

# Resonance in Complex Social Systems

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*Resonance* is a vital dynamic but an ambiguously defined concept that is central to systemic change. Working with resonance typically involves identifying, supporting and marshaling coherent and directed waves of motivation and energy in networks of people in service of communal change. It can spring from a variety of sources including from an increased awareness of unmet basic human needs; from perceptions of wrongdoing or injustice; from the emergence of crises and opportunities; from internal top-down, middle-out or bottom-up leadership, organization and mobilization; or from external actors and events. Resonance can be mercurial; ebbing and flowing and taking different forms at different stages of systemic change. Ultimately, resonance is the energy necessary to drive and sustain systemic change.

The word resonance comes from Latin and means to "resound" - to sound out together with a loud sound. Although resonance has received increasing attention in the systems, peace-making and peace-building literatures (e.g., Burns, 2007; Eoyang, 2013; Rothman, 1997), its conceptualization, definition, component-parts, underlying dynamics, measurement and the conditions that foster or inhibit it have yet to be sufficiently specified or empirically tested and refined.

This paper presents a summary and synthesis of some of the literature on resonance. It has been derived from a scan of the literatures in physics, philosophy, political theory, anthropology, identity-based conflict, systemic action research, frame analysis for social movements, interpersonal extension of affect theory (research on affective resonance), motor theories of action understanding (motor resonance), morphic resonance and telepathy, limbic resonance and love, leadership, narrative-art, reflexivity, human system dynamics, music, Chinese thought and Hawaiian culture.<sup>1</sup> Accordingly, we searched the following databases: Super Search, ProQuest, LexisNexis, ERIC, JSTOR, and PsycINFO. Our search privileged theoretical models that were thorough and consistent (taking into account the impact of the journal, number of citations, and the presence of a relevant body of literature). In fields where recent empirical research has been conducted, we focused on publications from the last 10 years (no year limit on non-empirical studies).

Our synthesis of the literature was organized around the following set of questions, which we see as informing practice:

- 1) How is the phenomenon of resonance conceptualized and defined?
- 2) What are the various mediating mechanisms associated with resonance (from physical-neural to social-cultural) at different levels of analysis?

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<sup>1</sup> For more details about the sources (including full references), please refer to Appendix 1.

- 3) What seem to be the necessary and sufficient antecedent conditions for resonance to occur?
- 4) How is resonance identified, detected or measured? Methods of assessment?
- 5) Can resonance be managed, fostered or controlled in some manner? If so, how? What practices are associated with this?
- 6) What are the primary dynamics and outcomes associated with resonance (positive and negative)?

## Literature Summary on Resonance

### 1) How is the phenomenon of resonance conceptualized and defined?

The literature on resonance has a rich and varied history (see Table 1 for a summary).

In philosophy, Lucretius wrote in *On Nature* (99 BC), “*Resonance is how matter comes to be in the first place as the initial swerve of a particle comes to influence how things come to be*”. Spinoza in *The Ethics* (1677) first developed a theory of affect in relationship to causality. Then, Henri Bergson, in *Creative Evolution* (1907) suggested that resonance is a vital principle in self-organization and evolution. Alfred North Whitehead in *Process and Reality* (1921) and in *Principia Mathematica* (1910) proposed a mathematical theory of resonance as “*Resonance arises when two sets of connected circumstances have the same periodicities. It is a dynamical law that the small vibrations of all bodies when left to themselves take place in definite times characteristic of the body. A more complicated body may have many ways of vibrating; but each of its modes of vibration will have its own peculiar period.*” These are the philosophers that most influenced Ilya Prigogine on the vibratory nature of matter. Whitehead in particular developed the above concept of resonance and rhythm to describe what he calls the ‘non-euclidean’ nature of life and the cosmos. In 1895, Gustave LeBon published *The Crowd* (1895), which tried to theorize crowd phenomena and resonance as means of explaining unplanned collective action and riots. Later, Gabriel De Tarde in *The Laws of Imitation* (1903) proposed a more mature version of an empirically grounded social theory for thinking through the ways that resonance can create, steer and control collective behavior. He offered the concept “*extra-logical influence*” to describe the transmission of affect and collective emotional experience. Then, Elias Canetti’s theories of resonance in *Crowds and Power* (1960) attempted to develop typologies and affects that particularly resonate with violent mobs.

In *First Order Cybernetics*, John Ashby took notions of resonance and amplification from the hard science and applied it theories of the brain as well as conditions like schizophrenia. Scholars like Norbert Wiener, *The Human Use of Human Beings* (1950); Karl Deutch, *The Nerves of Government: Models of Political Communication and Control* (1963); Harold Lasswell, *The Signature of Power: Buildings, Communication, and Policy* (1978); Stafford Beer, *Designing Freedom*, 1974 followed suit. Beer goes on to take his theories of resonance, the environment, and feedbacks to try to design a national computing system to optimize socialism in Chile just before Allende is assassinated. However, *Second Order Cybernetics* developed resonance in much more

depth. The most developed being Gregory Bateson, *Steps to an Ecology of Mind* (1972); as well as Francisco Varela and Humberto Maturana's work on autopoetics which influences a lot of the resonance and machine learning stuff like: Stephen Grossberg. Competitive Learning: "From Interactive Activation to Adaptive Resonance. Cognitive Science" 11(1):23-63 (1987)!

In *physics*, resonance is *the tendency of a system to oscillate with greater amplitude at some frequencies than at others*. Frequencies at which the response amplitude is a relative maximum are known as the system's resonant frequencies, or *resonance frequencies*. *At these frequencies, even small periodic driving forces can produce large amplitude oscillations, because the system stores vibrational energy. Resonance occurs when a system is able to store and easily transfer energy between two or more different storage modes* (such as kinetic energy and potential energy in the case of a pendulum). However, there are some losses from cycle to cycle, called damping. When damping is small, the resonant frequency is approximately equal to the natural frequency of the system, which is a frequency of unforced vibrations. *Some systems have multiple, distinct, resonant frequencies*. Resonance phenomena occur with all types of vibrations or waves: there is mechanical resonance, acoustic resonance, electromagnetic resonance, nuclear magnetic resonance (NMR), electron spin resonance (ESR) and resonance of quantum wave functions. *Resonant systems can be used to generate vibrations of a specific frequency (e.g., musical instruments), or pick out specific frequencies from a complex vibration containing many frequencies (e.g., filters)*.

In *music*, musical instruments are set into vibrational motion at their natural frequency when a person hits, strikes, strums, plucks or somehow disturbs the object. Each natural frequency of the object is associated with one of the many *standing wave patterns* by which that object could vibrate. The natural frequencies of a musical instrument are sometimes referred to as the *harmonics* of the instrument. An instrument can be forced into vibrating at one of its harmonics (with one of its standing wave patterns) if another *interconnected* object pushes it with one of those frequencies. This is known as *resonance - when one object vibrating at the same natural frequency of a second object forces that second object into vibrational motion*. Resonance only occurs when the first object is vibrating at the natural frequency of the second object. The result of resonance is always a big vibration - that is, a loud sound. The familiar *sound of the sea* that is heard when a seashell is placed up to your ear is explained by resonance. Even in an apparently quiet room, there are sound waves with a range of frequencies. These sounds are mostly inaudible due to their low intensity. This so-called background noise fills the seashell, causing vibrations within the seashell. But the seashell has a set of natural frequencies at which it will vibrate. If one of the frequencies in the room forces air within the seashell to vibrate at its natural frequency, a resonance situation is created. And always, the result of resonance is a big vibration - that is, a loud sound. In fact, the sound is loud enough to hear.

