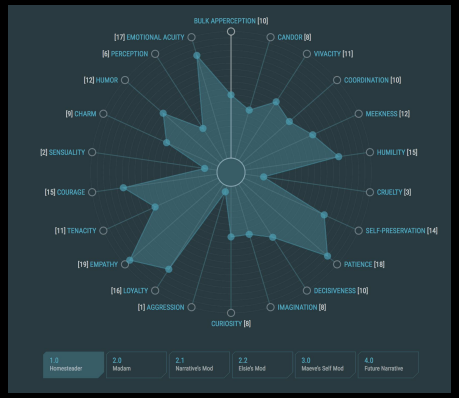


Story

Placed in a Context with Pressure + Make Choices & Take Action = Essential Character is Revealed



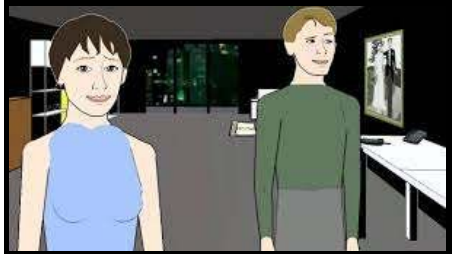




Unfolding Story Over Time

Are You a Ghost or an Embodied Character? Does You Have Impact on the Story?

Impact on Story	Character Presence: Ghost	Character Presence: Character
No Impact	Ghost without Impact	Character without Impact
Impact	Ghost with Impact	Character with Impact



Bye, K., & Dolan, D. (2016, February 4) *#292: The Four Different Types of Stories in VR*. Voices of VR Podcast. Retrieved November 14, 2021 from https://voicesofvr.com/292-the-four-different-types-of-stories-in-vr/.

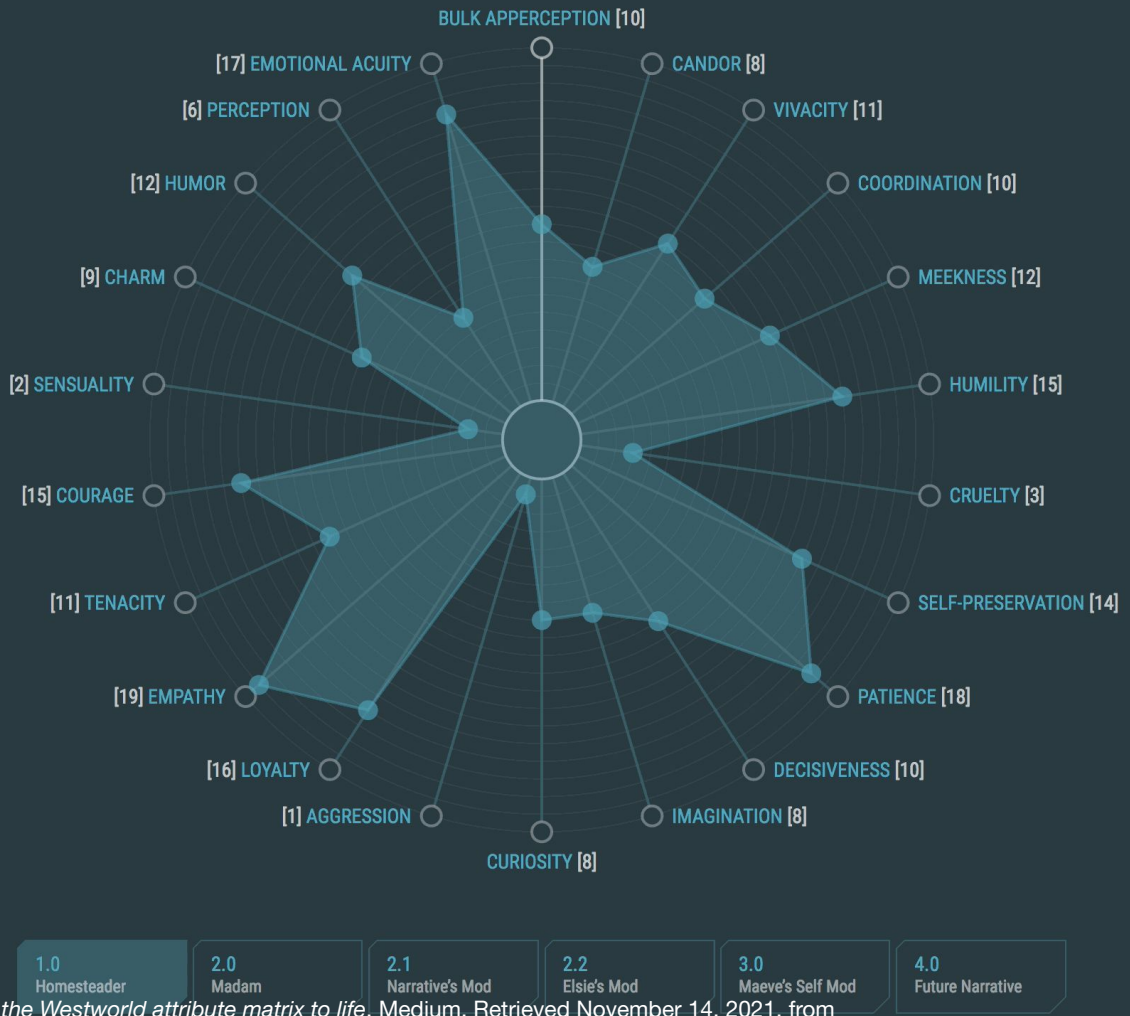
Whose Character is Revealed?

