Neuronal opinion, public opinion: decision making and the evolution of societal aspirations for racial equity

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The foundation of a democratic system is the vote, the individual voice that gives rise to collective action in society. In the brain, individual neurons also vote; firing off volleys of action potentials or "spikes" when stimulated. Neurons don't signal spikes for anything. Each neuron has its preferred set of stimuli, conditions and actions - *its selective opinion*. Remarkably, and like humans, neuronal opinions are not fixed, but change depending on the context. A diversity of opinions is found among neuronal populations in addition to broad changes in physiology over time. These information processing dynamics may be necessary for the emergence of individual, human minds (Deacon 2011). Like the individuals in a society, shifting opinions among neurons can influence the course of action for an organism. In a society, as in an organism composed of numerous cells, individuals must sacrifice degrees of autonomy in the service of the collective "we." The emergence of a global mind, or *noosphere*, might reflect the dynamic information processing perspectives of its individuals even as those very individuals are shaped by the dynamics of the whole.

In the spirit of Socrates' attempt to analogize the polis as the soul writ large (Republic II), we explore the possibility that societies organize their anatomy and physiology similarly to neuronal populations. The anatomical structure of society is a web-like network, similar to the neural connections that comprise the brain. When nature evolves an effective pattern, she tends to repeat herself. Much less is known about the dynamics of the information flowing through these networks. If the network is the container, what about the content of that information? In the brain, the meaning of the content is crucial: the dynamic perspectives of neuronal populations determine action. It is not enough to send a neural signal, the signal must be of significance and critically timed. We utilize public opinion to study the dynamic physiology of society, as an indication of *what matters* to people. We hope to obtain a glimpse of the information content of the noosphere related to societal challenges that demand collective action. We start by focusing on racism, a salient issue that embodies how public opinion reverberates (or fails to) through existing network anatomy.

Public opinion on race in the U.S. has been remarkably slow to reflect societal conditions for Black Americans. We analyzed a publicly available dataset (Roper Center,

Cornell) to examine the dynamics of public opinion around the time of the civil rights movement and in the time afterward, culminating in the Black Lives Matter (#BLM) movement of the early 21st century. We found an initial transient shift in public opinion toward greater recognition of racial inequality around the passage of the Civil Rights Act of 1964. Shortly thereafter, public opinion returned to a perspective dominated by ignorance of racial inequality; most Americans felt that Black Americans were treated the same as white Americans. Beginning around the end of the 20th century we found a slow and steady increase in the proportion of the American society that felt blacks were treated unfairly (see Figure 1A). Since 2018, there has been a sharp increase in the proportion of society recognizing that Black Americans are not treated fairly. These dynamics suggest that the orienting of societal attention to race and the formal passage of the act had only a transient impact on public opinion during the 20th century civil rights era, which was notably mixed between support for protestors and systemic change.[1] These trends are echoed by the large support for Black Lives Matter protests and yet less firm support to address the challenges of structural racism (Serwer 2020). In both the 20th and 21st century race upheavals, the media played a critical role in shifting public opinion toward support of the protestors. In the 21st century, social media has played a role in spreading the images of racism, particularly the violent deaths of young blacks such as George Floyd. This spreading effect of social awareness is similar to the older media content that denounced the murder of Emmett Till and led to the passage of the Civil Rights Act of 1957 (Clayton 2018). It remains to be seen if, like the experiences of the 1960s (and Reconstruction before that, Litwack, 1980), American society will respond to injustice with attentional re-orientation, and yet fail to do the long-term work required to change the structure of society.

With history as our guide, and neurodynamics as our lens, we see two dynamic forces at play in the noosphere of public opinion: (1) Transient bursts of activity that re-orient attention and motivate action (*kairos*). (2) Ongoing activity that sustains goal-oriented behavior (*chronos*). These dynamical modes correspond to bursting and sustained activity seen in individual neurons and their respective neuronal populations. In society, transient bursts coincide with periods of mass upheaval in collective consciousness. Kairotic time is necessary, but so is the ongoing, chronic effort to maintain

[1] https://www.pewresearch.org/fact-tank/2020/01/16/50-years-ago-mixed-views-about-civil-rights-but-support-for-selma-demonstrators/

progress toward a particular goal. Brain activity is similarly chronic and incessant. Sustained in reverberating networks, neuronal activity builds to the point where organisms reach a critical decision (a kairotic moment), action or goal. In some cases, these dynamics are sustained by distinct neuronal sub-populations (see Figure 1B). These kairotic and chronic dynamics are maintained across scales in time and space, shaping network connectivity, just as the presence of structural connections themselves determine the potential for dynamic interaction in the first place.