(<http://www.physicsclassroom.com/class/sound/Lesson-5/Resonance>)

At the *intrapersonal* and *interpersonal* levels, research tends to concentrate on the affective and physical component of resonance (Tomkins, 1962; Goleman et al, 2002;

Singer & Lamm, 2009; Lockwood et al, 2013; Lewis et al., 2001; Van Elk, 2008; Fredrickson, 2013). Psychiatrists Lewis, Amini and Lannon (2001) describe *limbic resonance* as *an unconscious and internal process by which two people become physically and emotionally in-synch with one another* - “a symphony of mutual and internal adaptation whereby two mammals become attuned to each other’s inner states.” For Fredrickson (2013), resonance – which she labels “positivity resonance – is conceptualized as an “interpersonal transaction” that resides “within connections” (Fredrickson, 2013, p. ?). She defines its *underlying components as the sharing of positive emotions, a synchrony of biochemistry and behaviors, and motivation to invest in one another’s well being*. A number of other studies, including those on *motor resonance* (Van Elk, 2008), demonstrate the degree to which neurobiological processes can become in-synch or mirror one another during particular types of resonant interactions (Lewis et al., 2001; Goleman et al, 2002; Zwaan, 2006; Van Elk, 2008; Aglioti, 2008; Stephens et al., 2010; Kok and Fredrickson, 2010; Fredrickson, 2013).

At the *intragroup* and *intergroup levels*, the literature shows a greater emphasis on the cognitive and action oriented dimensions of resonance in social systems. Rothman (1991, 2001), writing in the context of identity-based conflict resolution, conceptualizes resonance as *a harmonious fusion of horizons brought forth through a process of “deep dialogue” and reflexivity*. Resonance, according to Rothman, occurs when “disputants incorporate their different subjective frames into a shared intersubjective definition of the core narratives, meaning and motives.” Elsewhere Rothman (2014) defines resonance as a state of “emotional vibration” brought forth through empathy. Burns (2007), bringing attention to the action potentialities that emerge in situations of resonance, defines the phenomenon as a process by which “*people see and feel the connection between things, they know that it is related to their experience, they are energized and motivated.*”

The cognitive and action tendencies actualized through situations of resonance come across most strongly in studies on social movements and *frame resonance* (Snow et al., 1986; Buffonge 2001; McCammon et al., 2001; Reese 1996; Trevizo, 2006). According to this perspective, social movements are best able to succeed when they deploy frames – packaged slices of experienced reality (Snow and Benford, 1988, pg ?) - that are congruent or complimentary to people’s core beliefs, attitudes and values (Babb 1996; Cooter, 2006; Taylor and Van Dyke, 2004). Such resonance energizes and mobilizes people in support of the movement’s cause and goals. Cooter (2006) defines frame resonance as, “*the degree to which individuals can identify with the stated positions of a frame.*” A high extent of frame-to-identity correspondence translates into support. The greater the reach and diversity of the frame-resonant audience, the more likely a movement is thought to be able to achieve its goals (Babb 1996).

Resonance is also a concept that has been getting increasing attention at a *political level*. The anarchist manifesto “The Coming Insurrection” (2009), authored by “The Invisible Committee”, describes resonance as the apparatus by which social revolutions spread: “Revolutionary movements do not spread by contamination but by *resonance*. Something that is constituted here resonates with the shock wave emitted by something constituted over there. (p?)” Gastón Gordillo (2011), writing on resonance in the context of the Arab

Spring, sees resonance as the material-affective force that gave rise, power and connectivity to the insurrections that mushroomed across the Arab world. Gordillo defines resonance as the way in which bodies fighting for the control of space are “*modulated by the same temporal pulsation*” (Gordillo, 2011).

Characterizing resonance in Chinese thought, Jullien (2004) shifts the focus of resonance from figure (individual physiology, affect, cognition, and so on) to ground (*contextual*). He writes,

Rather than set up a model to serve as a norm for his actions, a Chinese sage is inclined to concentrate his attention on the course of things in which he finds himself involved in order to detect their coherence and profit from the way that they evolve. From this difference that we have discovered, we could deduce an alternative way of behaving. Instead of constructing an ideal Form that we then project on to things, we could *try to detect the factors whose configuration is favorable to the task at hand*; instead of setting up a goal for our actions, we could allow ourselves to be carried along by the propensity of things. In short, instead of imposing our plan on the world, we could rely on the potential inherent in the situation (p. 16).

Jullien likens resonance to nature’s process of ripening, as captured in the proverb from the kingdom of Qi: “However acute one’s intelligence may be, it is better to rely on the potential inherent to the situation” “even with a mattock and a hoe to hand, it is better to wait for the moment of ripening (p. 16).”

Finally, reaching beyond the individual and the context of resonance to the *spirit*, traditional Hawaiian culture offers *lokahi*, which speaks to the harmony between self and the great chain of being. According to the native Hawaiian worldview, the self is embedded in a web of natural, social and spiritual relations. A sense of resonance between these interdependent elements is believed to be vital for the health and functioning of both the individual and society. McCubbin & Marsella (2009) visualize *Lokahi* as a triangle formed by *aina* (nature), *Kanaka* (humankind) and *ke akua* (gods). Connections and balance between these three elements is made possible through *mana*, which “represents the most primordial force in the universe that animates or gives life or power to all things” (Kanahele, 1986, qtd in Shook & Ke'ala Kwan).

“Mana is reflected in the felt or experienced connection between the psyche and the many life forms around it (i.e., gods, nature, family) thus creating a sense of relationship—perhaps even obligation—to act or to behave in such a way that the mana is increased, enhanced, and sustained and brought into harmony or *lokahi*.” (McCubbin & Marsella, 2009). According to Shook & Ke'ala Kwan (1987), in traditional Hawaiian culture it is “important for a person to know how to relate to the varieties of life force, whether of rocks, fellow humans, animals, or the gods in a beneficent way. Wrongful or disrespectful actions could have negative reverberations throughout the web.”

Alternatively, the Hawaiian concept of *E pupukahi* means *be united*. Literally, it means draw together into one, but sometimes people use it to mean, be of one mind. Hula teachers say it to mean move together as of one mind. Where *lokahi* means unity due to nature's balance, *e pupukahi* means come together to become more united through something shared. *Ho'okahi ka 'ilau like ana* is a phrase meaning use the paddles together. Technically speaking, it's about working together, but there's an element of little individual responses building into something bigger.