Authored Narrative

Generative Narrative

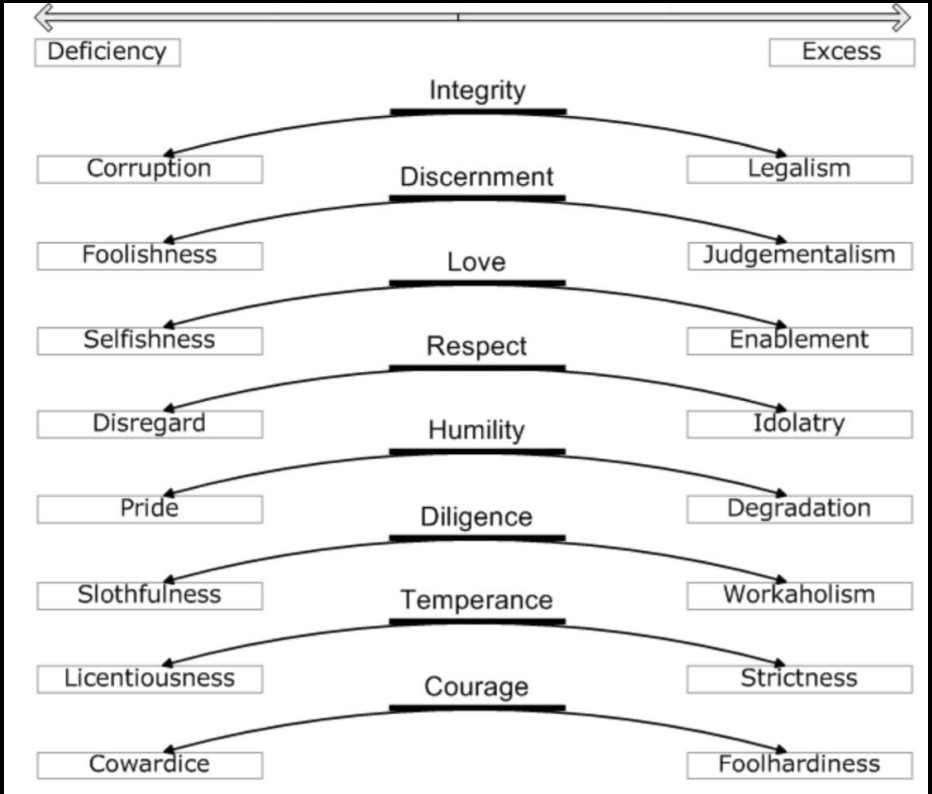
Character of an Event, Person, Culture, or Place

Character of the Interactor



Passi, E. (2017, January 10). *Bringing the Westworld attribute matrix to life*. Medium. Retrieved November 14, 2021, from https://epassi.medium.com/recreating-the-westworld-attribute-matrix-3e72d9d419df.