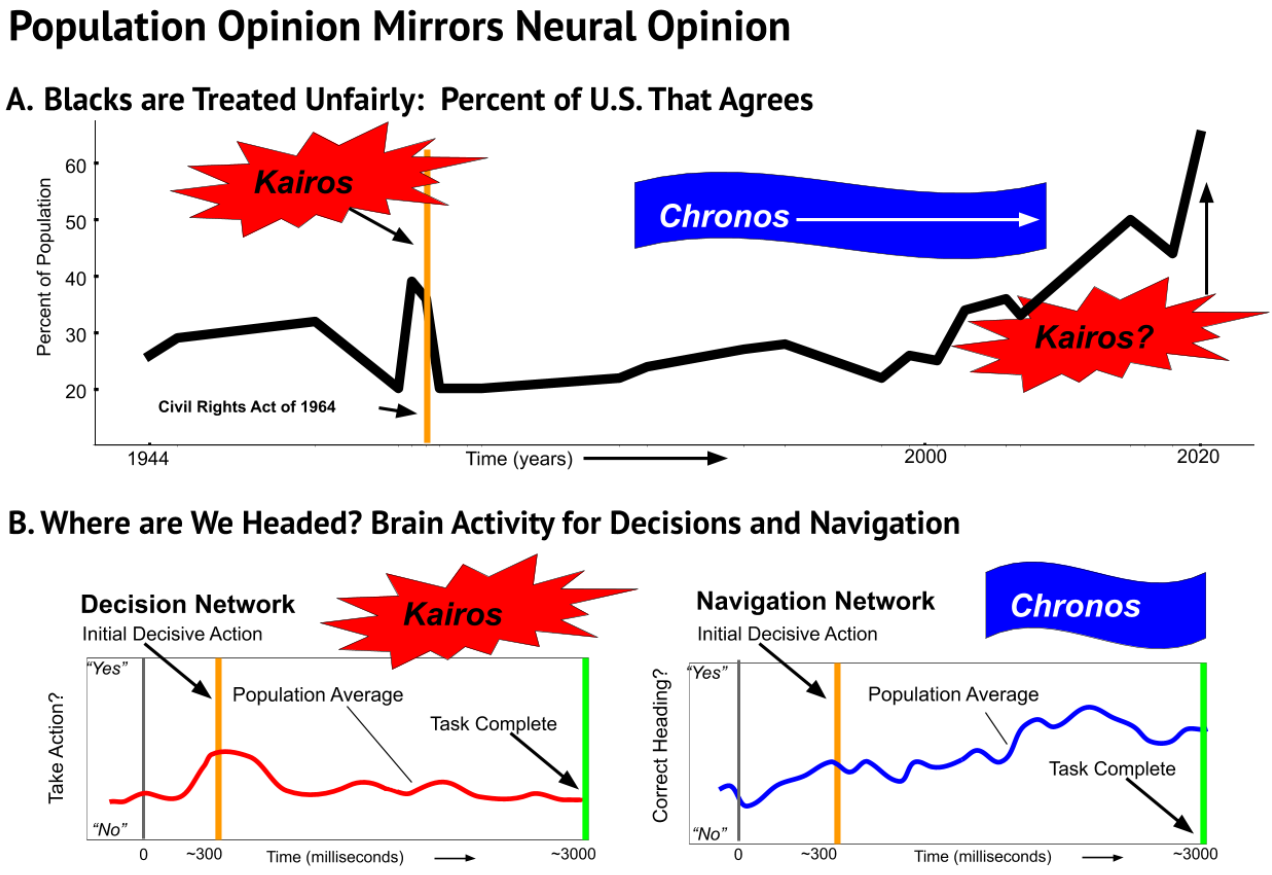

FIGURE 1. Population opinion mirrors neural opinion. (A) Public opinion data regarding the treatment of Black Americans plotted as the percent of the US population that agrees that Black Americans are treated unfairly over time, from 1944 to 2020 (Source: Roper Center, Cornell). The date of the Civil Rights Act of 1964 is marked by an orange line, culminating a brief period of time we refer to as *Kairos* (a propitious moment). This is in contrast with the slow evolution of opinion leading up and then into the early 21st century, a period of time we refer to as *Chronos* (father time). (B) Neuronal activity data regarding the decision to act during the execution of a spatial navigation task. Activity is reported by the "opinion" of each neuron and then averaged over the entire population. The population on the left forms a decision network (neural "opinion" reflects the decision to act), while the population on the right forms a navigation network (neural "opinion" reflects the determination of the correct navigational heading; source: Jacob et al. 2015 & unpublished data). The timing of the initial decision for action is marked by an orange line, although the task is not complete until the time marked by the green line. We hypothesize that these distinct neuronal populations contribute to epochs denoted by *kairos* or *chronos*.

If humans are like individual neurons (or the "microchips" of society; Harari 2016), what is the data that we process? What is the content of the messages reverberating through social networks and social media? In the brain, signal content is not raw data, it is information of significance to the organism. Each message reflects the unique, dynamic, interpretive perspective of the neuron, filtered by neighbors and the surrounding media. Similarly, we suspect that the significant messages reverberating through the noosphere are relevant to societal challenges and collective action. For example, as of the writing of this article, "Baby Shark" is the most viewed YouTube video with over 7 billion views. We suggest that collective action necessitates shared content, but also significant, motivating content. Significance and value are subjective for individuals and intersubjective at the level of society. As such, meaning cannot be determined from raw, "objective" measures of activity, such as the total number of views. That is, it is not merely the presence of activity in the noosphere that is necessary for collective decision making; this information must be of significant value and maintained across multiple spatial and temporal scales.