**A working definition of resonance:**

We define *resonance* as a **dynamic of shared energy, connection and purpose within and between people and groups in a particular time and space.**

At its essence, resonance in social systems is a form of heightened, shared (congruent) emotional, cognitive, physical or social energy that – through some processes (such as neural mirroring, sympathy, empathy, mimicry, synchrony, flow, rapport, harmony, art, incentives, structures, etc.) results in people feeling and finding connections and coherence. In other words, it is a form of shared energy that gives way to different degrees of conceptual, emotional and behavioral coherence. Directed behavior can result when this energy crosses some threshold in a group (beyond resistance to change), and may be constructive or destructive (or both) depending on the valence and direction of the groups shared interests (e.g., a mobilized, efficacious community addressing joblessness or sanitation problems in their community versus an angry mob addressing grievances against members of an outgroup).

From this perspective, crisis can also be viewed as a form of increased energy with *decreased* coherence that introduces more degrees of freedom and chaos in a system. Resonance is a form of heightened energy that induces increased coherence which provides a sense of shared direction and meaning in a social system.

**2) What are the various mediating mechanisms associated with resonance (from physical-neural to social-cultural) at different levels of analysis?**

The various conceptions/components of resonance described above have different and complementary mechanisms associated with them. In physics and music, the focus is on the natural frequency of an object, which is associated with one of the many *standing wave patterns* by which that object could vibrate. This is the inherent potential of the object or system (the natural frequencies of a musical instrument are sometimes referred to as the *harmonics* of the instrument). An object such as an instrument can be forced into vibrating at one of its harmonics (with one of its standing wave patterns) if another *interconnected* object pushes it with one of those frequencies. This is known as *resonance* - *when one object vibrating at the same natural frequency of a second object forces that second object into vibrational motion*. Thus, the main mechanisms are a) an object's natural frequencies, b) an interconnection with another object, c) where the second object shares the same frequency.

The understanding of resonance as a human physical phenomenon favors the *neural and biochemical processes* that underlies and produces synchronicity between individuals. The work on motor resonance, for example, looks to *mirror neurons* as the automatic mechanism by which resonance is made possible (Zwaan, 2006; Aglioti, 2008; Van Elk, 2008). Similarly, Fredrickson (2013) focuses on a mechanism known as *neural coupling* – the way in which two or more brains connect, or synch-up, through communications – which is most evident during moments of emotional connections. She also addresses the way in which resonance produces and is produced by an increase of the *neuropeptide oxytocin* (known to play a key role in social bonding and attachment), as well as her own research on the relations between *vagal tones* (degree to which your heart rate is patterned by your breathing rate) and capacity for resonance. All three of these mechanisms, according to Fredrickson, work in *causal loop* so that each factor above – brain patterns, oxytocin levels, and vagus nerve - both produces resonance and is in turn produced by resonance.

The focus on affective resonance looks to constructs such as *sympathy* and *empathy* as capacities that enable resonance to take place. Singer and Lamm (2009) define empathy as the capability to comprehend or *resonate* with the emotional experiences of others. Lockwood et al. (2013), providing additional nuance, underline two important processes that contribute to empathy: *being in tune with the emotional state of another* (which they call *affective resonance*) and *perspective taking*, which is *identification with and comprehension of (without necessarily feeling with) the interiority of another*. Likewise, Rothman (2014) also distinguishes between emotional empathy and analytical empathy. Decety and Meyer (2008) assert that empathy is a prerequisite to intersubjective understanding (and thus resonance) between people. They write, “*Intersubjectivity, the ability to share the subjective states of others and resonate with their perspective, strongly relies on the ability to read (in the sense of reacting and understanding) others' emotions to determine their psychological state.*”

There is also evidence that *physiological resonance between individuals is fundamental to the biological capacity for empathy* (Buchanan, Bagley, Stansfield, and Preston, 2012). According to this research, physiological stress can resonate: observers of pain and distress commonly exhibit increases in reported distress, autonomic arousal, facial mimicry, and overlapping neural activity (Buchanan et al., 2012). From a neurophysiological perspective, Fredrickson (2013) explains that the neural coupling mechanism, or the way in which two or more brains connect, or synch-up, as well as levels of oxytocin, and vagal tonality (degree to which the heart rate is patterned by the breathing rate) can lead to moments of resonance or bring a sense of resemblance between interlocutors. Furthermore, in the case of limbic resonance, the need to synchronize “delicate neural rhythms” through interaction (emerging from the infants’ need of the presence of a caretaker to regulate their open-loop physiology) is seen as a factor preventing the social isolation of adults (Lewis, Thomas, Lannon, Richard and Amini, and Fari, 2001).

At the interpersonal-level, from the perspective of motor theories of action understanding, the activation of motor responses and abilities can emerge from processes that go beyond

mental representations and involve observation and other interactive processes such as *social modeling*. Zwaan (2006) found that *observing actions and understanding sentences about those actions* activates corresponding motor processes in the observer–comprehender. Aglioti (2008) points out that excellence in sports may be related to *fine-tuning of specific anticipatory 'resonance' mechanisms* that endow elite athletes' brains with an ability to predict others' actions ahead of their realization. Van Elk (2008) goes a step further, and explains that there is evidence that our motor skills crucially affect the way in which we perceive the actions generated by others, by *showing stronger motor resonance for observation of actions that are established in one's motor repertoire*. This again points to the importance of an actor's internal capacities or readiness for a specific type of resonance.

Some theories of leadership argue that aside from neural-biological processes, the key criterion for resonant leadership is *emotional intelligence* (EI): a leaders' ability to attune him or herself to the emotions others. According to Goleman, Boyatzis, McKee, and Annie, (2002), there are four dimensions to EI related to resonant leadership: self-awareness, self-management, social awareness, and relationship management.

Transpersonal psychology sees the emergence of resonant states between patients and therapist as a direct consequence of *a-causal expressions of meaning* (Thygesen, 2008). The article is based on S.H. Foulkes' definition of resonance as: “communication without any message being sent or received, an a-causal and transpersonal process at the primordial level in the psychic network of communication, the matrix”. According to Thygesen, Foulkes' conception is equivalent to Jung's concept of the “collective unconscious” which is very similar to the idea “morphic fields”. In other words, resonant states between individuals are not the product of causality, but of a “'tuning in' or 'attunement' to what is unconscious to our 'normal ego-consciousness'.”

In his essay “What is Art?” (1897), Russian novelist Leo Tolstoy looked to *empathy* and *contagion* as mechanism that enable art to be effective and timeless. Tolstoy argued that the essential function of art – of any type - is to dissolve the sense of separation between people. This union is achieved through a process Tolstoy called “infectiousness,” which is the ability of the artist to “infect” others with his/hers feelings. He writes: “The activity of art is based on the fact that a man, receiving through his sense of hearing or sight another man's expression of feeling, is capable of experiencing the emotion which moved the man who expressed it.” Empirical evidence has suggested that exposure to narrative art (in particular literary fiction) can increase both capacity for empathy and tolerance for others (Litcher and Johnson, 1969; Katz and Zalk, 1978; Castano & Kidd, 2013).

At the inter-group level one of the mechanisms that enables resonance is that of *saliency*, or the importance of a frame's message to a person's life. According to Snow and Benford (1988), frame-resonance depends on three factors: *the frame's centrality - how important are the ideas, beliefs and values to a person life; experiential commensurability - how relevant is the frame to a person's daily experience; and*

*narrative fidelity/cultural resonance*, - how aligned is the frame with a person's cultural narratives and understandings (Snow and Benford, 1988).