Virtue Continuum

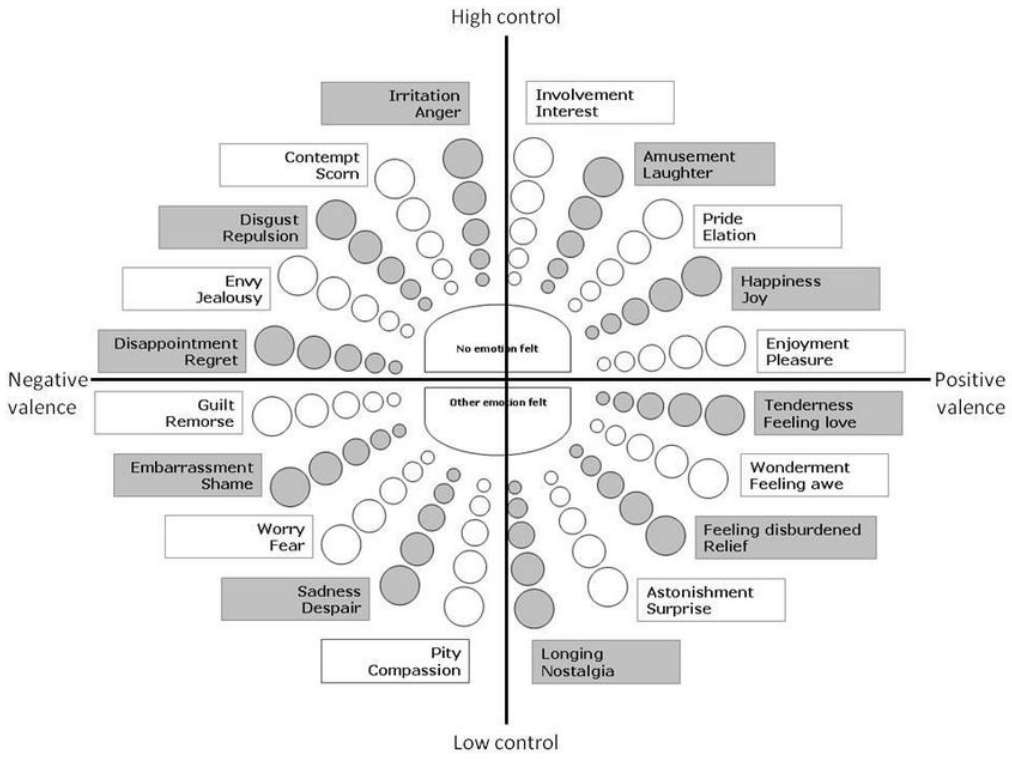


Lanctot, J. D., Irving, J. A. (2010). *Character and Leadership: Situating Servant Leadership in a Proposed Virtues Framework*. International Journal of Leadership Studies, Vol. 6 Iss. 1, 2010. Retrieved November 14, 2021 from https://www.regent.edu/acad/global/publications/ijls/new/vol6iss1/2_Final%20Edited%20Lanctot%20and%20Irving_pp%2028-50.pdf via https://www.regent.edu/acad/global/publications/ijls/new/vol6iss1/home.htm