We consider that this collective content reflects the habit of a global consciousness (or nascent collective unconscious) that is early in its developmental trajectory. #BabyShark might suggest that the global brain is an infant learning through song (similar to parent-infant affect sharing), and notably songs are the most popular content on the internet. Simple, repetitive catchy songs may be a mechanism for sharing and evolving social content in the noosphere (as social media apps like TikTok have demonstrated). Current social media content is not functionally organized, action or problem oriented with respect to society. At this stage, the noosphere appears to reflect the activity of a spatially distributed nervous system; not clearly organized with respect to the functional demands of temporally *and* spatially directed actions, as seen in organisms with a centralized nervous system.

Could societal "progress" be a key example of the current noosphere's action output that is most analogous to the movement through space of an organism with a centralized nervous system? If racial equity or social justice is an example of societal progress, the civil rights movement of the 20th century had only temporary effects on public opinion because the work of equity and justice was not broadly sustained. The noosphere may have initiated the kairotic moment of the 1960s (the impulse to action) but did not support a significant increase in long-term awareness and effort in the following decades; in other words, we have struggled to maintain the kind of social activity that recreates on a collective level the concerted navigation through time and space of an individual animal's centralized nervous system. Reflecting on our current predicament, the content of #BLM is highly motivating and significant to a societal challenge (unlike #BabyShark, for example). It

remains to be seen if #BLM will help achieve a sustained chronos effort necessary for societal progress.

We now consider the ingredients necessary for an adaptive, evolving noosphere. We extend Harari's parameters for information processing efficiency between people to consider the importance of information dynamics, in terms of dynamic shape and content:

1. Networks must have adequate number, variety, connectivity and plasticity
2. Information dynamics must have the potential to be rapid and sustained
3. Information content must be significant to societal challenges

Our initial studies of racism suggest the intertwined importance of information dynamics (#2) and content (#3). Thus, we expand upon Teilhard de Chardin's original conception of complexity consciousness: structural complexity (#1) is necessary but not sufficient to support the noosphere; anatomical complexity must be mirrored by dynamic, physiologic complexity (#2). The global brain must acquire rapid feedback and this feedback needs to occur at the right time, for the right groups, and for the right reasons (#3). The human brain has achieved this through a balance of synchronization, desynchronization and ongoing, "spontaneous" reverberation through neural networks across multiple spatial and temporal scales.

What about the noosphere? While many in the media have complained exhaustively about the so-called "short news cycle," the rapid transmission of information is necessary for kairos, for shock, surprise, re-orientation and collective mobilization. Moreover, as in the brain, the information content must be motivating and of significance to the organism. The quality of the dynamics and the content are informed by an evolutionary process (see Deacon's Teleodynamics) that while goal-directed is no guarantee of success.

A critical question to arise from this work reflects the importance of chronos. How do we, as a society, shift from the chronic illness of racism to sustained, transformative chronos work? Building on a therapeutic model, we consider the importance of emotional vulnerability, compassion and the self-other-we boundary. We see these forces as the necessary ingredients of the ongoing information *content* of a noosphere whose evolutionary telos we can orient toward ethical transformation. We transcend our individual self when we are willing to be vulnerable. This occurs transiently within the context of civil rights movements, when we see ourselves in the other, in an experience of emotional vulnerability:

> *I was shaken to the core by the killing of Emmett Till, I was fifteen, black, at the edge of my own manhood, just like him. He could have been me. That could have been me, beaten, tortured, dead at the bottom of a river.* -John Lewis (John and D'Orso 1998)

> *I said that this could have been my son. Another way of saying that is Trayvon Martin could have been me 35 years ago…I think it's important to recognize that the African-American community is looking at this issue through a set of experiences and a history that -- that doesn't go away.* -Barack Obama (Franke-Ruta 2013)

These are examples of kairos, the moment of emotional insight, when our skin is gone and we are compelled to action. Do we go back to life as usual? Chronic illness, like structural racism, is a lifelong project and there are no easy fixes. Compassion, and not mere transient empathy, are essential guides. This is persistent chronos work, defined by a quality of experience where we do not know the outcome of our work, where no single organism survives forever, although each contributes to the greater physical, biological, and social world. The same may be true for society: the greatest challenges such as structural racism and the global threat of climate change find their horizon when we imagine the potential dissolution of society. Nevertheless, these horizons of individual death or social collapse coexist with the vision of lineage and the promise of effortful adaptation. We as individuals and societies participate directly or indirectly in the many lineages of the vast interconnecting and fitfully unfolding mosaic of human cultures, with all the joy, pain, conflict, and collaboration entailed in the process. We can endeavor to extend our chronos work as individuals to the chronos work of societies, even as the chronos work of our societies shapes us as individuals. The kairotic moment offers the possibility of transformation, but it can only become realized through our engagement in the long arc of chronos.

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