With regard to identity-based conflict, Rothman (1991) has focused on the importance of *reflexivity* to resonance. He writes, “*A reflexive reframing of a conflict that fosters a harmony that can emerge between disputants, a harmony growing out of a deep exploration and articulation of what goes on within them. It grows from an expression of the needs and values that have been threatened or frustrated by the conflict or the relations between adversaries. They may discover that “We are in this together”* (Rothman, 1991. p. ?).

Another mechanism associated with resonance is *synchronized activity*. In a series of studies, researchers have found that people walking in step with each other, or singing and waving cups in unison, reported greater feelings of connectedness and trust with their group than did the unsynchronized groups (Wiltermuth & Heath, 2009). Other studies have found that participating in marching in bands, religious chanting, reciting the pledge of allegiance, singing in unison, and rock concert mosh pits facilitate bonding and mutual support among the participants. Synchronous activity seems to create bonds among the participants that facilitate cooperation and even sacrifice. When acting in unison we are thinking collectively and not individually. (Wiltermuth S. S. & Heath C. 2009. Synchrony and cooperation. *Psychological Science*, Vol. 20, Pp. 1- 5).

*Cooperative orientations*, the result of more cooperative personalities and cooperative relationships, task and incentive structures, should also be considered a central mechanism of resonance. A large canon of research has shown consistently that cooperation and cooperative tasks and reward structures in groups, when contrasted with independent or competitive tasks and rewards, tend to induce a perceived similarity in beliefs and attitudes; a readiness to be helpful; openness in communication; trusting and friendly attitudes; sensitivity to common interests; a de-emphasis to opposed interests; an orientation to enhancing mutual power rather than power differences (See Deutsch, 2014; Johnson & Johnson, 2005). Many of these outcomes of cooperation could be considered central components of resonance, and are likely to be associated with experiences of *E pupukahi*.

An examination of various models of biological and social elements that have the capacity to spread (e.g., contagion and diffusion models of attitudes, epidemiology of diseases such as the spread of HIV) reveals the utility of using frameworks informed by complexity science, including dynamical systems theory, for conceptualizing the spread of resonance in social systems (Musallam, Coleman & Nowak, 2011). A dynamical system is defined as a set of elements that change over time as each element adjusts to the myriad influences from the other elements that make up the system. These elements can be thoughts, feelings, and actions at an individual level; people, groups and norms at a social level, or various institutions such as families, the media, religious organizations, schools, etc. at a broader structural level. Each element can be stimulated and perpetuated along its current path through *reinforcing feedback loops* between elements, where one element stimulates another along its current trajectory and this element, in turn,

stimulates the first – thus making a loop. We see this when a positive act by an outgroup member links to positive memories and feelings from previous encounters and increases a general sense of positivity towards the outgroup and the likelihood that they will perceive future acts as beneficial. Elements can also be inhibited via *inhibiting feedback loops* where one element constrains another (Coleman, Bui-Wrzosinska, Vallacher, & Nowak, 2006). We see this when a sense of guilt or compassion arises within us and buffers our hostile intentions or actions. Feedback loops can exist both within levels and between levels in systems. We suggest that *the spread of resonance over time can be usefully characterized as an increase in reinforcing feedback loops and a decrease in inhibiting feedback loops between various elements both within and between the psychological, social, and structural levels of a social system*. Ultimately, understanding the potential in a social system for resonance with regard to a specific idea or action may require a sufficient understanding of the network structure of feedback loops that constitute the system.

### **3) What seem to be the necessary and sufficient antecedent conditions for resonance to occur?**

Across different fields and disciplines, the necessary and sufficient conditions conducive to resonance vary in accordance with distinct levels of analysis. In physics, resonance occurs *when a system is able to store and easily transfer energy between two or more different storage modes* (such as kinetic energy and potential energy in the case of a pendulum). With music, *resonance only occurs when the first object is connected with and vibrating at the natural frequency of the second object*. So if the frequency at which a tuning fork vibrates is not identical to one of the natural frequencies of the air column inside a resonance tube, resonance will not occur and the two objects will not sound out together with a loud sound.

At the intrapersonal level, resonance is more likely to occur *when people hold the joint values of compulsion and compassion* as they can influence the intensity of resonance between ideological preferences and personality traits (Eckhardt & Alcock, 1970). It is also more likely when people evidence motor expertise as a product of observation of others enacting a behavior (Van Elk, 2008) and extensive practice leading to the ability to discriminate and predict between erroneous and correct motor performance (Aglioti, 2008). There have also been accounts of *sudden extraordinary distress or shock* leading to the emergence of resonant states (Grof & Grof, 1991).

Interpersonally, resonance has been found to be more probable when individuals *share an ability to identify and describe feelings and to feel what others feel* (Lockwood, Bird, Bridge & Viding, 2013), evidence *self–other awareness and self-regulation* (Decety & Meyer, 2008) and show high levels of *empathy and emotional reactivity* as they affect the subjective empathic behavior towards external situations perceived as positive or negative (Balconi & Bortolotti, 2012). Larson (1987) similarly found that high levels of *individual self-tuning and openness to receive resonance patterns, sympathy* leading to emotional responses, *empathy or the capacity to match resonance patterns in the imagination*, and *rapport* resulting in harmonic resonance at various systemic levels to be

associated with resonance. In addition, high levels of *empathic connection as a result of awareness of nonverbal factors, particularly postural, gestural, and facial mirroring, emotional attunement and capacity to articulate emotional experiences, physical touch, listening, bodily, emotional, and spatial awareness* (Lovkvist, 2013), *awareness of internal and external cognitive and emotional states* (Haas, 2011), and *attunement to an 'interactive field' of inner subjective and outer objective phenomena* (Thygesen, 2008) have been found to increase interpersonal resonance.

Within groups, several factors increase intragroup resonance, including sharing a *multidimensional and reflexive understanding of identity* that includes both vertical factors, such as cultural heritage, language, and ancestral history, and horizontal factors associated with the individual's current situation and relationships in everyday life (Rothman, 2012); *familiar cultural repertoires* such as religion, political preferences, and other forms of group identity (Robnett, 2004); *shared emotional states* deriving from situational factors experienced collectively (Robnett, 2004); *shared narratives* that are commensurate to lived experience in terms of fit with collective ideas of the past, present, and future (Ettema, 2005); and *leadership that is able to define a group's self-understanding* (Mols, 2012).

At the intergroup-level, research on *affective resonance* emphasizes the *link between ideological beliefs and empathy* (Eckhardt and Alcock, 1970), where a sort of "resonance" mechanism between the observer and the observed permits a direct form of understanding of members of the other (Balconi and Bortolotti, 2012). *Ideological factors* such as militarism, nationalism, conservatism and religiosity, and personality factors, such as neuroticism, extraversion, misanthropy, and a history of strict childhood discipline can shape an individuals' level of connectedness and capacities for empathy with others. Decety and Meyer (2008) characterize processes leading to empathy as being intersubjective and inductive, covering the sharing of positive and negative emotions without losing sight of whose feelings belong to whom. According to this perspective, *intergroup resonance depends on the capacities of self-other awareness and on self-regulation of emotional states, allowing the assessment of the other's state and the use of strategies to cope with distress in pro-social ways* (Decety and Meyer, 2008).