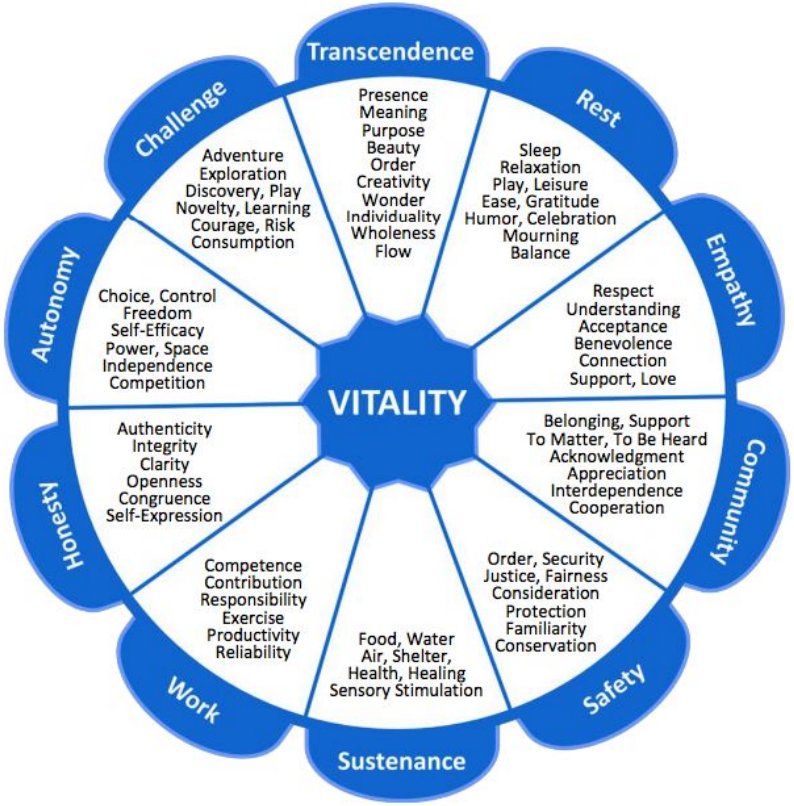
Big Five Personality Characteristics

Barrick, M. R., & Mount, M. K. (1991). *The Big Five Personality Dimensions and Job Performance: a Meta-analysis*. Personnel Psychology, 44(1), 1–26. doi:10.1111/j.1744-6570.1991.tb00688.x. Image via https://commons.wikimedia.org/wiki/File:Wiki-grafik_peats-de_big_five_ENG.png

Feelings

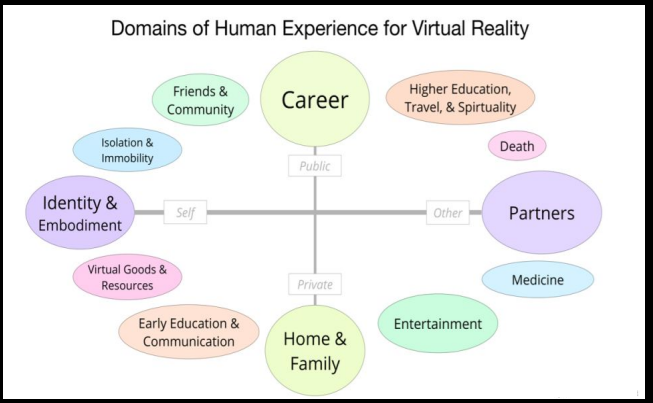


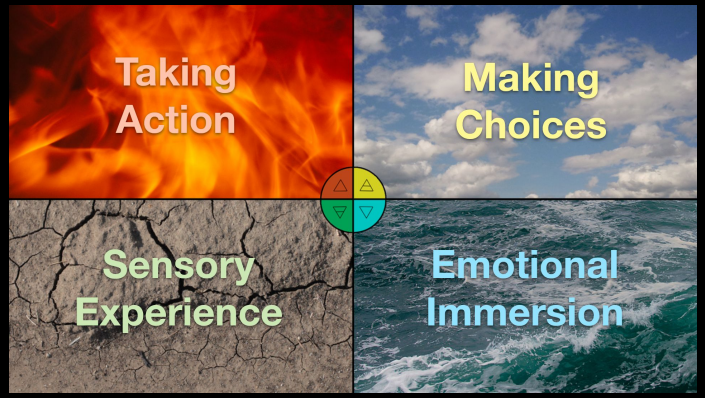
Needs

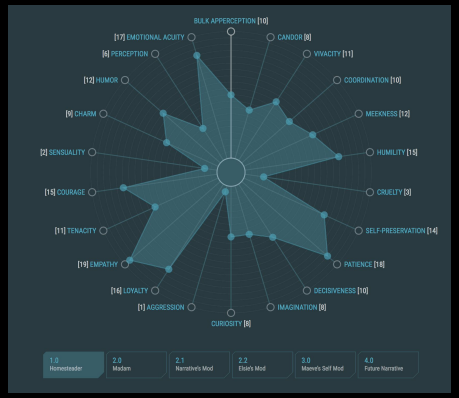


Sacharin, V., Schlegel, K., & Scherer, K. R. (2012). *Geneva Emotion Wheel rating study* (Report). Geneva, Switzerland: University of Geneva, Swiss Center for Affective Sciences. Retrieved on November 13, 2021 from https://www.unige.ch/cisa/files/4514/6720/4016/Geneva_Emotion_Wheel_Rating_Study_Report_2012_08_11_2.0.pdf.
Tschannen-Moran, B. (2012, February). *Appreciative Empathy: New Frameworks for New Conversations*. International Journal of Appreciative Inquiry: AI Practitioner. Volume 14 Number 1. Retrieved November 14, 2021 from http://www.schooltransformation.com/wp-content/uploads/2012/06/Appreciative_Empathy.pdf