Morphic resonance theories attribute the emergence of spontaneous cases of telepathy and 'distant intentionality' to *the presence of a collective morphogenetic field that contains a collective or pooled memory that encourages organisms to prefer thoughts and behaviors that had been selected most frequently* (Roe and Hitchman, 2011; Sheldrake, 1987; Sheldrake, 2013). In other words, according to Sheldrake (1987) the key concept of morphic resonance is that *similar things influence similar things across both space and time, and the amount of influence depends on the degree of similarity*. In the case of 'distant intentionality', Schmidt, Schneider, Utts, and Walach (2004) found that up to certain degree, there is a relationship between the intentional efforts of one participant (often called the 'agent') and physiological changes in another remote person (often called the 'receiver').

At the macro level, research on frame resonance focuses on how *collective action frames, as organic systems of meaning* (Vicari, 2010) *can lead to forms of resonance that motivate social mobilization and change*. Zemanová (2009) argues that *cultural representations* not only constitute an important part of frames in social actions but also that their modification is one of the crucial steps within the process of re-framing when transmitting messages and diffusing actions across societies. Mols (2012) found that radical leaders are able to gain considerable control by persuading the electorate of *threats to collective identities*. Schrock, Holden, and Reid (2004), define emotional resonance as *the emotional harmony and/or disjuncture between collective action frames and the emotional lives of potential recruits*. Robnett (2004) that ideological practices produce varied collective meanings, which are mediated by socially located emotions, successful framing of collective meanings is connected to emotional resonance. Schemer, Wirth, and Matthes (2012) argue that *frames in media outlets are linked to resonant effects with people's existing value predispositions*. Ernst (2009) highlights the role of power and identity in the perception of framing choices available to activists. Also relevant is the research by Resnick (2009), who found that *by appealing to different audiences, a movement can gain complementary and reinforcing forms of legitimacy and support*. In particular, frames that are *inclusive of multiple groups and minorities* (Resnick, 2009), *take into account socio-political aspects beyond cultural and identity factors* (Ernst, 2009), have a *solid argumentative logic* of collective action (McCammon, 2009), *involve claim-makers that are perceived as credible* (Matesan, 2012), *include value appeals through messages that match with the value orientations of recipients* (Schemer, Wirth & Matthes, 2012), and *appeal to people's sentiments and emotions in a holistic manner*, taking into account the processual, contingent, and social nature of emotions (Schrock, Holden & Reid, 2004), are particularly resonant.

In cases of identity-based conflicts, Rothman (1991) explains the exploration and clarification mechanisms by which reflexive dialogue can lead to introspective and interactive dynamics that leads to recognition and a disposition to work towards resolution Rothman (2001). Rothman (2012) *highlights the importance of having identity-groups work with each other to cooperate in defining, promoting and assessing some shared future state in which agreements to reduce destructive dynamics and promote cooperation is practically consolidated through creative action*. Kuttner (2012) defines these processes as leading to *relational mindsets, a main antecedent of resonance*.

Ultimately resonance reverberates out when there is a positive interplay between developmental experiences at the personal level, including growth through experience and emancipation; at the group level, such as meaningful integration of change in work practices and increased awareness of individual impact on others; and the wider community, including the adoption of new practices in organizations, and higher awareness through service and informal communications (Kakabadse, Kakabadse & Kalu, 2007). This can be enhanced by trans-personal and extra-personal awareness as a product of healthy brain function, extensive environmental interaction, low levels of physical and emotional stress, awareness of energy experiences (Welch, 2012), and expanded awareness through spiritual practice (Siegel, 2013)

#### 4) How is resonance identified, detected or measured? Methods of assessment?

##### Measuring Resonance for Research

For measuring resonance at the individual level, one research topic that is relevant is that of *affective resonance* and *empathy*. One method of measurement, employed by Buchanan et al. (2012) to measure empathic experiences of stress uses physiological *measures such as salivary cortisol*. In this case, resonance is measured as the extent to which individuals' physiological reactions are similar to the experiences of others. Another example is a measure of trait empathy, developed by Balconi & Bortolotti (2012), which *compares assessments of specific facial expressions* of actors to biofeedback readings from observers.

In research on autism, which has been defined as lacking affective empathy (see Lockwood et al. 2013), affective resonance has been measured in multiple ways. For example, Seara-Cardoso et al. (2012) developed the *Self-Assessment Manikin Faces Task*, which assesses the *affective empathic response of an individual to pictures of emotional faces*. Additionally, research on autism has employed survey questionnaires to measure this construct. Examples include the Self-Report Psychopathy Scale–Short Form (SRP-4-SF, Paulhus et al., in press); The Autism Spectrum Quotient (AQ, Baron-Cohen et al., 2001) and the Toronto Alexithymia Scale (TAS; Bagby et al., 1994; as cited in Lockwood et al., 2013).

Lastly, another example of measurement at the micro level comes from research on the resonance between children and parents (i.e. child socialization from parents), described as “ideo-affective resonance.” This has been measured by *calculating the survey response correlations between ideological beliefs, personal feelings, and values of parents and children* (Eckhardt & Alcock, 1970).

At the interpersonal level of analysis, examples of measurement in research come from research on psychotherapeutic approaches. For example, Larson (1987), interviewing therapists reporting having experienced resonance in their clinical work, focused on *assessing experiences of altered states of consciousness, synchronization of movement patterns, immediate non-verbal responses to client expression of feelings, and felt bodily sensations*. Other researchers have focused on assessing resonance in therapy through *video analysis of observable behaviors such as “postures, gestures, body-spatial dynamics, movement rhythms, facial expressions, speech qualities, and breathing patterns... video segments were also scanned for nonverbal communication concerning the influence of touch, and skin tone variations”* (Lovkvist, 2013; p 33, 46)

At the macro level, *research on voting patterns, activism and activist activities* explores some of the possibilities for measuring resonance at this level. For example Schemer, Wirth, and Matthes (2012) studied resonance, defined by the impact of democratic campaigns, compared the results of a content analysis of information used in the campaign, and compared this to population data assessing voting intentions.

With regards to activism, Ernst (2009) *used interviews of activists to measure existing and shifting “terms of frame resonance,”* while McCammon (2009) measured activist frames using *content analysis of historical documents, such as speeches given by activists, letters to lawmakers, letters, articles in newspapers, public interviews,*

organizing documents outlining topics for public speeches, and minutes from legislative hearings. Building on each of these, Matesan (2012), using polling data of the larger target population, compared activists' frames of reference to the level of adoption of those ideals in the population.

Finally, other examples of research measuring resonance at the macro level include *measuring emotional resonance by coding "emotion discourses" from interviews, secondary sources, and archival data* (Robnett, 2004), and *analyzing news media to measure the extent to which certain patterns of story reporting are repeated – representing "formal textual features" of the topic* (Ettema, 2005).

### **Measuring Resonance in Practice**

In practice, when measuring resonance at the micro level, some therapists employ *"intuitive tracking skills" to sense shifts in the therapist-client "shared energy field"* (Siegel, 2013). Haas (2011), from the transpersonal psychology perspective, proposes *measuring collections of brain charges between organisms as increases or decreases in brain activity can be measured using fMRI and EEG, representing "windows of opportunity" for influencing therapeutic change.*

Burns (2011) provides an example that illustrates measurement as the extent to which an individual demonstrates resonance with a certain perspective through *retelling of one's experience: "At the market she talks casually with the women about their lives. One of the women tells her about the difficulties the women have in getting salt. They now have to dig for salt in locations which expose them to danger. She tests the resonance of this narrative by talking about the issue of salt with other women. They have similar stories to tell. They are receptive to being brought together to talk about this issue"* (p 106).

Resonance in groups is typically measured through *facilitator observations and by analyzing records of participants' dialogues and interactions* (e.g. Burns, 2007; Wadsworth, 2008). Rothman and Olson (2001) suggest that resonance in conflict interventions is measured by *"the ability of the participants to reframe the conflict in terms of their identities, and recognizing where they mesh and merge. The degree to which parties have come to recognize and accept one another's identity"* (p 299) although they admit that this is difficult to assess. In conflict resolution work, Kutner (2012) measures resonance as *the emergence of a "common dialogic space" that shifts from a dialog about positions or interests to, instead, constructed meanings.* This is measured through observation: *"Thinking together... Somebody would get an idea, somebody else would take it up, somebody else would add to it. The thought would flow rather than there being a lot of different people, trying to persuade others"* (p. 324).

### **Options for Quantitative Measurement of Resonance in Groups**

As described above, in facilitated groups, resonance is typically measured by the facilitator based on their observations of the group, as well as from qualitative assessments of the outputs from the session. While this can be a very effective approach for facilitators aiming to further guide the work and process of groups, there is an opportunity to explore other methods for assessing dynamic patterns in groups using quantitative approaches. What follows is a review of the empirical literature related to attempting to assess qualities of groups through various forms of measurement. While

these studies were not measuring resonance per se, they offer a selection of assessment tools that could possibly be modified for this purpose.

### Individual Member Assessment Methods

Perhaps the most common form of measurement of group-level phenomena is through *survey administration*. At the most basic level, group members have been measured and compared on perceptions of cohesiveness (Stinson & Hellebrandt, 1972), coordination (Faraj & Sproull, 2000; Lewis, 2003), and energy and pleasantness (Barsade, 2002). Analysis involves both assessing the extent to which group members endorse having these experiences, as well as the consistency of this experience across members.

Another common form of measurement assesses *shared mental models*, which can be measured through survey (e.g. Levesque, Wilson & Wholey, 2001; Mathieu et al., 2000; Stout et al., 1999) or by guiding participants through tasks that assess their individual models and then comparing the similarity of these models across group members (Marks, Zaccaro & Mathieu, 2000). For example, Marks et al. (2000) presented each participant in a three-person task group individually with a concept map related to the activity they had just participated in, and asked them to select from a list of concepts those they felt were most relevant to the situation and to which team member the concept most applied. The authors then compared these mental models across the three team members in a systematic way in order to arrive at a “similarity” index score for that group.

The primary limitation of these methods is that they are static and occur after the group has interacted. One way to overcome this limitation is to use *experience sampling* to measure group participants at multiple time points, which allows for an exploration of patterns that emerge within the group over time. For example, Ballard, Tschan & Waller (2008) describe an experience sampling method using PDA's (Personal Data Assistants; today smartphones could fulfill this role), where data is collected from each participant periodically throughout a session and patterns in the group's dynamics are identified using an algorithm called “Theme.” *Experience sampling might be used to measure resonance, for instance, by periodically assessing the levels of energy and pleasantness of individual members (Barsade, 2002), and later analyzing the data to determine at what time intervals where group members most aligned along these continua.*

### Live and Video Recorded Observer Coding

A second primary limitation of survey methods, which experience sampling does not address, is that much of the richness of the group dynamic is lost as the data that is collected is limited to self-reported experiences. Much of individual behavior, including reactions to other group members, occurs outside of individual awareness (citations ??). In order to avoid this limitation, many researchers and practitioners make use of coding schemes to analyze the behavior of groups.

Early group dynamics research made use of “interaction process analyses” that allowed observers to live code each individual group communication behavior (Bales, 1950). More recent methods take advantage of video and audio capture to analyze groups post-interaction. Example methods include “Time-by-Event-by-Member Pattern Observation” (Futoran, Kelly & McGrath, 1989), “The Affect Grid” for assessing group mood (Lehmann-Willenbrock et al., 2011), and assessing individual contributions that further or prevent group goal pursuits (Westaby & Pfaff, in press). Each of these coding

schemes may provide an opportunity to assess patterns of resonance following a facilitated session.

Another common approach to analyzing group-level interactions is called SYMLOG. SYMLOG is a system for rating group member actions along three dimensions: upward-downward, positive-negative, forward-backward (Bales & Cohen, 1979; Polley, 1987). Additionally, Polley (1985) provides an algorithm that can be applied to SYMLOG data that assesses group *unification* or *cohesion* – concepts similar to resonance.

### Automated Live Coding and Feedback

While observer coding methods of assessment offer expanded opportunities for measuring resonance in facilitated group sessions beyond survey approaches, these methods are limited primarily by the time-intensiveness of the coding procedures, and consequently the timeliness of feedback of these observations to the facilitator and/or group members.

Recent innovations that allow live automated coding of group member behaviors may offer benefits similar to both the simplicity of experience sampling methodologies and the richness of more extensive observer coding schemes. First, there are multiple technologies in development for providing live feedback of individual participant contributions to the dialogue, which are presented in real time to the whole group (Bergstrom & Karahalios, 2007; DiMicco, Pandolfo & Bender, 2004). Additionally, Gatica-Perez et al. (2005) *has developed software that monitors the vocalizations of members and detects the interest levels of the group as a whole*. Combining this technology with the visualization technologies described previously, would provide researchers with a live assessment of the collective interest levels of groups that emerge over time. Each of these technologies requires only that individual group member vocalizations be monitored using a microphone.

Taking this further, other systems described by Germesin & Wilson (2009) allow *automatic coding of transcripts for points of agreement in conversation*. With subsequent developments in voice recognition technologies, it may soon be possible to live code participant conversations, which when combined with the above described technologies, would provide a robust feedback mechanism for identify points of resonance in real-time while working with facilitated groups.

Finally, another technology in development that is designed specifically for monitoring group phenomena over time takes the form of “sociometric badges” (Kim et al., 2008; Olguin et al., 2009; Pentland & Madan, 2005). Participants are asked to wear a small device that is hanging from a lanyard placed around the participant’s neck. This *device measures speech signals (enthusiasm, interest level, nervousness), bodily movement, proximity to other group members, and face-to-face interactions*. Additionally, *there is a button on the device that participants can press to signify that a significant event as occurred*. Built in to this technology are software systems that work with the data from these badges in real time, providing feedback to participant’s mobile phones. More information about this platform is available here:

<http://hd.media.mit.edu/badges/index.html>. This technology is non-intrusive and seems flexible enough to offer many potential options for measuring group resonance in real-time.