Placed in a Context with Pressure + Make Choices & Take Action = Essential Character is Revealed







Unfolding Process Over Time

- Underlying Experiential Age Context
- My Elemental Theory of Presence
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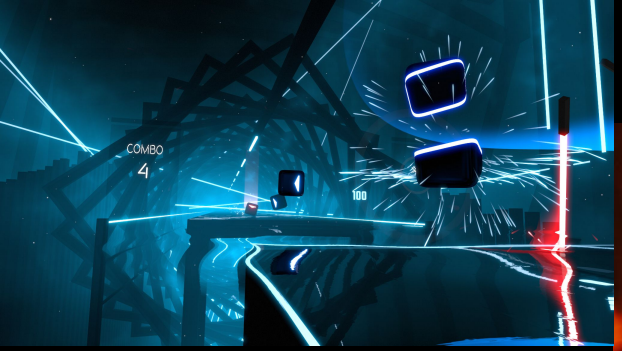
Beat Saber (2018)



Story: n/a

[Top-selling VR app of all time].

Context: A VR rhythm game that gamifies exercise through embodied puzzles and music

- Satisfying game mechanic loop
- Easy to play, difficult to master
- Needs precise movements

- Anticipating how to move hands yields higher score.
- Develop pattern recognition
- Scoring encourages improvements
- Global leaderboard
- Multiplayer options

- Solving puzzles w your body
- Duck & dodge walls
- Haptic responses
- Spatializing Rhythm
- Develop spatial perception
- Unconscious reactions
- Fitness apps

- Musical immersion
- Cultivate flow states
- Low barrier to massive fun
- Lots of music licensing deals with big artists

Character: Incremental improvements of perception, timing, and embodied movements to develop speed, agility, precision, and cultivate flow states.

VRChat (2014)

Story: n/a

[VRChat is the closest experience as to what I imagine what the Metaverse will become.]

Context: Social VR

Platform emphasizes custom avatars, custom worlds, & private Instances

- Exploration
- Some games, but mostly lives into VRChat name

- Most fully-fledged social VR community w social presence
- Underground communities & subcultures
- Deep control/complicated UI
- Social graph

- Full-body tracked avatars
- Upload customized avatars
- Going all in on the Virtual Body Ownership Illusion
- Interactive & haptic avatars

- Deep intimacy from private instances & communities
- Limited facial tracking
- Immersive theatre worlds

Character: Expression of Identity and connecting to groups of friends

The Collider (2018)

Story: Enter an imaginal machine that collides you with another audience member. [Linear audio, Emergent story].

Context: 1-on-1 immersive theater (both audience) with guided [linear] audio, 1 inside VR & 1 outside VR

- A meditation on possibilities
  - Can play/torment other person

- What will you Choose?
- Asymmetric Information
- Don't know you're interacting with human while in VR
- Audio-guided onboarding
- Audience self-debriefing

- Fun embodied interactions
- Puppeteer other user in VR

- Recall memory of emotionally salient moment
  Power Over vs Power Under + Sandplay

Character: Explores your relationship to boundaries, power, dependency, & temptations to be transgressive.

On the Morning You Wake (to the End of the World) (2022)

Story: Live through a false HI ballistic missile warning leaving you asking why is nuclear annihilation even a thing? [3 chapters, linear, & non-interactive]

Context: Volumetric capture of homes, nature & sewers to find cover, military bases, Indigenous POV

- Mostly non-interactive piece
- Non-live social presence from volumetric capture
- Imagine different futures
- Embed yourself within the volumetric context to bear witness to reactions
- 1:1 scale & tabletop scales
- Go to diff chaotic scenes
- Watch nuke war sim
- Really emotionally evocative to relive this scenario.
- Emotional impacts of colonialism & Imperialism

Character: Embody a ghost who sees situations that'd threaten your mortality. Connect stories of personal trauma to collective trauma of nuclear anxiety.

MetaMovie: Alien Rescue (2020)

Story:

Emergent, Live Action Role Play with 2 main branches. Either rescue alien as a team or choose other narrative branch.

Context:

Space/ adventure, immersive theater, role-play & shooter with 3-4 actors & 6-10 embodied audience robots.