**5) Can resonance be managed, fostered or controlled in some manner? If so, how? What practices are associated with this?**

Although there are marked differences in the conceptualization of resonance across disciplines, there is a commonality across perspectives: the characterization of resonance as a dynamic phenomenon. Seen as progressive, linear, non-linear, or emergent, theories tend to identify a wide array of practices and processes that may foster resonance or help manage it as it unfolds. From the micro to the macro perspective, we have identified three broad categories of practices associated with the promotion, prevention, and management of resonance: strategies to increase self-regulation, or the individual's capacity to control motor skills, emotional and affective processes, and levels of social awareness; facilitated intervention processes and frameworks that regulate the relationship between patients and therapists, as well as that of facilitators and different parties; and framing techniques for social mobilization.

**Increasing self-regulation**

Research focusing on the biological and non-biological underpinnings of empathy (affective resonance) has shown that *along with the capacity of understanding and incorporating visual information related to motor goals, self-other awareness and the ability to regulate emotional states are fundamental components of prosocial forms of resonance* (Decety & Meyer, 2008). Along the same line, Eckhardt and Alcock (1970) highlight *the importance of childhood training- understood as a fundamental part, function, and/or expression of a culture- in determining values of compassion and compulsion and consequently levels of empathy and resonance*. Also relevant, *exposure to a particular genre of fiction (literally fiction in contrast to nonfiction, popular fiction, or nothing at all), has been found to lead to better performances on affective and cognitive theory of mind tests* ( Kidd & Castano, 2013). Finally, at the intersection of the physical, cognitive, and emotional, Frederickson (2013) explains that *an increase of awareness of individual physical and spiritual dimensions as well as of cognitive and emotional states can aid in the prediction and influence of behavior*.

**Facilitated interventions and frameworks**

According to research rooted in transpersonal psychology, *resonance can be fostered by empathically attuned clinicians who are trained to better understand and intervene in the context of changing emotional landscapes*. Among the different processes and strategies to increase resonance, Larson (1987) proposes *the gradual change of focus from external to internal dynamics can produce an altered state of consciousness in both the client and the therapist which can lead to a radical shift from the general reality orientation (usually associated with perception in the neocortex) to perception achieved primarily from the entire body*. From a limbic perspective, Lewis, Thomas and Lannon (2007), explain that *resonance in the therapeutic context requires that the therapist knows how to help the patient regulate levels of emotionality while creating a connection that allows for the movement from/to limbic attractors*.

Welch (2012) explains that *the development of transpersonal spiritual capacity* can result from advanced cognitive development that can allow the therapist to better understand the client's experience. Along the same line, Lovkvist (2013) advocates for *psychotherapy trainings that strengthen somatic experiences of empathy, including how to better communicate at the visual, auditory, interoceptive, proprioceptive, and kinesthetic levels*. By increasing the awareness of physical and spiritual dynamics, Haas (2011) suggests that *practices such as mindfulness can lead to the development of a perceptive capacity that allows the therapist to distinguish between real states of positivity and negativity, and to conceivably gain new abilities to guide and predict behavior*.

Similarly, Siegel (2013) *awareness of changes in the patient's and therapist's energy field may be used as intuitive tracking skills to sense resonance and finer vibrations of expanded awareness*. This approach is connected to Jung's concept of the 'collective unconscious'. Welch (2012) explains that individuals receive and transmit messages that come spontaneously through mental or physical channels of information— including words, automatic writing, and speaking from trances. Lovkvist (2013) found that in cases of patient-therapist interactions, postural, gestural, facial, vocal, breathing, and cross-modal dynamics may be associated with moments of mutually reported empathic resonance. Larson (1987) identified five tuning stages leading to resonant psychotherapy: sympathy, empathy, rapport, and resonance.

In systemic action research, Burns (2011) proposes a framework where *facilitators operate intervening in multiple streams informed by a profound understanding of energy patterns in a system*. Burn's approach *advocates for intervention approaches where action is seen as important as dialogue, issues can be reframed, the act of doing collectively can lead to changes in the landscape and the creation of new 'entry points'*. From this perspective, Kakabadse, Kakabadse, and Kalu (2007) underline the importance of interaction in interventions where both facilitators and participants embark on *collaboratively inquiry*.

In cases of identity-based conflicts, Rothman (1991, 2001, 2012) proposes a framework where one of the facilitator's primary goals is to foster reflective dialogue. In his ARIA framework, Rothman explains that *practitioner are tasked with guiding the parties through the process, facilitating a discussion that will ideally lead to antagonism, a stage that precedes states or resonance*. In terms of the implementation of the ARIA framework, Badawi (2012) suggests that peace workers and facilitators could profit from enhancing their understanding of antagonism engaging techniques. Most effective are identity-based third party interventions conducive to introspection processes or reflexive dialogue that go beyond interest-based methods and address identity needs (Rothman, 1996, 2001), address human needs associated with the factors that are fundamental to the parties' identities (Badawi, 2012), and promote a relational view of the self (Kuttner, 2012).

## **Framing**

The general assumption behind notions of resonance in social change theories is that by appealing to different audiences, social movements can gain strength, legitimacy, and support. To achieve this, *points of strength and vulnerability ought to be targeted through the use of frames* (Resnick, 2009). Many factors have been found to be important in determining the right frame. Ernst (2009) found that socio-economic characteristics are relevant in shaping frame preferences. McCammon (2009) found that *frames that diagnose social problem as serious and with broad implications are more likely to convince lawmakers to alter policy as opposed to narrower political scopes*. Matesan (2012) explains that *the resonance of frames depends not just on internal organizational factors, but on the legitimacy and credibility of the different claim-makers in a particular context*.

In terms of broader mechanisms involved in the framing process, Schemer, Wirth, and Matthes (2012) found evidence supporting the value-resonance hypothesis, or the idea that *value appeals are more persuasive when messages match with the value orientations of recipients*. Robnett (2004) found that resonance is determined by the socially located positions of participants, and that emotional resonance is a mediator in the ideology-frame development link. In other words, Robnett found that *emotional resonance can mobilize participant even in the absence of resonant ideological practices*. Furthermore, Schrock, Holden, and Reid (2004) found that a need to gain a more holistic understanding of emotional resonance not only as it pertains the way messages are framed, but also as they are connected to the emotional lives of participants. The capacity of better defining a group's self-understanding can enable movements to influence what is considered knowledge and that counts as evidence (Mols, 2012).

### **In Art**

*Narrative art* has also been characterized as a medium to help foster sympathetic understanding. For example, evolutionary psychologist Steven Pinker (2011) argues that the significant rise in literacy along with wide exposure and consumption of realistic fiction in the 18th century played a crucial role in expanding people's circle of concern which contributed the decline of violence in modern times. Along the same lines, historian Lynn Hunt (2007) argues the popularity of the novel in the 18th century played a central role in the advancement of human rights.

### **In Hawaiian Culture**

There are a number of attitudes, behaviors and forces that can undermine harmony and resonance between self and the great chain of being. In the social realm, these include: Hate (ina'ina); Jealousy (lili); Rudeness (ho'okano); Being nosy (niele); Bearing a grudge (ho'omauhala); Bragging (ha'anui); Showing off (ho'oi'o); Breaking promises (hua Olelo); Speaking bitter thoughts (waha 'awa); Stealing, fighting, and hostile (huhu) behavior. In the spiritual realm, dissonance takes place when people transgress certain taboos, thereby angering spiritual forces who call for propitiation. These include: Offended ghosts (lapu); Natural spirits (kupua); Spirit guardians (aumakua); Ancestor/elders (kupuna); and Black magic or sorcery (ana'ana) Curse (anai). (McCubbin & Marsella, 2009)

To resolve such social and supernatural conflicts - to restore *lokahi* - there are a number of pro-social behaviors and rituals that one could engage in. Pro-social behaviors include the following: *Humility and modesty (ha'aha'a)*; *Politeness and kindness ('olu'olu)*; *Helpfulness (kokua)*; *Acceptance, hospitality, and love (aloha)*. *Resonance-enhancing ritualistic behaviors include the following native Hawaiian healing arts: Herbal treatments (la'au kahea)*; *Purification baths (kapu kai)*; *Massage (lomi lomi)*; *Special diets and fasting*; *Confession and apology (mihi)*; *Dream interpretation (moe 'uhane)*; *Clairvoyance (hihi'o)*; *Prayer (puleho'onoa)*; *Transfer of thought (Ho 'olulu ia)*; *Possession (noho)*; *Water blessings (pi kai)*; *Spirit mediumship (haka)*. (McCubbin & Marsella, 2009)

“Thus, the Native Hawaiian worldview encompasses a complex system that is rooted in the interaction of body, mind, and spirit, and is directly tied to prosocial human relations and prospiritual relations. The restoration of health and wellbeing requires the adoption of prosocial behaviors and engagement in the healing arts and protocols that can reestablish interpersonal and psychological harmony.” (McCubbin & Marsella, 2009)

When addressing conflicts, the indigenous Hawaiian method of conflict resolution is called Ho'oponopono, which means "setting to right." Ho'oponopono is a sacred conflict resolution process aimed at restoring harmony among conflicting parties through prayer, discussion, apology and forgiveness (Shook & Kwan, 1987). According to Shook (2002) the goal of Ho'oponopono is to, "restore and maintain good relationships among family, extended family and supernatural powers". Conflict resolution scholars such as Johan Galting (2004) has called Ho'oponopono one of the most effective and powerful methods of conflict resolution available today, while Olivier Urbain (2004) has argued for (respectfully) using Ho'oponopono as a model for more secular “Hawaiian-style Reconciliation Methods”.

Returning to resonance, according to Ulrich Emil Duprée (2012) Ho'oponopono “proceeds from an understanding of the unity of everything in the world, which is true even though we feel ourselves to be separate. Because of this unity or oneness, nothing can happen in our own world without creating a resonance in the observer. It follows that we can only influence problems in the external world if we heal the corresponding inner resonance.”

#### **6) What are the primary dynamics and outcomes associated with resonance (positive and negative)?**

Lewis, et al., (2001) argue that resonance is a basic human need whose fulfillment is essential for the *healthy development and functioning of individuals*, and whose *frustration leads to host of pathologies, ailments and even death*. Resonance is also said to be terminus of spiritual practice (*cite*), the driving force in the cosmos (Sheldrake, 2013); the purpose of art (Tolstoy, 1897??), integral to therapeutic intervention (Lewis, et al., 2001); the core of great leadership (Goleman et al. 2002), the engine of political revolutions (Gordillo, 2011); and an essential approach for transforming protracted social conflict (Rothman;1991; Burns, 2007).

Fredrickson (2013) associates resonance with a host of benefits at various levels of experience. *At the cognitive level, she argues that resonance opens up perceptions, orients awareness towards others, and enlarges circle of concern. Behaviorally, resonance creates physical synchronicity (when body postures/movements and nonverbal gestures mimic one another); which increases trust and cooperation between people (cite). Relationally, positive resonance fosters greater growth, resilience, and moments of intimacy. Health wise, resonance reduces risks to a multitude of ailments: including heart diseases and stroke, diabetes, Alzheimer disease, common colds and even some cancers.* (Fredrickson, 2013).

While the bent in the literature on resonance is the direction of positive outcomes, some authors, in particular those dealing with larger groups, recognize that the phenomenon of resonance to be a value-neutral concept that is *also associated with the politics of exclusion and inter-group violence* (Goleman, et al, 2002; Cooter, 2006; Gordillo, 2011). Goleman et al (2002), for example, differentiates between negative and positive resonance: *positive resonance unites and is pro-social, while negative resonance, also called “demagoguery”, divides and is anti-social.* Gordillo (2011), who differentiates between political and non-political resonance, also separates political resonance that stands in opposition to state power (e.g. 2011 Egyptian uprising), with reactive and exclusionary resonance that is manipulative by state power (E.G. Nazi Germany).

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	CONCEPTUALIZATIONS	MECHANISMS	CONDITIONS	METHODS	PRACTICES	OUTCOMES
PHYSICS	The tendency of a system to oscillate with greater amplitude at some frequencies than at others.	Interconnection between two objects that share same natural frequencies.	Storage and transfer of energy between two or more different storage modes.			
INTRA/INTERPERSONAL	An unconscious and internal process by which two people become physically and emotionally in-synch with one another.	Neural and biochemical processes; empathy; sympathy; contagion; social modeling; emotional intelligence.	Empathy, self-awareness, self-regulation, High levels of comprehension, high levels of individual self-tuning and openness.	Physiological measures (such as salivary cortisol); Self-Assessment Manikin Faces Task; survey questionnaires; assessing and analyzing observable behaviors.	Childhood training, exposure to fiction, meditation, limbic regulation, mindfulness, love.	Opens up perceptions; orients awareness towards others; enlarges circle of concern; increases trust & cooperation; resonance fosters greater growth, resilience & moments of intimacy; reduces risks to a multitude of physical ailments.
INTRA/INTERGROUP	An unconscious and internal process by which groups of people become attuned with one another.	Frame saliency; reflexivity; synchronized activity; cooperative personalities and cooperative relationships; task and incentive structures; +/- feedback loops.	Link between ideological beliefs and empathy, shared worldviews, Identity-based third party interventions.	Survey administration; experience sampling; interviews; content analysis; coding of "emotion discourses"; analyzing news media; facilitator observations & analyzing records of participants' dialogues & interaction.	Systemic action research, reflective dialogue, collective rituals.	Increase motivation towards collective action.
POLITICAL	The apparatus by which social revolutions spread.	Frame saliency; collective empathy; bodily proximity; mobility and spatial dispersion (i.e. rallies).	Frame saliency, collective action frames, collective empathy, bodily proximity, mobility and spatial dispersion.	Data collection, observation, content analysis.	Rallies, demonstrations, chants, marches, speeches.	Increase motivation towards collective action.
SPIRITUAL	Harmony between self and great chain of being.		Trans-personal and extra-personal awareness.		Herbal treatments; Purification baths; Massage; Special diets & fasting; Confession & apology; Dream interpretation; Water blessings; Spirit mediumship; prayer; discussion; apology & forgiveness.	