- Live improv
- Maximum expression of agency
- Explore space

- Immersed in social context of other actors
- Non-verbal communication with embodied audience
- 2 main narrative branches
- Light puzzles
- Negotiation as a mechanic

- Fully embody a character
- Environmental storytelling

- Emotionally engaged in the adventure
- Dramatic Presence
- Some horror elements

Character:

Embody the main protagonist who can improv lines & help drive the narrative (or be a more observational flying robot). Be the hero or the villain.

Book of Distance (2019)

Story: Reckoning of Japanese Internment via linear immersive story with participatory parts, theatrically staged.

Context: Migration journey from Japan to Canada, new home, work, then exiled to Japanese Internment.

- Participate with props, take pictures, engage with environment across different contexts & key moments in the story.

- Narrator who breaks 4th wall & with characters who talk with each other
- Mundane actions make you feel a part of the family
- Some visceral experiences of bureaucracy

- Theatrically-staged piece
- Very effective embodied interactions
- Environmental storytelling

- Very emotionally moving to bear witness to the grief of loss & discrimination.
- Great lighting & color sets mood

Character: Ghost of a character watching protagonist's experience of racism & discrimination. Embody 1st person POV to participate at key moments in the story.

Pearl (2017)

Story: Time-lapse story of a car serving as a selfless giving tree. Many coming-of-age moments of daughter with her father in the car.

Context: A road trip through space & time anchored by an emotionally-moving song as artists find their voice.

- Non-interactive story, although there is a 6DoF version and a 360 version.

- Watching the familial dynamics of virtual beings.
- Choosing where to look.

- Sitting in a car throughout the entire piece feels very plausible, immersive, & deep sense of environmental presence.

- More of a passive linear story.
- Very emotionally moving.
- Nostalgia & memories
- Amazing song carries this piece
- Time lapse across time

Character: Sit in front seat as an invisible ghost watching many ups & downs with father & daughter on their relationship to music. Car is a main character who dies at end.

Virtual Virtual Reality 2 (2022)

Story: A story of merging consciousness 5x within a large story of escaping a virtual world that's shutting down.

Context: Open-world exploration, but w tight guardrails. Travel in a mobile mech/home with roommates, but also switch POV scales

- Mostly a directed piece, but still provides a great illusionary experience of open world exploration
- Lots of battling enemies

- Solving lots of puzzles
- Tons of character dialogue & monologue (lots of ASMR speaking in your head).
- Quirky & surreal humor

- Amazing, fractally-nested world within a world architecture
- Environmental storytelling
- Very much a spatial journey

- Implemented external & internal storytelling engine to dynamically
- Different parts of these overlapping stories can be triggered by different things.
- Random VR indie art/music.

Character: You embody a character, but have no real narrative agency with 5+ other characters, who are not coping too well with merging consciousnesses.

The Key (2019)

Story: Go through symbolic experiences of loss & slog through virtual bureaucratic lines to recreate a specific empathy experience.

Context:

Experiences of home, loss, grief, and exile.
A dream-like embodied journey with symbols.

- Simple interactions, but ultimately very intuitive & powerful.
- Otherwise pretty light engagement as most of the experience is on rails.

- You're forced to make a bit of a *Sophie's Choice*.
- Uses surreal dream logic

- Does great job of cultivating a deep sense of spatial & environmental presence.
- Has some embodied interactions that really work the unconscious psyche.

- I had a really, viscerally deep emotional reaction after experiencing this piece.
- Cultivates empathy through narrative story in a unique way.

Character: Embody main protagonist, but don't speak to anyone. Manages to deliver a series of symbolic unconscious interactions that are unlocked into conscious awareness at end.

Travelling While Black (2019)

Story: Situated at Ben's Chilli Bowl, explores racial violence, Green Book history, & places of refuge for the African American Community.

Context: The experience of racism & Traveling While Black while in America amidst all of this racial violence.

- Non-interactive 360 video.

- Successfully recreates the feeling of being present for a really intimate conversation, but for a conversation that would probably be way different if I were actually there.

- Made it feel like I had an embodied presence w their 360° camera placements.
- Experimented with body transfer by looking at mirror in 360° video, which changed my identity to a black man.

- Evoked a deep experience of empathy, grief, & compassion as I bore witness to these experiences of trauma.

Character: You have a seat at the table as an invisible ghost while African Americans speak candidly about their experiences of racism. Powerful to bear witness.

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Voices of VR
Podcast
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